DAVID BUTTS: All right. Let's get this puppy started.

Hello everybody. How are you doing today? Oh, that's not loud enough for me. How's everybody doing?

AUDIENCE: Good.

DAVID BUTTS: You're at the halfway point for AU. How many people are planning on making it the other half of AU?

AUDIENCE: [LAUGHTER]

DAVID BUTTS: After the party tonight, we'll really find out who the true troopers are.

My name is David Butts. I'm a BIM Specialist with Gannett Fleming. Here's my Twitter handle. A couple of introductions for you real quick here. Again, I'm a BIM Specialist. Been with Gannett Fleming for three years. I've got about 28 years experience in the Autodesk world. I've been a training manager, an instructor, a consultant.

I've also been a Revit architectural certified professional. I've been the top speaker in 2011, thanks to the generosity of a lot of patient people. And we also have with me today Armundo Darling. Everybody wave and say hi to Armundo. Does everybody know Armundo already?

AUDIENCE: [SHOUTS]

DAVID BUTTS: See, Armundo's more popular than I am. Here, you get up here and do this.

So Armundo and I have known each other for a long time, and he volunteered to be my moderator and help today. So I'm really glad that he got to be here and hang out with us today.

This class is about using Revit in the process in a water resource project world. And how we, again, at Fleming have taken advantage of these tools, not just Revit, but a lot of the associated tools in the building suite to help us do better projects.

So we're going to talk about what's in the class here real quick. Go ahead and hit that. We're going to talk about using the right tools. So the first thing you need to know is it's important to

always have the right tool on the job in here. And we're going to look at how we use these tools in Revit MEP to benefit these types of jobs.

We're going to learn how you work with your content providers to get the best representation possible. We're also going to learn how to get more value from BIM models and other products such as simulation. We actually started trying simulation out now to see if we can get it to work with Revit. And we are also talking about how to position the BIM model to your client and the contract, how you can get the most out of that.

There's a couple of key learning objectives in here. So of our learning objectives, we want to make sure that you describe how these MEP tools are used in these types of projects. How to use the manufacturer-based content.

We're going to look at Inventor for a little bit here today, and Fusion. We're also going to look at how we used BIM models for our analysis applications, such as running energy models.

And we're also going to look at defining BIM projects to maximize the owner and contract or benefits. That's our summary of everything that we're covering in here. Most importantly, we're going to teach you how to catch big fish. So everybody ready for that?

OK, so let's hit on the next one.

A couple of things about class information in here. Class number is MP-1304. Everybody got that one? This class is be recorded live. Everybody turn around and wave to the cameraman in the back of the room. He's back there. Everybody say, hi camera man.

There's a couple of deals about doing a class like this. The first thing you need to know is that we normally don't take questions, except when we get the logical breaks. And so everybody should have the AU app on their phone, right? You got the AU app installed?

When you go to your agenda and you look up this class, you pick this class and there's an activities page. If you'll post your questions there, Armundo's going to be monitoring those, and as the questions come up, we'll try to answer them as quickly as we possibly can.

So like I said, we're going to have to take some logical breaks in here, but when we do we'll try to answer as many of those questions as possible.

Our class rules include making sure that you've got your cell phones turned off. Where is my

cell phone? Oh, dag-gone. Armundo's stealing my phone.

Class participation is highly recommended. So yeah, we do want you asking questions. Ask a lot of questions, because the idea here is to look at how we do things, and hopefully we can help you guys learn how to do these projects.

You're on camera, again, you have to smile. You've got to be happy and be glad to be here. Is everybody ready to get started?

AUDIENCE: Yes, sir.

DAVID BUTTS: OK. Let's go ahead and get started. Ah, there goes a phone already.

So first thing we're going to talk about is using Revit tools in process and water projects. Take a look at some of these images in here. They're pretty cool stuff.

I was really lucky three years ago. I had been an Autodesk resource channel for about 13 years. And I had been doing a lot of consulting work, and working with a lot of people just like yourselves, trying to help them move into the BIM environment.

Everybody knows that BIM is not just software. It's a process that we use. And when I got the opportunity to go again to Fleming, one of the reasons why I did that was because of the environment and the culture at the firm. And we're fortunate, and I'm blessed to know, that these guys support what we're doing 100%, from the corporate level down.

That's where our initiative comes from. And in order to be successful in these types of projects, you've got to have that buy-in from the top. It's really hard to move BIM as a process into a firm because it really is a culture change. It's not just going and changing tools. It's changing how people use tools. And so it's important that you have that buy-in from the top-down.

And when I got there, the first thing I was asked was can Revit do a water treatment plant? And me being me, what did I say? Sure. My redneck came out and I'm like oh, we can do anything we want.

And so we started with a couple projects, and our first one was a project called Red Line, which we've published for the last couple of years in here. And boy did we learn. We learned a lot. We learned that we didn't have any content. We had to spend a lot of time developing

content that was for the water resource world. This is in Revit 2010 and 2011.

Since then, we've done a variety of different projects. We're using it for transportation jobs, for educational facilities, we're using it for wastewater, we've done some biomed facilities with it.

Now, I will tell you this much. We're not the glamour boys. I don't have the half a billion airport terminal jobs going on. I do the real grunt jobs. We do the work that's the most common stuff that you do in the field every day.

And so Revit, and the combination of tools, has its benefit no matter how big or how small the job is. The couple of particular jobs that we're highlighting, also address existing conditions and new conditions. And we're going to be talking about the Pleasant Hills Water Authority Plant that we just renovated. We're also going to be talking about the Mon Valley Project.

The other picture that we have up here is from the New Cumberland Water Treatment Plant at New Cumberland Army Base. It was a Corps of Engineers job. That was another challenge in itself.

So these are all projects that we've done recently that are either close to completion or are already completed and not for bid.

So let's go and go to the next page here.

So one of things you need to know about doing this is you've got to just not know the tool, you've got know how to use it. There's one thing that I've learned from fishing from all these years in here. So let's take a look at the next piece here. go on, keep up. You've got to have the right tools for the job, right?

How many people fish? You recognize any of these reels in here? They're different size reels based on saltwater fishing in here, and it depends on the type of fish that I'm trying to catch as to what tool I'm going to use.

So I've got these big spinning reels that I use to do fish that are right under the boat. But then we've got the big bait cast reels for trolling when we want to after really big fish. So it really depends on what tool I'm going to be using in order to know-- I've got to know what I'm going after first so I can pick the right tool for the job. And that's important. And it doesn't matter whether we're talking about the types of projects that you're using or whether you're fishing, the right tool always makes a difference.

We actually do something called stripper fishing. How many people are familiar with that? Stripper fishing off the coast, they can get 40, 50, 60 pounds. They can get really big. You're not going to take rod on the right and use it to go stripper fishing with. You will break that thing in a heartbeat. So that's why we use the heavier stuff-- bring out the bigger guns. And it's the same perspective when you're picking out your tools for a job.

So the first thing you need to do is make sure you get some good goals. You want to make sure that before you start using all these projects, you have a good plan. And that's something we developed. And we also made it very clear to our corporate leadership that this is not a one year plan.

This plan is going to be ongoing. There's always going to be ways that we improve and change the process. You have to have that perspective. If you believe that you can go and implement something like BIM in your firm and have it done in two weeks, you're in trouble already. That's not going to happen.

Our goals include making sure that we do training. And that's part of what my role is. I'm not a billable person. I'm actually part of the corporate management team. But in my role, I'm responsible for training and managing all the software.

So my training is constant, whether it's one person or 50 people, and we do training every week. A lot of time for doing training over WebEx. And we start with foundational training. We'll start guys off with doing training live in a big class where we talk about basic modeling concepts and we move them up. Then we get into more details with individual person-to-person type training.

The other thing you need to look at when you're starting your projects is how you're going to manage the data in the projects. And this is one of things that's really near and dear to my heart in here.

Everybody talks about coordinating models. I mean how many different tools do we have to check for conflicts between pipe and duct? Right? We've got 360, we've got Navisworks, you do it inside of Revit, you still do it inside AutoCAD MEP. They all have conflict detection tools.

But you also have to plan for your data. And it's really important, not just making sure that you have the right fields, but you also can correspond fields with other applications. Be thinking about outside of the box. We talked about that a lot yesterday at the keynote address.

So you have to have that outside perspective that I need to know how I'm going to share this information with builders with clients, and everybody else. You need to be consistent about how you do it.

From your workflow in here, we did system-based design methods. We've been teaching the three and four step process for years about starting with equipment, creating the connecting geometry, creating logical systems, and then additating the model.

We do the same approach regardless of what discipline we're working in, whether it's part of the water treatment group, or part of HVAC and piping, plumbing. We teach everybody to work the same way. That brings us a lot of consistencies and a lot of value. And it's really important, again, that you push that down from the top, so that when someone else gets trained, they're all getting the same message, same information.

And then standards. Standards don't just include what visibility graphing settings you have in a template. They include what your deliverables are, what your work methods are, and anything you're going to do with internal and external users.

We just recently started a new document that actually outlines what task should be occurring at what phase in a project that corresponds to the Revit task. And we've got it charted out based on the type of job. And it was really critical for us to do this, because a lot of times-- let's use electrical, for example. How many times do you guys get all the electrical data you need at the start of a job? You typically don't, right? You get that at the end of a job.

Well, we're changing that culture of trying to get that information into the electrical engineer's hands sooner, so we get a more comprehensive design, and fewer errors and changes at the end of the job. You have to establish that standard.

So starting from day one, again, this required a culture change at our firm, big time. We had a lot of guys that were very good at CAD, but they were not very good at modeling. They didn't understand the concepts of working with BIM.

So we started with select team members. We call them subject matter experts in our firm. We picked the best people that we had that we knew we had some modeling capabilities, and we put them on the first Revit jobs. And then we continued to build and promote those people so that they can help others in the company. So if I'm not around, if I get hit by a bus, I've got

somebody that can fall in behind me and follow the same work processing work method.

You've got to have an open mind. I ran into an electrical engineer the other day that said Revit can't do panel schedules. I smiled at him and I said, oh, yes they can. The way we have them programmed, if you're not doing panel schedules, we're repeating work. And that's one thing that is my pet peeve. I cannot stand to see anybody do something twice. So we try to find every possible spot to eliminate that from happening.

You also have to address each project is its own. How many people have heard that Revit's not good at doing renovation projects? I'm about to prove you all wrong.

We actually have a job coming up, a big job, a large government building that we're renovating, and we're doing an as-built model with a combination of scans and actual modeling in Revit, depending on the complexity of the rooms and where we're working. And again, we're leveraging the tools that are available to us to be able to do these types of projects. So you have to make sure that you can address everything in here.

So the first thing we're going to look at is the Pleasant Hills Water Authority job. This is a project that is at 95% complete. And it is a renovation. Does that look like a renovation job to you? This entire project was modeled architecturally and structurally in Revit in 100 hours. Every structure, every building. Pretty impressive?

Let me show you how. Let's go to the next slide here real quick. Come on, Armundo, keep up. [LAUGH]

All right. So here were our key factors on this job. This was an existing client. We had been doing work for this client for many years. And we already had the CAD files. In fact, we had a very well-defined site. We had done the site in Siebel 3D.

We were the original designers of the structure, so we had the original CAD files with all the sections and everything else. And when we got to the point where we were doing the structures, we actually used the CAD files to create our profiles and shapes for all the structures. It saved us a tremendous amount of time.

But it also helped that we had two experienced Revit users that were really getting into this on a project. This came out of my Pittsburgh office. And both of the techs that I had working on this job had already had a little bit of experience working with some smaller jobs, but they learned a lot on this job. They learned how to do, from a process standpoint, how the

architectural building is defined. So they did a really good job.

So it's important to start with that staff that was familiar with the project and with the client. It really helped us out a heck of a lot.

So our key decisions included using these existing CAD files to build the model. Now, we only modeled this to LOD 200. We didn't do a overly detailed model. But how complicated would it be for us to take some of these concrete structures and just swap them over to a different type? It's not complicated at all.

We also had all of the new and existing MEP in one file. So we have one big MEP in process model. Everything is done in that one file. And amazingly enough, with this whole structure, the file's only about 120 meg. And it's because we use a lot of representative parts. We didn't use a lot of actual manufacturer parts. But we were using their parts and their cut sheets to actually model the equipment. It made a big difference on how the job went.

So all the facilities that we do-- and this is another thing we do. We talked about this a little bit this morning in the AutoCAD MEP lab I was doing. We work at real world coordinates. We work at real world elevation. We don't work at zero-zero anymore.

We figured out how to bring Revit sites in, and actually get everything in on the site. So when we design the buildings, they're at their real coordinates, and it makes coordination with Siebel very simple. It makes it a lot easier for us to make our connections.

Now, one of the things that we wound up having to do is we really had to implement using scope boxes and work sets to take advantage of each building. So every structure in here has its own scope box and it's own work set, so that the levels can be controlled. You don't have levels shooting off into space. And we can also use work sets to control the visibility. So we have it all sorted by building structure, according to the client's building numbers.

So we had to put a lot of thought into this before we got started. And that's what made it successful is we had a good plan going in to make sure that everything worked.

So a couple of other key decisions on this. We communicated our goals and needs to the vendors early on. How many of you guys get 3D parts and content from manufacturers? How's that going for you?

AUDIENCE: Not very well.

DAVID BUTTS: Not very well?

AUDIENCE: A place to start.

DAVID BUTTS: I'm going to show you some stuff here in a few minutes that's going to make your life a whole lot easier. How many people have the Building Design Suite Ultimate? Good. You're going to love life after this.

AUDIENCE: All right.

DAVID BUTTS: So we made a requirement to our vendors, and it kind of shocked them. I actually went up to our practice lead and said I'm going require our vendors to provide 3D models, and if they don't provide them, they will no longer be our vendor. That sent a couple of ripples out.

Now luckily, a bunch of our vendors were already using 3D modeling programs. Some of them were actually using Inventor-- we just never asked the question. So it's important that you ask that question.

And we also had people that were using SolidWorks. We got a lot of SAT files and SDL files for the projects. So those were required and we converted those. My team converted them as part of the overhead, not as part of the project cost. That was one of our advantages is that we can help our staff convert families forms, because they're not spending project time to do this.

So that makes it really easy for us. And we also, during the course of this, had developed starter families that already have all our parameters in them. You every had that problem where you bring in a family from Seek, and you get 50,000 parameters that have absolutely nothing to do with your schedule?

AUDIENCE: Yeah.

DAVID BUTTS: That's a huge problem. So we created our own system of using our own families with our own parameters that are already mapped to the schedules. We're going to talk about that a lot tomorrow in my next class here. So those are just a couple things.

Now, another thing we did is we had a large training class at the start of the project where we got everybody in and we talked about the concepts to workload. And we required our engineers and project managers to attend. A big difference.

How many of you guys can get a project manager to go to Revit training? What's that like? Sometimes computer concepts can be really hard for project managers, but they figured it out and they knew how it was supposed to work. And now they're some of our biggest supporters.

So the BIM management team, myself, and Norb, and a couple of other people, we continue to support customization throughout the project. If somebody gets in a bind, they get us on the job and we help. And again, we're not a cost of the project, so that makes a big difference in here.

So these are a couple of things that made this job go by really well. And like I said, we were ahead of schedule and under budget. Those are a couple things that we like to hear. But we also learned a lot on this job about how we can work and how we can improve our process. And electrical was one of our issues. We were getting late electrical data, so we started requiring that sooner.

So let's talk about another project in here. This one's a little bit more popular. We're going to have a video about this one in just a second in here. This is the Mon Valley combined sewer overflow/treatment facility in here. Mon Valley is in a blighted area in Pennsylvania, and they had a lot of brown site problems that they were dealing with down on the river. And we got hired to come in and help with some of these combined sewer overflow problems, where we were getting a lot of debris in the water system.

And so this site, this was a tough one because we had a lot of issues dealing with getting some of our site stuff worked out. But the beauty of having everything in Revit was is we had the ability to move things around very easily because we did everything in one file.

Now, when I say everything, we did everything MEP. I have one architectural model, one structural model, and one MEP process model. And because we used a lot of level-based information, it made it really easy for us to adjust things pretty easily.

In this case we also used a lot of place order equipment, and we had a vendor who was more than patient. And they came through many times to readjust this grit separator as we started coming across different site conditions that we had to address.

That communication was started on a Pleasant Hills project, where we went back and started establishing that relationship with the vendor. And by having them as the exclusive or

preferred vendor now, that makes a big difference.

So those are a couple times of things that we did in here. So let's talk about this job in a little bit more detail.

Let's go ahead.

So, again, another existing client. We had the experience team already ready to work on Revit. We had the familiarity with the vendors that were already providing content. And the system wasn't really that complicated. We're not talking about big plant. And that's the thing that you have to take away from this.

A lot of people think that some of these projects are too small to do in Revit. I've done a valve box in Revit. A concrete box in the ground with a bunch of pipes coming in and valves in it. We've done them that small. Because we gained so many advantages from the sectioning tools and everything else that it's ridiculous for us not to do that.

So our guys that are in Revit now, they hate to go back to AutoCAD. No offense to AutoCAD, but that's not the workflow that they prefer.

So it really works well when we're doing compact areas, where we have a lot of close coordination going on. In this case, we had some very dense piping in our chemical building and in our diversion building. So we had to make sure that we could get everything to fit in there, and that was one of the advantages that we gained by doing this.

So a couple of lessons that we learned from it in here. Get your schematic conceptual layouts nailed down early. We did have some issues with our hydraulic profile on the project, and again, we learned how important communication is with the client and the landowner before we get started to make sure that we're meeting all their requirements. Because you can run into problems down the road if you're trying to move one level above another. You can actually break things in Revit. That can actually cause you some problems.

So we leveraged detailed line work over a site. We actually brought the site into the Revit model, and instead of drawing the initial model, we just did some basic shapes and some basic line work to figure out where everything was going to go. And that made it a lot easier when we actually got the building nailed down.

Now, I didn't know about InfoWorks when we started this. And I found out about InfoWorks

about three months ago, and I'm sitting there kicking myself thinking if I'd of had this tool within my project managers hands, and in my engineers hands when we started the job, he could have saved us a lot of trouble by being able to show the site schematically in 3D. It would have made a big difference for us.

So starting with that well-defined hydraulic profile is critical, and we really drove that home into our water engineers.

We also ran into a problem when we got the site file from our civil consultant, we asked for the specific property and we got the entire valley. 16 miles of site file. So we, again, had to communicate with our engineer that we were working with on this job and explain to him what our requirements were. Once we got the file trimmed down and it was site-specific, it made it a lot easier to make sure that we were doing this accurately.

Now, our process guys actually did our first architectural file. How many guys in here do water projects or process jobs? Who actually designs the building on a water treatment plant? Is it the architect or the process engineer?

AUDIENCE: The process engineer.

DAVID BUTTS: Process. So why would you not have them draw the model? So we went through and taught them architecturally what they needed to do, but we let them keep it down to generic objects. And we cheated. We actually made generic walls purple. This ugliest shade of purple you could possibly ever see.

So when you're looking at a plan view, if somebody hadn't changed that wall to a construction type, you have purple walls in the drawing. And really was a nice little visual effect to help us check to make sure that we had everything designed.

We also didn't underestimate the importance of our shared parameters. And we made sure that when we set the project up, everybody was working from one file. I have one corporate share parameter file for MEP. And it applies to process and everything. And that made a big difference for us to make sure that everybody had consistent information on the job. It made it work a whole lot better in here.

So I wanted to give you a quick picture of this combined sewer overflow project. And so we're going to go ahead and show this video real quick, and see how you guys like this. Oh, Armundo missed it. Just click on that sucker and there it'll go. So watch this.

[VIDEO PLAYBACK]

-A combined sewer is a type of sewer system that collects sanitary sewage and stormwater runoff in a single pipe system. During wet weather, it combines sewer overflow, or CSO, can discharge excess wastewater to waterways. Contaminants can include bags, bottles, and cigarette butts, as well as fecal coliform, oils, and grease.

In the case of Mon Valley, as with cities throughout the United States, industrial sites along the river have turned into abandoned brown fields. To help alleviate this concern for the Mon Valley Sewage Authority, Gannett Fleming has designed a sustainable 44 million gallon per day CSO treatment facility that uses green infrastructure for onsite stormwater management.

Combined sewage first enters the facility where solids and floatables are removed and deposited into a dumpster within an odor controlled building. Next, water flows through several underground structures and pipes where disinfection chemicals are added to kill waterborne organisms and bacteria.

The water then enters a unit called the storm king, a system designed to effectively capture and remove total suspended solids and contaminants larger than six millimeters.

Seen here, the facility conveys clean water to the river. Once complete, the Mon Valley Sewage Authority Treatment Facility will encourage economic growth along the river front, by eliminating a major source of pollution, and inviting people to an area that can be enjoyed as a place to work, live, and play.

To learn more about Gannett Fleming's total water resource solutions, visit us on the web at www.gannettfleming.com.

[END VIDEO PLAYBACK]

DAVID BUTTS: Is that pretty cool? You've got to clap for these guys, man. My techs did a fantastic job.

[APPLAUSE]

DAVID BUTTS: And one of the things that's really cool-- we're going to stop and take a break here for questions in just a second. But one of things I want to talk about, everything you saw in there was modeled in Siebel 3D and Revit. Everything. Materials, whole shooting match, was done in those files. Don't tell me you can't do these projects. Because it takes the time and the effort

and the right planning to do it. And look at what we're able to leverage from that is that benefit of being able to have the video.

Does anybody have any questions about that particular part? OK. That'll be one of our break points.

ARMUNDO DARLING: We're good.

DAVID BUTTS: We're good? OK. So we're going to keep going.

So next thing we're going to talk about, and I'm going to be sitting down, driving a little bit for you here, next thing we're going to talk about is how to edit some of this manufacturer-based content for efficiency. And for parts.

I want to talk about a couple of the images that you see up here. The first one is a preview from the Red Line project that we did a couple years ago. And look at the detail level that you see in this model in here. That's pretty cool, isn't it? You can even see the decals on some of the instruments that you have in here.

Now we did a lot of neat little tricks. That was actually a 3D Studio max trick. But we also used some decals inside of Revit to actually show a little bit more detail inside the Revit model, instead of actually modeling the whole control panel. Something along those lines.

So you can see it's a combination of using 2D graphical information with 3D information to get what you need. And again, this was an early project, so it wasn't quite as good as some of the ones we're doing now.

For example, you don't see the actuators on the valve bodies. But there's some neat things that have we actually learned from this job.

The second one in here was an as-built model of a project that we're going in Woodbury, New York, where we were trying to just model existing conditions. And so we were going in and looking at the three grit route separators that they had, and just sketched up a quick model to give the client an idea of how we would change what they were doing in this particular project.

I have a technician named Chris Isreal I'm giving a shout out to. He's probably one of my best technicians. Chris calls me up one day and says I need to do a water tower. In Revit? Yeah.

So he modeled the water tower in Revit. Pretty cool? How many of you guys have ever done that before?

Now, luckily for me, he was an Inventor guy, so he knew the combination of how to use Inventor and how to use Revit together, but this was back a couple of years ago. So he wasn't working with the same tools that we have now in 2014 that really make it easy to do this.

So I just want to give you some examples of what you can do inside of Revit that are not traditional type projects in here.

So sometimes you've got to take what you can get and make it work for you. Now again, you guys know I like to fish, right? So we took a trip down to Key West a couple years ago, and I'm sitting there thinking, with my redneck mind, what can I do to redneck my Jet Ski.

[LAUGHTER]

DAVID BUTTS: And the combination of redneck and fishing kicked in. So I went into Revit, and I designed the rack on the back of that to hold my cooler with, and I also have a couple cupholders for the beer, so that's good.

And then I said well, I'm going to be in shallow water. I really meed to see the bottom, so I put in a side scan imaging hummingbird radar detector or radar fish finder on that thing with the through-hole transducer. Isn't that really cool?

[LAUGHTER]

DAVID BUTTS: Who's the biggest redneck in here, right? That is the fastest trolling boat in Southern Florida right now.

[LAUGHTER]

DAVID BUTTS: And then when I was building it, I exported out DWF files to design review, and was down in the garage with my tablet on the ground cutting PVC, manually. I didn't have a CNC cutter. I'm sorry, I'm just not that sophisticated.

You've got to take what you can get and make it work for you. And, again, this actually has worked really well. We've done a lot of shallow water fishing with it, getting up in the coves where I can't get my big boat. My big boat drafts two and a half feet. There's no friggin way I'm taking that thing into some of the sounds that we go to.

But the nice thing about the jet ski is it's a stable platform. And so I can stand on the edges and cast and do all that other good stuff. And it's a whole lot better than being in a kayak, as we've heard recent new stories. That's not a good place to be fishing from.

So that's just a couple examples of taking what you can get and making it work for you. Let's move on here.

So we have different tools that we can use right now, and we use a combination of tools at Gannett. We use Fusion 2013. I was going to show you that today. I think we're going to hold off on that. Because, really, where we are now is with Fusion 360.

How many people have been using Fusion 360? Nobody? How many people use Inventor in here? A handful.

Well, 2014 is the bridge we needed to cross. And with this product, we have the ability now to take any format file and save it into something that we can use in Revit. And it makes your life a whole lot easier because now you can talk to your vendors and your manufacturers and get them to give the content that you need, and then convert it into something that's usable for a project.

Now, I want you to keep in mind there are some issues sometimes. For example, when you're bringing in a model from SolidWorks and they use a lot of swept surfaces, those don't really translate very well. So we've learned how to bring those into Inventor and convert them over into different types of files so that we can reduce the complexity of those files. They have a tool I'm going to show you in few minutes called Shrinkwrap Substitute that makes it a whole lot easier for us to keep up with that.

And what we look for is the ability to export these file formats in here. Now, in our firm, we primarily have premium design suites. But our BIM team and our specialist team have the Ultimate suite. And one of the reasons why we bought that is because it has in full, Inventor in it. I promise you, for what you get in the Ultimate package, this gives you the best set of tools to do this job. You want Inventor on your desk.

And you know what? I'm not an Inventor expert. I'm barely a Revit expert. But when you go back and look at this stuff, having Inventor to do those conversions makes your life a whole lot easier. So when we do our exports, what we're looking for are DWGs, DXFs, Inventor IPT-- and that's actually wrong. That should be IEM files. We're looking for SAT files, STL, STEP

files, IGES files, things that we get from people all the time.

So there's a couple differences between the programs. I want to point this out before I give you a little demonstration here.

Fusion 2013 supports additional formats such as DWG, so when you open a model up in Fusion 2013, which runs on your local computer, you can do a Save As with that file and save it as 2013. That's all it is. So I can open up an SAT file, go to the file pull-down menu and pick Save As. Save it as a DWG, and I can use that to import it into a Revit family and add my connectors to.

Fusion 360 also does the same thing, but it doesn't give you the DWG export. One of the advantages to Fusion 2013, with it being in the cloud, is that you can collaborate with other users. So I can actually show my vendor what I'm doing if I invite him into my group.

I can also do in full Inventor 2014. And the advantage to 2014 Inventor is that it can create Revit in ADSK files natively now. Depending on the type of parts you have. If you have an IPT part, you can actually save in RFA. If you have an assembly, you can save it as an ADSK file, which all you have to do is open it up and Save As in Revit and it becomes an RFA.

Now, the other beauty of Inventor is it does allow part editing. So if you want to take out un-needed detail, you can do that. We use the Shrinkwrap Substitute tool frequently to actually go through and de-tune those assemblies. But we don't try to take out the guts of the part. That's not really our responsibility, because we don't own the design. We're just tweaking it enough so that we can use it in the models.

And so any of these assembly files that you see in these formats, they can be defined as an assembly when you bring them in. If you bring in an SAT file, it automatically converts it to an assembly. And that's one of the things that makes it really easy for us to use.

So I'm going to kind of get out and do a little demo for you. I'm going to drive. I didn't lose my glasses, so that's a good thing. So let's go ahead and do a little switch here. I'm going to start as showing you Fusion in here.

Now, again, I'm running Fusion up in the cloud right now. And this is a pump that came from Flight. How many of you guys work with Flight? They have a lot of manufacturer solids, but they have a lot SAT files that they use.

And so what I did with this is I simply opened the file up in Fusion. I loaded it up on my cloud service from my Home tab, and I've got it up in here. Now, the beauty of Fusion is when you import a part like this, it does break the part down into pieces. I need my rails to be parametric. I don't need them in here. So all I have to do is pick up and delete them out of the file.

And what I'm doing is using part of the assembly in here that I know has got to be fixed. And then when I bring it into Revit, I'll add those rails back in as parametric solids.

So I'm leveraging part of what I got from a manufacturer to help me develop a part that makes it a little bit smarter. And it's just a really simple step. It doesn't take a lot of effort to do this. And then when I'm ready to actually convert it, it's another simple step. I simply just go back and save the part into a different format, or just print it in whatever image that I need in here.

So I go to Create and add solids. I can modify shapes. I can work on the symmetry of the project. I can sketch lines and anything else that goes in here. I can do an inspection of the parts. I can add images as I need to, and I can select the objects.

So there's just a bunch of different ways. And then when I'm ready to create a new version, I just simply save it, and I just add it as a new version. And then I can save it into an SAT file, which is what I really want to be using.

And again, the other advantage to doing this up in Fusion is the fact that I have this web portal up here-- and again, I'm not a great expert at doing this stuff. But if I've got this up here and I set up a group for other users, than anybody can go grab this file. So as long as I define the group and I say who the users are, then they can go up and download that project.

And now, why would I want to use Fusion in this group to actually share the files? The beauty of this is that you're keeping a record of what your changes are. And by having it up here in the cloud, I don't necessarily have to attach it to an email to send it.

I can get somebody in another office to actually download this file very quickly and very easily. They can make changes right here in Fusion 360, which is a subscription product. And they can go in and make those changes, and then dump it back up here if they need to.

So it's real simple in here. It's a great tool to have for actually editing a model.

Now sometimes I need to get into a little bit more detail. I'm going to go ahead and close this guy out. And I'm going to switch over to full Inventor right here.

Anybody recognize what this is? I got my water designers in here. Somebody's got to know what that thing is.

AUDIENCE: [INAUDIBLE].

DAVID BUTTS: It's what?

AUDIENCE: [INAUDIBLE].

DAVID BUTTS: It's a UV unit. Now, you're looking at a vertical version of this unit. This is an increasingly popular tool that we use for water treatment. Ultraviolet radiation is a very low emission, low impact type of way of treating water. You don't have a lot about by-product from using this. And so we've started doing more and more of these on a job.

Now, I get a model file from somebody. It might be a little bit hard for me to edit. And let's take a look at some of the UV tubes in here. I might need to manipulate how deep this component is inside of a channel.

Well, the beauty of doing this inside of Inventor is I've got a couple of tools that let me save it directly as a Revit family. And when you start from something that's an IPT format file, which is the way we got this. We got this actually from somebody who was using Inventor already.

You get these tools in here, and the first tools is check Revit features. And what this does is it goes and looks at the model and it look for problems and errors and anything else that might be happening with that particular model.

So we'll give this guy a second to come up. And here's our little feature check report that tells us if we have any components. So it says, all right, there's a feature in here that isn't recognized by Revit, so something is not going to get transported. And I can actually go back and take a look at that later and figure out what's failing. And I use the recognize Revit features to actually do that with.

Now, the next step I do when I've gone through and checked the model is I do something called BIM exchange in here. Now, this is something that I got a little bit of a mixed feeling about. I like the fact that I can do cable trading, conduit, and pipe and electrical connections inside of Inventor. But I really don't do that. I do that inside of one a my starter families, because I already had my parameters loaded up there, and they're already correctly

associated.

So in this particular case, I don't use the connectors piece, but I do use the export building components for it. And it's real simple. All I've had to do is call this file up and come over here and do export building components. And it tells it right here that it's creating an RFA file.

And how nice is this? I mean how many times have you wanted to get an RFA model of your equipment? Think about that. Think of the advantage of having a software package like this where it directly makes an RFA.

Now, we do have it controlled. Like I said, we only have four licenses in this. I don't put it out for everybody. One of the reasons why we do that is because we want to also make sure we're protecting our vendors' intellectual property. We've got that great relationship with them and we don't want to take advantage of it, in a wrong way.

So there's a couple of things I can do in here. Once I decide whether it's going to be an RFA or an ADSK file-- Let's say I'm going to start with an RFA, I can come in and I can set what the component type is. So I can say, OK, what is this? Is this the supply or distribution or treatment. Whatever it needs to be. Sanitary laundering equipment. You just go in and pick how you want to assign this to a specific OmniClass.

So in this one, I want to just look at general purpose services, and just call it general protection for services. Any one of these Omni classes, it doesn't matter. But one of things that's really unique about this is if I go in and tell it that I want it to be mechanical equipment, then I already get the classes that I need.

Now, how many people are actually using OmniClass labels in their families? What's the advantage to using OmniClass? Why would I want to do that? Hmm?

AUDIENCE: [INAUDIBLE].

DAVID BUTTS: Well, it lines with my specs. It also gives me a way of filtering schedules. You can actually use OmniClass numbers as a filtering tool for your schedules. So if I only want to grab my UV equipment, I just go to the OmniClass class number that I've assigned for that. And so you can actually break these categories down and look at which specific one you want to use to assign this to. And you're doing this in Inventor.

Now,the other thing I'm looking at in here, too, is what properties I want to export. And I can

filter this to only show me properties that have values, or I can come back and pick specific model properties that I want to export.

So now I can say what do I want to include in here in this particular list. And I can also include additional information, additional model properties as I need to is like when this thing was created, the status of the file, when the manufacturer approved it. And I can also change the orientation based on model cube or view cube or model origin.

So once I've set that export up, I simply click OK. And that goes and creates my file for me now as an RFA. Pretty cool? And then when I'm done, I simply pick Finish BIM Exchange.

So the whole purpose in here is to be able to take a part from somebody that's already using Inventor and be able to make that conversion. What happens if I get to a situation where somebody's not using Inventor? How would I actually go about making that change?

So we're going to let this guy finish here real quick for a second. Actually, let's cancel this so we can move on to the next one.

I'm going to open up another model for you real quick. Let's see, I want to do this assembly, too. So this was a grit collector and separator that actually came to us as an SAT file. And all I had to do was open it in Inventor, and it automatically creates an assembly file for me.

Now, one thing I want to show you is the difference between working with a part and working with assembly. Notice that the BIM tab isn't there. So I go to Environments and I start the BIM exchange.

And here's my real good one. This is what I love about Inventor. Have you ever gotten a model file that's like 50 meg?

AUDIENCE: About 500.

DAVID BUTTS: 500 meg? We actually were working on a train maintenance facility, and we got a train model that was over a gig. Well, needless to say, we didn't use that model. We also didn't have this. So again, just the trucks along were like 300 meg on the rail cars. So it was crazy. We couldn't use that.

So by using Shrinkwrap Substitute, what you can do is you can actually pare this thing down and create a derived part in here. And so when you're actually substituting this, you can go in

and say how do I want to make this smaller?

Do I want to do whole parts, or do I want to do parts in phases? Do I want to ignore surface features? Do I want to remove parts by size-- anything smaller than 1% of the overall model? Do I want it to patch holes? What I want it to do? And I'm working in a reduced memory mode. So you've got a lot of options in how you can actually set this.

So when I pick OK, watch what happens to the model. You're actually going to see a lot less detail in this model than what was in there before. And again, the whole idea is to give me something that I could work with.

Now, the big difference in working with the assembly here is that you can only save it as an ADSK file. But that doesn't matter to me because I can still call that thing up, bring it up into my project, and actually use it-- just open it up as an ADSK file, save it as an RFA, and then load it in the project.

Pretty simple? This all good?

So it allows me to work in the more complex world of the water resource and project projects by giving me a tool that lets me use real world equipment. A lot of our clients have specific vendors they like to work with. And so this is one of the reasons why we use this tool. It's very helpful for us. OK. Pretty cool?

All right. So we're going to switch over to another mode here real quick.

AUDIENCE: [INAUDIBLE].

DAVID BUTTS: Does this work in AutoPLANT?

AUDIENCE: Have you ever used AutoPLANT?

DAVID BUTTS: I haven't personally used AutoPLANT. But I know Plant 3D has some compatibility with it. You can use AutoPLANT information in a Plant 3D project. We decided not to use Plant 3D for a variety of reasons. We like Revit much better. And I'm going to show you something at the end of the class here as one of the reasons why.

All right. So let's get out of this guy. And now I'll switch over to Revit here and get back to our presentation.

Now there's other things that I use Revit with. How many of you guys have started using some of the plug-ins and the add-ons for Revit? OK. How many people are using CFD simulations?

We actually just got in to doing that type of work, doing more analytical reviews of our models. There's a couple things about doing this. You've got to know when it's the right time to actually use these tools.

We also-- I finally got my engineers out of the cave and got them to start using Green Building Studio. They're Trace guys. They love Trace. How many of you guys have Trace in your office? Pretty much everybody, right. You're an HVAC guy and you say I'm taking your Trace away, what do they usually do? They panic, they head to the cliff, they drink the Kool-Aid. These guys really have a hard time with that.

So, one of the reasons why I like to use BIM models with these types of tools is because I don't have to create the geometry twice. Again, I'm back at that I don't want to do anything twice if I don't have to. So there are steps in here that we're going to take a look at of how we can get this information into other tools and into these analysis applications.

All right, so in today's climate it's all about knowing how to use this stuff with analysis. Again, back to fishing again. Boy, you'd think I'd get off of this by now.

I got all excited because Garmin-- I have a lot of Garmin navigation equipment on my boats and in my car. I really love those guys. And they just came out with some really new touchscreen type equipment.

So I'm here at AU slaving myself out today so I can buy some of these new GPS units for my boat. But not everything you have it has to be GPS-based in here.

There's another company called HotSpot Charts in here, and we use this to do sea surface temperatures in here. Because transitions between sea temperatures, between water temperatures, is usually where the fish are. So what we look for are those high gradients between cold and warm water. And that's where we find the bait, and that's what we find a lot of the bigger fish fishing on the bait.

And so we use a lot of modules on our GPS system to help us determine what sea temperature you are. We cheat. We take all the fun out of fishing. And it's funny because you get on some of these units-- we actually did this. The stripper fishing, the lures weigh about 32 ounces. And we drop them down in the water, and on our side scan imaging you can see the

bait go down-- we have sonar on the boat-- and you see this bait go down and out behind the boat. And you can actually track it.

When we were doing jigging-- everybody know what jigging is? It's the redneck term for dancing. No, that's not what it is.

[LAUGHTER]

DAVID BUTTS: Jigging is when you take something-- I actually had a guy use kitchen knives for this-- old stainless steel kitchen knives. And he would drop them down in the water and reel them up real quick. And fish like tuna and albacore and all kinds of stuff-- really aggressive fish will go after it and chase anything that's shiny.

Well, we could actually drop the jigs down and watch the fish chase them up. Isn't that cool where technology is?

So what I was going to do was get a camera, send it down, and capture everything with recap and watch the fish coming up.

[LAUGHTER]

DAVID BUTTS: The geek in me lives.

There's a couple of steps about working with analytical models in here, and the first step is preparing the model. Getting the model done correctly. This is a pet peeve of mine, too. I've had some architects that we hired recently that didn't understand the concept of a template. And so they'd just go and copy another template or copy another project, or start from scratch and start drawing stuff.

You have to do the models the right way when you start to work with analytical packages. And really, when we talk about analytical software, you're really using this stuff early in the job. So you're going to be doing a lot of more conceptual type work, especially if you're doing CFD analysis.

We did have some problems-- we actually tried to bring the Mon Valley project directly into simulation CFD on my computer. I just bought a brand new laptop, right? 16 gig, flash drive, everything on it. Just hot rod.

Well, after eight hours of waiting for it to bring that project in, I finally killed it. When we did it on

the cloud, it didn't take long at all. But again, it's learning how to prepare that model in such a way that we can use it. You don't want to over-detail these things.

So a couple things about preparing a model. You've got to make sure that you have bounding elements, and that includes the architectural components. It doesn't matter where you are in the process or water projects, you have to have structure defined.

We start with raw walls, floors, roofs and openings. We had to get the basic stuff in there first, especially if we're doing something like Green Building Studio or energy analysis.

The next thing we do is we make sure that we have rooms in the model. You ever have a problem getting your architect to put rooms in the model? This is why we have our process engineers do it. Because we don't have to wait on the architect to give it to us.

Then what we do is we link the architectural model into the MEP model, and we go ahead and add all our spaces and zones. And we use the architectural model as the bounding element for the spaces so that they match whatever's going on with the room.

But we also put spaces in areas like chases and everything else. Just so we can say what the unoccupied areas are. We don't want the architect putting them in in unoccupied areas, but we do want rooms in every occupied area. So that was really important to us.

And then we have to get the zones defined. You have to have zones defined. And I will tell you this about zones. You can leave that there. Make sure you define all your zones. Don't leave everything in the default zone. You will get incorrect results if you do that.

Use site orientation where necessary. Again, this gets back to our work process of working off of a site, instead of working off of a common origin. If I'm using something like Green Building Studio, why is it so important for me to have a site oriented project?

AUDIENCE: [INAUDIBLE].

DAVID BUTTS: Because when I pull it into that project and I get my weather data, and if I start doing solar studies or anything else with it, if I've already got the building oriented according to how the site is going to be, how accurate are my results going to be?

You can't a zero-zero building and pull it into Green Building Studio and expect to get the right results. So doing this correctly is critical in here, and that's why all of our projects are site

oriented, not just wastewater.

We also started teaching our architects-- and this was a problem we actually had with Architectural Desktop when it first came out-- about using mass models in early conceptual studies. Now, Amando and I go way back. How many people remember Architectural Desktop?

You can blame Armundo and I for how the first couple of releases came out. We were the original 12 of the gunslingers that helped Autodesk get that product to market. And when we were there, the way we were teaching ourselves was to start from a mass model, in CAD and AutoCAD.

And then what we'd do is derive the floor plans from the mass model. And we really didn't understand our clients because that's not how they worked. At that point in time, which was '98, '99, the concept of doing 3D modeling on a computer was like I've got to have a $10,000 computer to do this.

And so, when we started selling Architectural Desktop, we started off by showing everybody massing studies. And the architects would get up and leave the room. That's not how we work. We didn't understand the work process.

Well, we've kind of come full circle when we go back to BIM again, and now that we have the tools that allow us to do this a lot easier, we do start getting our guys to do mass studies a lot sooner in the job than they have in the past.

So it's important to make sure that if you're not sure how things are going to work in the building, go ahead and use the mass market because it can be converted. But if you're really concerned about things like energy consumption, you're concerned about air flow around the site and the structure--

Example was I needed to come up with an odor control study from the chemical building that we did at Mon Valley. And so I needed to have that model. I'm going to show you that one in just a minute in here.

I didn't use the mass models in that case. I used the building. But what happened was I got some errors that I couldn't overcome. And we're going to see that in just a minute in here. So in my case, it would have been better for me to actually start this study from a mass model.

So we're going to start by looking at the Revit energy analysis tools. And this has been greatly improved inside of 2014.

First of all, you have two modes. You have conceptual model versus building element. Conceptual model allows you to take massing studies and masses within a model and use them to do the energy analysis. How many of you guys have mass models in your water treatment plants, in your Revit files? Anybody? What do you typically start with? You start off with a guy drawing walls, right? They'll trace the walls out, they'll draw a rectangle. Make walls out of it. That's the building element mode.

And so you have the option now inside of Revit to go in and say, I want to use the building elements that are in here and use that to do my energy study with. And that makes life a whole lot easier.

How many people have actually gone to Green Building Studio recently? Anybody been using that? God, nobody's been using it? Why haven't you been using it? Why don't you use it?

AUDIENCE: We have Trace.

DAVID BUTTS: Huh?

AUDIENCE: We have Trace on there.

[LAUGHTER]

DAVID BUTTS: The question was-- this is for everybody on camera. Why don't I use Green Building Studio? Because he has Trace. Jeez. Get out.

[LAUGHTER]

DAVID BUTTS: OK. So, what if I made it really easy for you to use Green Building Studio, would you use it more?

AUDIENCE: [INAUDIBLE].

DAVID BUTTS: How do you like the reports that you get out of Trace?

AUDIENCE: Ah, they're complicated.

DAVID BUTTS: Complicated? They're ugly.

AUDIENCE: [INAUDIBLE].

DAVID BUTTS: My marketing team looks at those things and go, I can't do anything with this. What are you doing to me? They g get really panicky when they get reports out of Trace. I'm going to give you better reports in here. We're going to take a look at that in just a minute in here.

So we have those two modes that we can use for energy analysis.

One of the other things you need to do is make sure you define your energy settings inside of the Revit model. Normally you would do that in Trace, right? You'd tell it where the site is, what the constructions are. All this information.

What are you doing when you do it in Trace? You're doing it twice, because the project already has all that information. And again, keep in mind, I'm using this more than just Green Building Studio. I might be using it in virtual environment. I might be using it in EcoTech. I might be using it in simulation CFD. But by having the site defined in the Revit model, I do it once and its leveraged with all those applications.

So if you're not taking the time to go through and define the energy settings, you just hurt yourself.

Now, you do have to enable the energy model, whether you're doing conceptual or whether you're doing building modes. That's one step that I always forget and then I try to go run an energy simulation, and it says you haven't enabled the energy model. Do you want to do this? And I say, yes. It's very nice. Very polite.

So what we're going to do is we're going to run a couple of energy simulations and review the results here real quick. All right, so let's go ahead and switch back over to Revit again.

By the way, this is the live model. This is an older version, but this Mon Valley, in case anybody wanted to see it. Pretty cool?

All right. So what I'm going to do is I'm going to switch views here and actually start looking at how I want to do this. So let me look at open views. I'm going to start from a floor plan.

Now, again, I only put spaces in zones in occupied areas. Somebody asked me that question earlier. You know, when you're dealing with a water treatment plant, where are you going to put spaces in zones? Again, I only do it for occupied areas. Because any of the structures

themselves that are actually handling the fluid, you don't need to do this for. OK?

So in this particular case, we when ahead and did the architectural model. It has rooms in it. And then we went ahead and did our spaces and defined our zones. So once you have all this set up in the project, you can assign specific information to a room if you need to, like see, I have the specified air flow, design air flow. And down here at the bottom, you can actually go through and say, is this occupiable? Is it heated and cooled, and what's the overall space type? I can go and assign this.

These are all based on ASHRAE standards. It's not like somebody pulled this out of the air. They actually went to ASHRAE and got the 90.1 standards in here. So you don't have to go and reinvent the wheel in here. So you want to get the most common use for the space, and so if that's an electrical room, I'm not going in and tell the program that it's an electrical mechanical room. And I get the right area per person, the right sensible heat gain. All that information is assigned based on those standards.

OK. Once you have that part done and you've got the model updated, there's a couple places that you go in here. We're going to start with the Analyze tab. This is where they put the energy analysis tools.

And so here's where you get your different modes. The first mode is conceptual studies in here. And when you have this set to conceptual masses, it's actually looking for masses within a model.

So let's say, for example, I started doing a conceptual mass study in InfoWorks. And I got that model completed and I brought it into Revit. What's you're really going to get are masses. And I can use those masses to start my study with.

Now, most of the time when you're doing something like InfoWorks, what are you doing? You're actually working around the site. You're working at real world coordinates already. So that really helps you out some.

But even if you're not doing InfoWorks, and you do site-based projects, you'll have this thing correct for those orientations. And like I said, when we start a lot of our plants now, if we're not sure what's going on, I taught the engineers, not the technicians, the engineers, how to bring the site file in, and how to drop masses and detail lines in place where things need to be represented or model lines. Whatever they need to get the job done. So that really helps these

guys out a lot.

You have to enable the energy model if you're going to do conceptual studies. Now sometimes this can take a couple minutes. It really depends on how big the file is. And it's also going to tell you if you have any errors or problems within the file.

So like this one is going to give me a problem. The zone doesn't have a mass floor, and so it treats it as an unconditioned space. So at least the program is telling you why it might have a failure in here. And the reason why we're getting this is because we told it to do a conceptual study, not a building element study.

So what we do with this is we go ahead and cancel this. And then we come back over here and we go to the building element mode. Now, notice how Enable Energy Model is disabled. You might get a prompt telling you you need to have this enabled if you start from this point. So it's always a good idea just to check that first.

And while I'm in Building Element mode, I go in and go to my energy settings, and I look at my information, like what's the building type in here. So in this case, it might be something like a manufacture or a storage facility. I'll use manufacturing. I can get the specific address on the site, which I love the fact that you can actually pop into the internet and get the actual address of where this thing is going to be located.

Then you can go in and set what level's going to be the ground plane, what you're exporting, whether it's spaces or rooms. In this case, I'm doing spaces. Whether I'm doing complexity with shading surfaces, without shading surfaces, just do a simple result.

What phase, my sliver space tolerance, what my primary building service is going to be, radiant heater, no flew. This isn't up north. I'm not really worried about coolant that much. But you can make it any type that you want in here. We can do VAV single duct.

Then you can do your conceptual constructions in here. Now, this is another step that a lot of people kind of skip out of. And I get this question a lot of time from people that are AutoCAD, Architecture and AutoCad MEP users is why doesn't recognize the wall type? Well, It recognizes the wall construction, but it doesn't necessarily recognized the wall type automatically.

What conceptual constructions does for you, and again, this is an early tool in here, is it tells you what you expect the primary materials to be. And let's say I have to do different iterations.

How many times do you have to do three or four different samples of materials in Trace, right?

You've got to go back and say, well, OK, what if we switch over to a brick and block wall instead of a block wall? You can still plug all this in the model and they have different versions as you export this model out, with different constructions. Again, where am I doing all this? I'm doing this in the model.

AUDIENCE: Quick question.

DAVID BUTTS: We've got a question, so we're going to take this question real quick.

AUDIENCE: Can you add custom U values?

DAVID BUTTS: Can you add custom U values? I know how to do it, yes.

There are a series of XML files that are loaded-- I'm not supposed to have my glasses on with the camera. But there are a couple XML files that you can edit with the text editor to go in and add your own fields in.

I think they're in the program files folder. Construction types is the file you want to look for. And you can edit the U values, you can edit solar heat gain coefficient for windows. There's all kinds of things that you can add into it.

All right. Then the last thing I do is I define what my HVAC system is, my outdoor air. Any of that stuff. I get all that defined.

After I have that defined and I've checked this out in the project, now I can run my energy simulation. Again, it's very polite. It asks you, hey, you need to create the energy analytical model. This is actually going to take about two minutes, so we're going to kind of-- while this thing is running, see if anybody else has any questions about doing this.

By the way, that happens, don't panic. This is called the Revit black screen, has scared me half to death.

[LAUGHTER]

DAVID BUTTS: I'm getting not responding. Can I put in a request? Can you change that from saying not responding to piddling around?

[LAUGHTER]

DAVID BUTTS: Not responding.

AUDIENCE: Making progress.

DAVID BUTTS: Yeah, or making progress. Wishing and hoping.

AUDIENCE: [INAUDIBLE].

DAVID BUTTS: You got questions?

AUDIENCE: He says not responding scares him to death.

DAVID BUTTS: Yeah, it scares me to death half the time, too. Especially since this is a new computer that I just bought, me. My computer. This is called the relief mode.

[LAUGHTER]

OK. So it's been successfully created. Complexity varied. OK, go ahead and pick OK.

Now, once you get that done, there's a tool up here to actually give you the results. Now what this has actually done is it's already gone up and created the project in Green Building Studio. Think about that for a second. Did I even open Green Building Studio? Why would I not use this tool?

So it's real simple for me to go ahead and bring this thing in. And all you're going at this particular case is it's saying this is what I want to do. I can either create a new Green Building Studio project or use an existing one. So I'm just going to go ahead and continue and let that thing finish loading it up, the Green Building, so it's actually there.

And then when I get done, all I have to do is pick the results and compare tool to look at how this building was reviewed and the information that I got out of it. So we'll give it another second to finish this.

Now, I will tell you, while this is spinning, a lot of it depends on the complexity of your model. Why do I want to do this early instead of late? You can see I already have a lot of equipment in here.

I really want to be doing this before I get the equipment in. Because as I add those more

detailed models, the files that I've converted from Inventor, you see we've got some big grit collectors in here. The smaller the file the faster this goes. So it's just like anything else in Revit. The smaller the better.

So we look at results and compare, and here's my report. It came right out of Green Building Studio. I had the building performance factors, I had the annual carbon emissions, annual energy cost, energy use, potential energy savings, monthly heating and cooling loads, monthly fuel compression, my wind rose cards. Everything based on that site that I would need to put together in a report.

And again, one of my guys, one of my mechanical engineers, I love this guy to death, but he's the biggest pain in my office. Because he would not Revit to do any of this with. He's looking at it saying I can't use Revit to do this. He says I'll use Trace.

And I showed him this and he's like oh. Well, that's a lot prettier than the reports I'm generating. So he learned how to do screen captures and take this out and embed them in a Word document. Just brilliant. So I got that guy off my back. And look, I'm lighter now, too. Pretty cool? All right.

ARMUNDO DARLING: We have a question that came in asking what's your strategy for breaking models out for the MEP discipline?

DAVID BUTTS: What's my strategy for breaking the models out for MEP discipline. Take a look at the screen. That's my strategy. I have one file.

Let me ask you a question. Why do I put everything in one file?

AUDIENCE: Coordination.

DAVID BUTTS: Coordination is one reason. What's another reason why? How many electrical engineers do I have in here?

AUDIENCE: [INAUDIBLE].

DAVID BUTTS: You're not just powering lights, right? You're powering your equipment. If I had the equipment in the same file as the panels and the loads, I can create that relationship. We've been talking a lot to Autodesk about how they handle things like switchboards. Right now they're a little cluncky how they work, right?

Now, we've figured out a way to cheat and get them to work for us. MCC centers, I have custom MCC parts made, and I have a custom MCC schedule that we've developed. We had to do a lot of cheating to get it to work.

Now, the good news is, is that Autodesk has really been good at understanding what our problem is and helping us work to fix that. But in this particular case, I need everything together here.

What's a limitation of Revit? Can I create connections across linked files? No. And so you only have an option, you have to file the CBA. You have to use connectors that are anchored to a device-- we use a hosted connector when that happens.

And we actually have a project coming up where we are going to have a separate electrical project on a transportation facility. One of our consultants can't be in our file. So we are going to teach him how to use connectors. But we also are trying out a trick. We're using copy and monitor on the mechanical equipment and bringing it in to the electrical file. And seeing how that works to create our connections.

Now, is it going to make this file bigger? Yeah. But by using copy/monitor, if a change is made to the original, what happens? I get notified when it's updated. And when I get a coordination warning, I can go ahead and check that and make sure that it's current.

So we're going to give that a try and we're going to let everybody know how that works next year at AU.

Yes, sir.

AUDIENCE: [INAUDIBLE].

DAVID BUTTS: Let me get Armundo down here so we can get your question recorded, for all posterity.

AUDIENCE: You were saying the file size is important, and to do the analytics you want to try to keep the file size down. Have you noticed when converting your content from SAT files or whatever into ADSK files and then importing them into your project, that they cause performance issues?

DAVID BUTTS: Not really, because we're actually-- they come in smaller. Has anybody noticed that? When you take a file, sometimes an SAT file may wind up being 30 meg, but it doesn't really use up that much space when you convert it to an RFA? We've noticed that a lot, especially using

Inventor and the Shrinkwrap Substitute. That really downsizes, and more to something that we would expect. So it makes it a whole lot more compatible.

One more, then we're going to move into energy--

AUDIENCE: Our guys do you use Plant 3D, and whenever we bring it into Revit, you get the proxy graphics, the ACIS, you get the 2D lines, and it's just miserable. You have to bring it into a family. Does Inventor take care of that or Fusion?

DAVID BUTTS: Talk to me after this class.

AUDIENCE: OK.

DAVID BUTTS: I'm going to give a shameless plug. I have been an author for 40 technologies for three years and I just finished their first Plant 3D product. I wrote that for them. So we have a Plant 3D and a P&ID database, and the projects that you can learn off of it.

AUDIENCE: [INAUDIBLE].

DAVID BUTTS: And we use AutoCAD P&ID all the time. I'm going to talk about that in a couple minutes here.

Where we are at on the clock right now? How are we doing?

ARMUNDO DARLING: 17 minutes.

DAVID BUTTS: 17 minutes. OK. All right. I'm going to have a string hanging. I'm terribly sorry. Here, I'll walk like this for the rest of the day.

All right. So I'm going to do one more little study for us here real quick. And I'm going to switch windows and I'm going to go over to a simpler model. And again, when I'm doing simulation, I have to work from something that's a lot smaller.

And so in this case, I broke this project up into pieces, and I actually set it up so that I had only that building I needed to do the simulation. I didn't want to have a bunch of stuff in here.

What you can do now when you buy Sim Pro 360, is there's a tool in here that actually allows you to import the model directly into a simulation model. Now again, why is this an advantage? Why would I want to be able to take this directly into a simulation program?

Think about it. You're not having to model the geometry twice. And so this makes it really easy. Now, you will get some errors doing this. And again, this is part of my learning curve. Notice how it's telling me that it can't necessarily get all the surfaces in here.

But what it will do is it will bring the model in. So we're going to jump over here to simulation real quick. Now, I am running the local version here, the one that's actually running on my hard drive.

It sets up a design study for you, and you can open an existing study, make a new one. You can do whatever you need to. So I'm going to pick David1 here. Let's actually pick this guy right here and launch that guy. All of these were exports from this particular model.

And the beauty of this is that simulation will review your model for you. And help you understand what kinds of issues that you're going to have with your model in terms of doing an analysis. How does this affect what you're doing? I'm seeing this wire out of my eye.

So take a look at this real quick. It gives you some tools that actually help you merge edges together, and it also eliminates small objects. So I can tell it to do highlights by surface or by an edge. And you can say, how many surfaces or objects need to be removed, and how detailed-- what tolerancing do I want to do for this. As well as what edges I want to merge. And merge edges are smaller than this.

So these are all tools that actually help you create the model. Well, take a look at this. I mean think about it from an overall workflow issue. Why have I not been using simulation tools before? Usually because I've got to figure out how to model in the simulation program. This eliminates that need.

So now, what we're doing is we have a new business plan to expand our simulation and modeling services. We just started a CFD group in our company. And we started off using a variety of applications. We do tunnel simulations, bridge simulations, and now we're learning how to do water and fluid simulations, just to do studies early on to see how everything mixes together.

I was talking to a buddy of mine over in the simulation group and he pulled up a water treatment plant, and he showed me how in simulation CFD, he found pockets in the structure where the chemicals weren't getting mixed accurately. And so while we're sitting in the speaker ready room looking at it, I'm like well, all you've got to do is go over here and create a

concave surface here, and then change the floor out here and that'll help mix those ingredients better.

So we actually editing the model right there. We ran the simulation in the cloud and it cleaned up a lot of those gaps and voids that were showing up in there. Trying to run water through a box, you're going to get pockets.

So it was just something just seeing that, and seeing that ability to leverage this model just makes it so much easier for us to do this type of stuff.

So let's jump back over to PowerPoint here.

Couple rules about using simulation in here. It's best used as an early pre-design tool, schematic design tool. You want to work from small projects, small portions, conceptual masses. It always works better when you're doing that with simulation CFD. I lost my guy over here, he's busy.

Limit the edges and surfaces. You want to make sure that you don't have a bunch of really crazy edges going on. Like I said, it's better from a conceptual study.

I also go through, and when I'm doing my model, I take out any model lines, generic models, things that aren't relevant to the building. So we'll pull equipment out. If we're looking at the structure, we're only studying what we need to study. And that makes a big difference in the performance of this.

It's like I said, I tried to export the whole plant. After eight hours I had to give up. It wouldn't do it. But by simplifying the model, you saw how quickly it pulled that thing in there. Very quick.

And if you get more detailed project, make sure you're using the cloud service. That does a whole lot faster by using Autodesk computers instead of my cheap little computer over here.

There's a class going on at AU that is MP-1329. It's all about simulation. I strongly recommend that you grab this handout and take a look at it. There's a really great paper on how to use simulation from the Revit environment in here.

ARMUNDO DARLING: Would you like to take a couple of questions?

DAVID BUTTS: Yeah, let's go ahead and take a couple of questions before we start our last section in here.

ARMUNDO DARLING: OK I've got a question here, which is what's the minimum amount of devices you recommend to have before running the energy analysis?

DAVID BUTTS: A minimum number of devices before running the energy analysis.

ARMUNDO DARLING: And that's coming from Jeremiah.

AUDIENCE: Like you said, you took out a bunch of equipment. You don't want anything in there before you run this. Well, where do you [INAUDIBLE]?

DAVID BUTTS: Clarification of this. I'm doing my energy analysis after the process engineers get the building defined. The building itself. Usually I haven't added a whole lot of equipment at that point. Now, in this--

AUDIENCE: What about lighting?

DAVID BUTTS: Now, if I'm doing lighting analysis, I'll leave light fixtures in there.

AUDIENCE: Yeah, but I mean it's all energy-driven with lighting.

DAVID BUTTS: Yeah, but keep in mind, when you're taking it out to Green Building Studio, you're not doing lighting analysis in there.

Now, if I'm working with something like virtual environment or any of the light-- Anybody seen Illum tools?

AUDIENCE: Yeah.

DAVID BUTTS: See, we use Illum tools. I love that program. If you want David's recommendation for the product to buy at AU, get Illum tools. It is a great package for doing lighting studies. It's based on the old AGI 32 guys. And we leave the lights in. We actually do that in mid-DDs after we get all the lights placed.

And we go grab the IS data files, make sure that the light source is set as a batch, not as anything else. We associate the data files, and drop it right in, run Illum tools. Tell it what kind of study we want to do, whether it's a room or a whole building. And it's almost instant how quickly you can get the results in there. Candle levels. It's so fast it's ridiculous. And I did some big projects with it. We had one building, it was 30,000 square feet. We had our simulation

done in about two minutes.

So I strongly recommend that tool in there. But now, if I'm doing energy studies from the standpoint of what the heating and cooling costs are, I don't really have a lot of equipment when I'm actually doing it. It gets back to finding the task at the right place in the project, and making sure that your workflow process follows that. And that's what we've been documenting.

AUDIENCE: [INAUDIBLE].

DAVID BUTTS: Yeah. We got another fan of Illum tools over here. Using t Home Depots. So if you don't like the lighting at Home Depot, man, don't talk to me. I didn't do it.

All right. Let's keep moving along. We're running short on time here. We'll take a couple more here. So let's go ahead. You're driving.

ARMUNDO DARLING: Oh. There's one final question. This is really serious and really important. Can you do Larry the cable impressions? Larry the cable guy?

DAVID BUTTS: Larry the cable guy?

ARMUNDO DARLING: That's a legitimate question.

DAVID BUTTS: Can you do Larry the cable guy?

[LAUGHTER]

DAVID BUTTS: Forgive me, Lord, for the starving Pygmies in Afghanistan, or Nigeria, New Guinea, wherever they are. I don't know.

[LAUGHTER]

DAVID BUTTS: I'm sorry. I go on a codent. Who wanted me to do Larry the cable guy? You want me to do Jeff Foxworthy, I can do him in a second.

All right, last thing we're going to wrap up with is talking about how to define BIM projects to maximize owner and contractor benefits. And this is what we're really talking about with data, and things like NavisWorks. And we had to start educating our clients on how we do work and how we do things.

So let's go ahead and skip ahead of this real quick.

You don't want to look past what the results are, what you're trying to accomplish in here. Why do I have all those tools to go fishing with? Why did I do that? Because I love to eat fish, and I want to make sure that I catch the best fish that I can possibly buy.

Now, some of them we don't always keep. Sailfish. Big challenge, tag and release. Big on that. King Mackerels, great grilling. And then that's my youngest son in the middle there and my oldest one is on the right. He was fishing for NC State University on the FLW Collegiate Bass Tour, the Bass Pak, was the president of the Bass Pak. Won $50,000 in scholarships bass fishing. Bass fishing.

What is the college system coming to that you've got to have scholarships for bass-- He actually won about $65,000 in scholarship and help pay for his college education. And I love him to death.

But you look at the results, why invest in the technology? Why learn? It made him more competitive on the circuit. And actually, college bass fishing is one of the fastest growing sports in the country right now. Almost every college has a bass fishing team now.

And it's amazing the competition and the money that the schools and the students can make from it. It's great team building skills, because they fish as teams, they don't fish as individuals. So that's his buddy over there who is now running a shark fishing tour service out of the Virginia or Maryland. So great guys.

So again, it's all about getting the results.

Here's one of the things I want to leave with you here is about the data methods. How do you manage your data in here? So the key things are you want to decide what data you're most likely to share with your contractors. And you want to structure your tools that you're using so that they're consistent.

How many AutoCAD P&ID users do I have in here? Got a few of them over here. OK. And like I said, I've been writing content. I've been using AutoCAD P&ID for several years. And was actually supporting it when I was still in the channel.

And one of things I recognized about P&ID that I love is the fact that when you put a symbol in, the information's automatically tied to a database. I don't have to go and make that database

connection. I just do it when I set the project up.

And so I already had the right work process that I'm looking for in that product. And so for all of our water treatment plants, our process jobs, all of those, we use AutoCAD P&ID to do our instrumentation and controls. And it's been a great tool for us. It's actually cut our reporting tools down to a fraction of what they used to be.

When I do my I/O reports, if you're doing an I/O report manually, it could take weeks. We do them in seconds now. Because all the information is stored with the symbol and with the part.

You also want to work from shared databases, and Revit does support some linking to databases. How many people have used DB-Link? And what does DB-Link do for you? It exports a point in time of what your model is. You've got to have SQL set up.

And if you go back to my handout, if you want to use SQL as your database, there's a lot of very specific directions for how to use SQL Management Studio, or the Management Studio, in SQL Express 2008. How to set up that database on your local drive and on your computer so that you could use it with DB-Link.

You also can use it with access database, with MDB files. Any of the formats that you're comfortable with. But you can also leverage these tools like some of the Excel exporters that are out there. Has anybody looked at IDH products and, who is it, CTC? A couple other guys. There's a lot of people that have good Excel exporters out there.

And we decided to go down a different path, and I'm going to talk about that in just a second here. So let's go ahead and go to the next one.

You want to manage this data as much as possible. You want to use the DB-Link tools, again, it's instant space. But what you're doing is you're pulling parameters out to a database at that particular point in time.

And again, you've got to have SQL set up. But the reason why we look at this standpoint, and why we look at SQL is because P&ID's already on that database. So that was one reasons it made me decide I wanted to use SQL for Revit.

So let's go ahead and go to the next one in here.

We did something a little bit different last year. Like I said, I'm blessed to work for this

company. They're very forward-thinking, great group of guys, great clients. But we have our own developers in-house. We're big enough that we have a bunch of C+ and Revit ADN guys in our house.

So we made a decision to start writing our own tools. A lot of reasons. I mean we own the property, we own the programming, we can customize and tweak it as we need to. It's easy for us to move up to new releases.

And so what we do, we actually had this tool set up that when we're exporting out of Revit, we can do it by phase, and we get a summary of all the parameters entered in a project, and we look at this particular project. There's 128,000 parameters found in the project. By the way, our tool processes all those parameters. That size project, it processes in about seven seconds.

But we're selective. about the data that we're picking out. This is a big difference from what we're doing than what DB-Link does, is that I'm picking what data I want to export.

And then I had the options to export it to Excel or CSV. I can do it by work set. And I go through and create that Excel file quickly. But then when I get done, I can import them right back in again. We have another tool that's an import tool that brings it in and overwrites the data. And it doesn't care what the format is in Revit. Is whatever goes out is what comes back in again.

So it's a really nice little tool, and I got to pat my programmers on the back. They did a great job writing this one. And there's a lot of people that have this type of tool. We're going one step further.

This year we started a project to create what we called the BIM validation tool. And what this does is it allows us to look into different databases and sync information between different programs, by using a common structure. Now, there's a lot more to this than just writing some code. And one of these days, hopefully we'll get to tell you a little bit more about it.

But we have tools, web portals, that allow us to build information outside of any of the CAD packages, so that we can set up our project with initial information. And then what we do is we test for conflicts.

How many times have you ever had a difference between your diagram and your model? You're doing your panel schedules in Revit. And on the diagram, it said that the load for that

device was supposed to be 5,000 VA and you have it loaded to 8,000 VA. Does that ever happen?

We talk about validating and coordinating equipment all the time. What we really need is to validate the data. And so that's what our project is. And so we've been working on this now for a little while. We're in our mid-design phases of it. But our tool, like I said, it works completely outside of all these environments. And it allows us to check for data in multiple applications.

So we talk in this session about being outside of the box and how important it is. And what we want you guys to be thinking about as we close this, is to think about how you structure your data. Think about how you set your projects up. Don't look at BIM as simply a modeling tool. If you do, you're handicapping yourself.

Step back, and look at everything that goes on in the BIM project. And make sure that you're taking all this into account. Because down the road, hopefully we'll get to a point where we can coordinate everything quickly and easily without having to spend $250,000 on a program like BDS or PDMS. We want to make it affordable so that every user, no matter how big or how small, can take advantage of these tools. Pretty cool?

OK, so let's wrap this up. Take advantage of the Revit modeling tool to do a more complete design. Work with your vendors and manufacturers to incorporate their content for more accurate results. Leverage the BIM model for your analysis tools. It doesn't matter what it is. Illum tools, Green Building Studios, CFD. Don't do something twice.

Then the last thing is define your BIM model in such a way that the benefits can go on to the owner and the contractor. We also have some IFC files, some NavisWorks files that you can look at. Don't have time to cover that today. But if you check out the handout, I've got some great descriptions for how you can use NavisWorks in this as well, too, and how you can share that data, too.

Again, here's our course ID. I hope everybody enjoyed everything. If you have any more questions, I'll be up here. You can come ask me any time. And thank you very much for being here.

[APPLAUSE]