

**CONTESSA HAYTER:** My name is Contessa Hayter. I'm a senior VDC coordinator at Brasfield & Gorrie. I've worked at Brasfield & Gorrie for about four years. I started as an estimator and then moved in the BBC group. And then prior to that, I have some field experience. And I'll let Shawn introduce himself.

**SHAWN MANCILL:** Yeah, I'm Shawn Mancill. I'm a regional VDC manager at Brasfield & Gorrie. I've been with B&G for about four years, 4 and 1/2 years, somewhere in that range. It goes by pretty quick. So you tend to lose track. I have some experience with estimating and experiences with BBC and 3D models.

**CONTESSA HAYTER:** Just to get a general idea in the room, who works for architectural or structural design firms in the room? OK, awesome. What about anybody working for general contractors? Awesome. Any specialty contractors? Anything I didn't mention? So just curious who we're speaking to. Great.

So I'm going to skip this slide. You guys probably already read that to get this class. But just to recap what we're going to be discussing, we're going to be discussing our workflow, kind of how it started and what it's formed into. And then we're going to go through some of our principles of how we model, kind of give a live demo of what we typically do on jobs now, show you some case studies of jobs that we have lessons learned from, and then move into a hopefully interactive retrospective at the end. And maybe you can go from feeling like this sweet little puppy to the leader of the dark world by the end of this.

**SHAWN MANCILL:** All right, so a little bit about B&G. We only have one side. We're a Southeast-based company. So we have 12 offices throughout the Southeast. But we do work pretty much everywhere in the United States. There's only a couple of states that we haven't done work. But we poured over 5 million cubic yards of concrete. And we've actually probably done even more than that. That's just what we've tracked.

There's a lot of experience. We have a lot of field teams. We have a lot of our own crews, our own superintendents and own foremen that are staffed as B&G employees.

So we've got a lot of different things that we do. We work anywhere from a wastewater treatment plant to a commercial high rise, and everything in between. We even do small \$1 million renovations. So it's a wide variety of things that we do.

But we also pride ourselves on being a self-perform contractor. We think we're a true contractor because we actually perform some of our own work. And what we're going to show you guys today is a little bit about what we self-perform with concrete.

**CONTESSA**

**HAYTER:**

OK, so some of you may have seen this workflow for a creative process. But we like to joke, this also works for our modeling process, mainly as a product of poor training and unrealistic deadlines. But I'm sure we can all find ourselves at almost the end of it here, all the work while crying. Anybody found themselves there? Yeah, I'm sure.

Really, the unfortunate thing when we first kind of got into using the models for concrete work for estimating or for construction was, again, a lack in training and understanding from their side of the world to our side of the world. So really trying to bridge that gap and have kind of a two way education system to help this workflow so no one's crying.

And so that brings us to this six letter bad word. So of course it's hard to bring change to your company, but I definitely think that, in the long run, it's definitely worth it. It's not easy. It's not hard. Some people think change is never fun. But we've learned a lot from our original workflow to our current workflow, which Shawn's going to discuss a little bit.

**SHAWN MANCILL:** So what we've essentially learned through a lot of different projects, a lot of different fields teams, and a lot of different battles is that we pretty much have a standard workflow that gets us from when the project starts to when we decide, really, the direction that we're going to go. So the beginning of this project of this process basically says, hey, we've got a model. What are we going to do with it? Or, we don't have a model. What are we going to do with it?

So the biggest piece that I really want to focus on in this entire workflow-- and this is it on your handout. That's available to everybody. But this meet with the team, that is incredibly critical. If you don't get that piece right, then the entire process is going to be broken the entire way through. You've got to get on the same page with your estimators, your schedulers, your field team, anybody that's going to be involved in a self-perform concrete process. You need to have those players in the room. If you don't, really the rest of this isn't going to matter that much because it's going to be a broken process and you're going to fight and scratch and claw your way all the way through. So, really everything else, aside from that, if you're not doing what's on the beginning of this, you probably need to begin to re-evaluate and get to this point before you get to the rest of these processes.

**CONTESSA**

**HAYTER:**

And that really brings us to, we really see this being three different types of workflows. And I'm not going to go through each of them. We are only going to be kind of discussing the collaborative work flow through this discussion. But we found that that's the best. And just reiterating what Shawn's saying, the most important thing we think in the collaborative workspace is not only to collaborate with your internal team but also to collaborate with your external team. So getting the design team on board ahead of time, having discussions about labeling, communication, and sharing of the models-- and we'll go through some of those in our lab demo of how we kind of approach that. But that is our most ideal process. And that really gets us to the self-perform model.

And that section of our workflow is what takes us into the field. And if we cannot get the self-perform model correct and work with our design teams and our internal teams, we'll never get to our build it section of our workflow. So just confirming that you're collaborating, you're communicating, and really creating the best product you can that's going to represent what's physically going to be built.

All right, we're going to go into some of the case studies just that led us from our original, hey, here's all the work shoved at you. Complete it in two days to our current collaborative workflow. The top left project, this project was kind of our initial descent into working with the estimating teams. To the right is kind of our estimating it to field teams. The bottom is also mainly just field. And then this is our best example that's not an A360 job of hours that is all collaborative, all in buyin job.

So the first one I'm going to start with is the Bridgestone. This is a huge facility that we have multiple complicated foundation work. I started working on this job. I was actually an estimator at the time. And they gave me the concrete part of this job to take off. I started trying to figure it out on the 2D drawings, trying to take off the concrete. I was so confused. I couldn't get any of it right. There was gaps everywhere. So I was like, hey, let's model this and get our quantities this way, and let's talk to the design team about all the missing information that we have currently.

So we started formatting the model, sat down with the senior estimator at the time. We worked through the plans. We used this for quantities. We did move some of this into the field. Once the field team started seeing this work, I ended up modeling the foundations throughout the process for concrete modeling, concrete quantities, and discussion for field layout.

**SHAWN MANCILL:** So [INAUDIBLE] project is probably one of the larger ones that we've done. It's a 60,000 cubic yard parking deck. It's 1.1 million square feet. It's part of a \$200 million hospital.

So the Grandview parking deck was sort of a conundrum. When we found out about it, I was actually sitting in a class at AU in 2013. And the chief estimator called me and said, hey, is my parking deck model done? And we said, what parking deck model? So you want to talk about freaking out when you have to do a 1.1 million square foot concrete cast in place parking deck and they're going to drive the entire self-perform estimate off of that, you've got to have it done in a week and a half. That really tells you why that initial meeting is so important. And I think that's why we stress it so much is this really taught us the communication between us and our preconstruction team to get it right.

But the path that we took with this parking deck was really, I think, intriguing for us. It was a great learning experience, because we were able to do, from the quantification of the concrete, our labor analysis and really start to plan our pours. The entire model was broken into the pour breaks.

But we said that this was also tied to the field-- well, when we got to the construction phase, where we'll take each of the concrete logs that we received for each pour and begin to track that and make sure that the quantities that we had estimated really started to align with what we were pouring in the field. So when you start to have that powerful analysis, you really start to validate your process.

**CONTESSA**

And the smaller picture is showing you some other field items that we worked on in this job.

**HAYTER:**

This is the columns broken up by PSI. So this is the job we kind of started to learn, again, the two way educating on what the field team needed and what we needed to be putting into the model. And that one can lead us back into NASA.

Again, this one was the field team-- our general superintendent came to us from our company and said, hey, we've got this huge NASA test stand coming up, and there's so much stuff in the foundation. Can you model this? We had dabbled in rebar and embed modeling at this point very little. But this was kind of our first big rebar project, I think, that we have completed. Shawn modeled the embeds. You can see an actual picture of what that looked like.

And then the rebar, the details were not great at our CD level. So I ended up meeting with the rebar detailer every other day and going through my model to make sure that we're building the model to represent what he was going to put in the field, how he was going to put that

together, and basically filling in the gaps of what the drawings weren't showing.

**SHAWN MANCILL:** Yeah, interesting story on this one is, we had a meeting with the structural engineer and said, you know, "There's so much steel in this foundation. Why don't we just pour the thing solid steel in the ground?" And he said, "Can you do that?" And we were like, "No, no we can't."

But what's interesting about this as well is that this foundation was so dense and had so much concrete in it that we actually had to coordinate cooling pipes to go through the concrete to keep the concrete cool while we were pouring it. So the rebar model really helped us as well on the coordination side to just make sure that those pipes were going to be able to feed through. So it's a lot more than just pouring concrete and getting the rebar right.

**CONTESSA HAYTER:** This is JB Processing. Again, this job is kind of our most all in that is not an A360 approach to date, so much so that our team called it the BIM bible. So this one was an all in team effort.

This job definitely posed a lot of hard hurdles to jump. The first set of drawings that we received for the reconstruction phase were all in Italian and all in metric. We were dealing with a design team in Italy, a design team in America, and incomplete drawings. So the modeling process was key for this job.

Another reason it's so important to get this right is each one of these foundations has a piece of equipment that has to fit perfectly into that puzzle piece. And so if we are off just a little bit, we're going to have to take all the concrete out and repour that entire foundation. So accuracy was very important. And with two different design teams and different continents, it's definitely a communication hurdle to jump.

Again, we started in preconstruction with this job. We ended up remodeling most of the foundations once we received drawings half in English, half in Italian, half in metric, and half in imperial, and started remodeling some of the rebar as well for this job.

**SHAWN MANCILL:** One of the things that the preconstruction effort really allowed us to do was really make it pretty easy transition to the field. And having all of these models, we were really able to sort of corral our team around the model. And our team became, really, bought in.

We had a meeting that we all called. I called it a meeting of the minds, essentially. We had all of our specialty contractors. We had us as the GC. We had the actually Italian equipment supplier that had designed all the foundations come over. So you put everybody in one room,

and you get to that level, you really start to be able to achieve a lot of different things. We were able to ask questions, find out the things that mattered and didn't. And that really drives us to that collaborative approach.

But once we got all those decisions made, we're really able to coordinate to a high level and really accurately begin to build this thing. And that takes us to taking that model to the field and working with our field engineers that are running the total stations, feeding that field engineer data, helping him calculate points, determine where the actual point in the dirt is going to go, and start to understand that process. And I think that's really what we kind of want to illustrate to you is that when you have a collaborative approach like that, you can take it from zero to 100. And I think that's where you would be.

**CONTESSA**  
**HAYTER:**

We're going to go into some live demos. Does anybody have questions at this point? If not, no worries.

So just showing you guys, again, how to collaborate is on your handouts. So if you need to make notes, I'm just going to let you know that it's there. I wanted to go through some of the most important communication elements that we have found to be crucial to discuss with the design team and our internal teams at the beginning of the job.

The first item would be labeling. If you are a contractor or a specialty contractor, you may have gotten a design model before where a floor is modelled-- or I'm sorry, a roof is modeled as a floor. Or you may have other items that are not actually modeled in the system that they are to be placed. So labeling includes making sure you're discussing how it's being modeled, making sure when you click on a slab that it's labeled properly with the size, if the size is listed in the name, and then being consistent from your preconstruction guys to your field team and making sure what they're calling items are also the same.

From here, what we start to do is once our labeling is kind of complete, we get into parameter work, which I'm going to pull up just our tower of this project. If you can see these different colors, these are representative of some of the grade beams that we had on site. We would start to label what pour sequence that these are in, what lift number they're in, to give information to the field so when they're going through the model, they can easily see that. We also use this information as some middle work to the design team for our pour breaks, in the future. And again, making sure that the team's on board for quantity work, if you have specific ways of breaking out the estimate and then passing it to the field so that they also know what's

coming up.

When items are wrong-- so this model was a design team model that we ended up breaking up based on what we were going to do for the project. And making sure that the communication and collaboration is there is also important for when items need to be edited. What we have typically done, if we can, is we'd love to get access to the model and work together and have model working sessions where, again, if this floor is labeled as a 10 inch slab on grade, but it's actually an 8 inch slab, then we can go through all of those edits and update the model so it most represents what we're going to actually build.

And then creating the sharing, that's another big thing that we have a hard time with. If you're not collaborating with your design team and going through those model working sessions where you're editing that information to be correct, you end up with all of the rework from the previous iteration when they hand you DD models from SD models. So just making sure that communication is solid and those edits get implemented before the next release of your model is crucial.

The next thing on your handout you'll see is scrub, scrub, scrub. So this step is going to help in those model working sessions. And that's basically what I've been showing you for labeling as well, is we're taking the 2D drawings and we are looking at each item in the model and making sure it reflects the information from the drawings. So if it doesn't, then we, again, put that in our model log, and then we're going to go through that in the model session.

And I'm not sure like what your experience level is with Revit or with the model sharing, but we learned this the hard way a little bit sometimes. Even with steel, for example, if the beam isn't the right size but it's labeled the right way, you're going to end up with the wrong quantity. So the scrubbing process, after collaboration, is like the most important item to make sure it's right.

And then your third step is just edit, input, repeat. This is going to be a hard process if you haven't worked with that design team before or if your internal team is not used to doing this. It's going to take some time to stick with it. It's not going to be easy at first. And it's just going to take a lot of editing and a lot of discussion and a lot of input into the model. I'm sorry, you have a question?

**AUDIENCE:**

Are you modelling this yourself or is this a direct edit of the delivered model?

**CONTESSA**

This is a direct edit of a model where we worked with the design team to make edits in their model. And the workflow process that's on our handout, we have one that's internal only. So if we don't have a design team that's willing to kind of work with us, we will end up creating a model on our own. But again, we try to avoid that and try to stay in the collaborative approach because of the rework. I mean, every single time that you get a model, you're going to have to add those parameters.

**HAYTER:**

For example, at first we weren't collaborating as much with this design team, in the first iteration. So all of our piers had been labeled. So the team wanted to know what the quantities were per the number of drill piers. So when I click on this drill pier, I can see that it's drill pier number six. So every single time-- and this is just the tower of this job.

So I'll try to pull up a view of the entire job. But every single time I got the model from them, I was having to edit and add that parameter. And there's over 200 drill piers. So it's really frustrating.

**AUDIENCE:**

[INAUDIBLE]

**CONTESSA**

Yeah, it's very frustrating. So that's why we're pushing and saying oh, collaborate. Get with your design team. Because once I'd done that about three times, I was definitely over that. And so I sat down with the team and asked them if they could add the parameter into the file, and basically just helping them understand that this is not a one time thing for us, that this is going from preconstruction to the field, and why it's so important that those are labeled or why it's so important that the parameter's there. Once you really show them that-- I think sitting down with them is invaluable. But yeah, once you show them that and they understand it, and especially for text-- we're not getting a lot of pushback to share parameters that are text inputs. So that's a great question though. Yeah?

**HAYTER:**

**AUDIENCE:**

For your internal delivery, so your field work, are you guys having more success with parts? What [INAUDIBLE]? What more [INAUDIBLE]?

**SHAWN MANCILL:** Yeah, so typically what we do, we generally break the actual model component up. So for instance, if we have a floor, like in this view here, we'll actually break the slab into three different slabs.

**AUDIENCE:**

[INAUDIBLE]

**SHAWN MANCILL:** That's correct. Yeah, that's generally how we do it. But it also depends on what we're trying to

achieve. We also use parts to do that. It really just depends on what's necessary and what's needed. For our workflow when we're trying to quantify and filter things like that, we generally break it into elements. If we're trying to create animations or we're trying to have different layers of things that we're doing for 40 schedules, we may break it into parts. We may do both. It just depends.

**AUDIENCE:** [INAUDIBLE] design teams requiring you to fill out some sort of [INAUDIBLE] form or [INAUDIBLE], just had it over to you when it's done?

**SHAWN MANCILL:** Yeah, a lot of times, it really just depends on the firm. Some people make us sign a model release that says, hey, you can't use our model for anything productive. Really the ones that we have good relationships with, we're not seeing that as much. But most still are making us sign a--

**AUDIENCE:** Do you have [INAUDIBLE] the model or anything like that? [INAUDIBLE]?

**SHAWN MANCILL:** Generally no. In some cases we do, but that's, not really.

**CONTESSA HAYTER:** And again, having that conversation with the design team and actually showing them why you need that information and how it's going to contribute to the future of the project-- I think that if you can just spend that time to explain that to them or show that to them, this light bulb goes off where they're like, oh, that's awesome. And they know that you're helping them make their model representative of what's physically going to be there. I think that starts to churn with them and think, oh, well this is actually a great collaborative process where they're funding issues with our model and we can edit that and it can be correct and representative. OK, any other questions about the Revit process that we just went through? Shawn's going to go a little bit more in-depth in a minute with the field, but if not I'm going to move on to kind of how we share this information with our preconstruction team.

So how many of you have used Assemble before? A few? OK. So we're using Assemble mainly to share this information with our field teams for quantities and our estimating teams for quantities. That is what we think is easiest kind of interface-wise between going from someone who has not a lot of experience with 3D models in general to seeing a 3D representation and being able to click on something and see where it's located and where that quantity's actually coming from.

Originally in the bad workflow that we were showing at first, it was hard when people weren't

trained in this. They weren't used to seeing 3D. All they wanted was the Excel document. They could care less where it came from. But that doesn't work, especially for, we're newer. We're green. Hey, teach me about concrete. I want to learn about this. And then I want to teach them how to view this. So it's just a continual exchange and the two way educating and collaborating throughout the entire process. But this is kind of the easiest step I think that we've found to share that.

There is an export to Excel if you haven't used this before. Or if you need a little bit of an easier blanket to transfer this information at the beginning with your field teams or your estimating teams. But yeah, that's about [INAUDIBLE].

**SHAWN MANCILL:** Yeah, I would say one of the advantages that we're seeing to this system-- and I'll be the first to tell you, this isn't the only system out there. You can use or Navisworks just as easy to do what we're doing. And you can use a bunch of other different things. But what we're finding is that this particular system, one, it's cloud-based. And two, if I need to get a grizzly superintendent that doesn't even know how to turn on an iPad into a model, well, if he can open it up on his web browser and all he's got to do is click and it spins, that's a lot easier than me trying to teach that guy how to use Navisworks or how to use something else.

So, it's a very simple system. It's easy to learn. And it's really not over complicated. And that's one of the reasons that we feel this is a great tool. And you can manipulate the data a lot easier than you can inside of Revit. So you can organize and create your hierarchies there.

**AUDIENCE:** [INAUDIBLE] the presentation of the Excel [INAUDIBLE] itself?

**SHAWN MANCILL:** That's right. So you can organize it. You can really start to change it. And I won't say change, probably isn't the right word, but organize it in a way that's conducive to your workflow.

**CONTESSA HAYTER:** So again, just adding to that, the parameters we were talking about, the text parameters where I'm adding a lift number, adding a pour sequence number, that information carries to a symbol. So you can start to make views and filter based off of what your pour sequences are, what your lift numbers are so that the field or the estimators can start seeing those quantities separated the way that they need to put them in the estimate, or the way that they need to sit down as a team and discuss how they're going to build it, and does this pour sequence make sense? Are the square footages right? And again, this is just an easier platform. I think people can see that. Anybody for-- OK, great.

All right, I'm going to hand it over to Shawn. He's going to show you a little bit more about how we implement this into the field.

**SHAWN MANCILL:** Yeah, so what I want to show you guys with Revit is really how, once we've got this model right, and we're really going in a-- we're done, we've kind of got everything that we need to start building this thing. We create lift drawings. We create shop drawings. And there's a couple of different ways that you can do it. But one of the things-- and I'm going to hop over to the Prezi just real quick.

**CONTESSA HAYTER:** While he's transitioning, I just want to point out that all the things we're talking, like adding a parameter, pushing to a symbol, all of that's on your handout, kind of how to, like a simple click here, do this. So we're not going through that exactly just for the sake of time. But it is on the handout on the second sheet.

**SHAWN MANCILL:** So where we generally start before we start spending a ton of time creating lift drawings, putting a lot of data that's on there that we may or may not need that no one's really ever going to look at, it's really important to have a conversation with the field engineer and the superintendent. And for us-- I know the titles are different-- for us, a field engineer is the person that's running the robotic total station, that's actually out there, putting the points in the dirt. He may have a rod man, may have another helper or something like that. But having a conversation with our field engineer and our superintendent and really start to understand how they're going to lay the building out, what information they're going to need, where they're going to start, and really what their workflow is.

Because if you've ever worked with someone doing layout and then you've gone and worked with another person doing layout and another person, you're going to find that they all do it different. They may be trained the exact same way, but they all calculate points a little differently. Some of them may lay out a spread footing with four corners. Some are going to lay out the center point and do offsets. So really understanding their workflow and the information that they need, understanding the pour sequences, understanding the schedule, and really where we need to get to is very, very critical.

We would like to do this during preconstruction. A lot of times that doesn't happen because you don't know who your superintendent is going to be because he's on another job. Or we just won another job and he's got to go to that one. So there's a lot of things that go into that. But as early on in the construction process is what we're trying to get.

The next biggest thing that we need to answer is how's information going to be exchanged. Are we going to use BIM 360? Or are we going to use Box? Are we going to use some other sharing medium, email? We have to determine that and we have to really set it in stone so that everybody knows, this is where you go to get the information that you need. And if you don't do that, what you're going to end up finding is your phone's going to ring off the hook because nobody can find anything that's been created. And when you do that, your life gets really crazy. So it's better to just have that understanding up front.

So then, it's also important to understand what total station setup that you've got. Now for us, we use fairly standard equipment across the board. We're implementing some new things. But some of our field engineers use older data collectors that run a different software than newer data collectors. So depending on what system they're using is the process that you're going to use. So we really need to determine that up front.

But once we've gotten one through three sort of answered, and we know that direction, then we can really start to go in and create the information that we need. And once your model's right, it actually proves to be a fairly quick process.

So what I'm going to show you guys now is just an example of a shop drawing that we might create for slab breaks. And Contessa, I think you have a drawing in here.

**CONTESSA**

We have. It's at the very bottom. Still down. It's BG, all the way down. Oh, right there.

**HAYTER:**

**SHAWN MANCILL:** So one of the things that Contessa actually created for our field team was a grade beam plan that shows sort of colorized plans of where the different sized grade beams are. So what we're able to do with this particular plan was to submit it to our designers as part of our, hey, this is what we're going to build submittal. And if you're working for a concrete subcontractor or specialty contractor, then what we're finding is that they really like that. Say hey, this is what our plan is. This is what we're really going to build. And it's somewhat, I would say, atypical to submit a concrete shop drawing, unless it's something that's really complicated. A grade beam, in general, is not that complicated. But when you're dealing with grade beams that are five feet deep, they tend to be a little bit more drastic.

**CONTESSA**

And relating to that and y'all's questions in the front earlier, just working back and forth with

**HAYTER:**

them and then seeing what products are coming out of our collaboration is why I think they're so appreciative. For this submittal, we submitted the 2D because liability-wise we're required

to submit the 2D application. But we also have been sending them some 3D representations of the submittal. So they're opening up our submittal in Navisworks, clicking on stuff. Everything's labeled and they can see where the pour breaks are and the different sizes are. So since it's easier for them to view it that way, they're already familiar with the model, I think that's, again, why they're so appreciative and willing to be collaborative.

**SHAWN MANCILL:** So when we're creating these sheets, really the first thing that we're going to do, or at least that we do, is go ahead and set up the sheets. So you can add anything, any sheet, any view that you need.

Generally, what we like to do is add a 3D view in with sort of whatever plan view that we're going to have. So if we're going to do like a level three slab pour break, then put an isometric so they can kind of visualize what they're going to do. But then also, you put the plan view there as well.

And that's one of the things that we have found is that a lot of our field guys, a lot of our foremen, they're still really used to the 2D piece of paper. So they're going to ask you for the piece of paper. That's just the way it is right now. But if you can give them something that is 3D and helps them to visualize it on their 2D sheet of paper, well then you can start to bridge that gap and gradually make the transition from the 2D to the 3D, almost without them even having to think about it. You can way more easily make that transition. Let's see if I can find that floor plan.

So once you get these views on the sheet, your sheet setup's essentially done. You can go back and add whatever annotations you need. Now, this is where-- I'm not going to show you guys how to add annotations. That's just one of those things that you probably know how to pull a dimension in Revit if you're familiar with it. But this kind of sheet setup is what we found to be very effective, and especially with column lifter drawings. One of the things that you always have to do is calculate the center point of a column or calculate the edges. Well, one of the most difficult things for field engineers is to go ahead and calculate the tops of every single column.

Well when you've built your model correctly and you've stopped your column at the bottom of the beams like it's supposed to be, well instead of my field engineer having to go calculate the top of every single column, I can now create him an isometric view that tells him every single top of column elevation. So it's based on the beams. It's based on those columns. And if I give

him an asymmetric view and also give him a plan view, well then I've really made him a lot more effective and provided him a lot of information that he would not have had without spending a ton of time with the calculator.

And if you guys have ever calculated a job's worth of points, you know that it's a very time intensive process. And if you auto generate them, you realize that you get about 50,000 points that you're never going to use. So that's the value of creating drawings like this.

So the next step, once you've done all of this, you can actually export these drawings to CAD. You can export these individual views to CAD. You can do a lot of different things. There's a couple of total station systems now that-- I think Trimble has one, Leica has one, that you can take a 3D DXF, bring it into the data collector, and the field engineer can lay out right off of the model.

So that's really the next step is getting this data over to that field engineer's data collector so that he's now visualizing the model right in his data collection software. And when he's doing that, you know your model's right. You know his layout drawing's right. You can really feed that process. And that's where we are. That's where we're taking that data and really sending it to the field so that they can visualize what they're building.

So once you've done that-- you're probably familiar with BIM 360 layout-- you can start to back check. You can start to do QA/QC. Now what we've seen with the BIM 360 layout is it's kind of clunky. I mean that's just sort of the way it is. It works with some systems. But what we're really seeing the use for it is, if I need to go out and very quickly back check something, I don't need to be exactly dead on. I just need to make sure it's in the right vicinity. I'm not going to go back check anchor bolts with it! I'm going to go to use my Leica total station that's a 1 second gun, and I know it's dead nuts on. I mean, that's what I'm going to do.

So, for QA/QC, there's a lot of different options. But it's really just taking that data as built and comparing it to the model. So that's really what we're doing with the field implementation and how it's starting to roll out and get pushed.

**CONTESSA**

**HAYTER:**

So we're going to go into a retrospective next. This is kind of a lean concept, if any of your companies are starting to use lean. I'll briefly kind of explain how it's set up. This is also on your handout. And we'd love for you to be interactive. So if you have any experience with any of this information, feel free to give an appreciation or share a risk or a story that you may have.

But the appreciations are obviously things that went well. We try to conduct these after each design iteration, or at least mid and end of job, to kind of assess where we are, see how that communication is going, and see what we can do better. The appreciations are things that we want to continue to do, that we want to strive for on every job, basically your best practices. Wishes are things that you hope to do in the next iteration. Pitfalls are the risks, the things you want to try to avoid. What's not going right? What can we make better?

And I always like to start off with an appreciation. I think for us, the biggest one that we have on here is helping bridge the gap between preconstruction and the site personnel. The model, especially like the JB Processing example that we showed you all, it really became the center piece of what we were discussing, and it really became what we were utilizing for the job, from the preconstruction level to the field level. So I think just generating that communication and that teamwork around our model is the biggest appreciation that we kind of have.

I'll focus on a few pitfalls, just for lessons learned. It's so hard to get buyin. If any of you are using this, has anybody had problems getting buyin from maybe a superintendent or a project manager? Never, right?

**SHAWN MANCILL:** There's never issues with buyin.

**CONTESSA** Never.

**HAYTER:**

**SHAWN MANCILL:** Everybody's happy.

**CONTESSA** I mean, we really are learning that once we get the team involved and they feel like they're part of the process, or they start to see value, or you produce a really good product for them, they continue to come back and they want more and they want more. And that's great. But the initial buyin is one of the biggest risk. So if you are new to this kind of process or implementing BIM into your preconstruction or construction phases, I'm definitely not going to stand here and lie to you and be like, oh, this is so easy, because it's not. We've definitely been yelled at a few times.

Also, giving a model without a plan-- and that includes training-- handing over a model that has been scrubbed and not training your team or communicating with your team, that's the biggest pitfall internally besides buyin that I've found. We have been bit on that before. If you

don't scrub hard enough, the collaboration-- or if you send an estimator or a field personnel a model that hasn't been scrubbed and you don't tell them that and then they are using that as if it's Bible, that's not going to work out. So generating a plan is definitely a huge risk. If you are sharing any information without a plan, that's not going to work.

**SHAWN MANCILL:** It's also going to be one of the biggest things that hurts buyin the next time, because if they've been burned, they're going to be far less likely to use it again.

**CONTESSA** I know we talked about at the beginning, all the work while crying, again, and how to avoid that  
**HAYTER:** step of the bad workflow. But the unrealistic deadlines, again, when your team's not familiar or they don't have buyin, they're very unrealistic with deadlines. Or if they haven't been trained in how the software works, model that-- like we were talking about, Shawn was giving the example of the Grandview parking deck. Hey, can I have this in a week? That's not going to work. So just communicating deadlines and training is huge.

Does anybody have any examples or anything they want to add, for a retrospective?

**AUDIENCE:** Do you guys have internal conflicts conflict of interests? You've got your GC responsibilities, your VDC efforts. But then you also have your [INAUDIBLE]. So you've [INAUDIBLE] a rich history with, if we'd done it this way, I would make money this way, in conflict with your business approach of integrating new technologies and leading the industry. Do you guys have that?

**CONTESSA** I will start with saying, we are going to-- usually the self-perform team is kind of a separate  
**HAYTER:** team, estimating. I feel like you're kind of saying, like if you're bidding on a job and through the estimating process at the beginning, we will try to estimate and be competitive on a self-perform job. If we're not competitive, we are not going to self-perform that work. So basically if we have three subs, especially contractors that give us a price for the self-perform work, and they all are a lot cheaper than us and have been scoped and everything's great, we're not going to go with ourselves just at all. We're going to put one of them in. And I think that maybe is what you're asking. You have anything to add?

**SHAWN MANCILL:** I think that's pretty much it. We treat ourselves like--

**CONTESSA** Like a sub.

**HAYTER:**

**SHAWN MANCILL:** --like a sub.

**CONTESSA** If we're higher, we're out. We're not going to build that.

**HAYTER:**

**AUDIENCE:** Do you reprimand yourselves like a sub?

**SHAWN MANCILL:** Do we reprimand ourselves like a sub? I guess that, I don't know the answer to that. I guess it just depends on what you mean by reprimand.

**CONTESSA** Yeah, I'm not sure. If we're not low, we're in trouble.

**HAYTER:**

**AUDIENCE:** Have you guys been able to put points into the model and use them like Autodesk point layout or something like that, go directly to the total station and get the field guys to trust that without recreating all those points themselves, since you trust your points from the model?

**SHAWN MANCILL:** So to answer your question is every field engineer is are always going to calculate it first, especially when they're first starting out. Now the ones that I've worked with have all calculated it sort of side by side. But once they realize that the model is accurate and that it takes 30 seconds to get all the points that he needs for his work that day as opposed to calculating a hundred points and spending two hours setting up in the morning, and he knows it's right, and he's checked it himself to make sure it's right-- that's the key, right, is every field engineer or anybody doing layout, even if they're using a CAD file from an engineer, everyone that I know goes and they dimension that thing. They check it. They make sure it's exactly what it says it is. Because at the end of the day if it's wrong, who's getting yelled at? It's them. It's their butt on the line. So they're not going to put anything in the dirt they haven't first checked.

So part of our process has been to train our field engineers and get them up to speed on the tools like Revit, Autodesk Point Layout, and get them understanding that and validating the information that we're sending them themselves. And honestly it's a back check on our VDC group too, right, because we may have missed something. So they trust it once they understand it. Until they understand it, they have a harder time trusting it.

**CONTESSA** And kind of backing up to that point, we've created some families that already have points on them. Like we were talking about automating points, you get way too many points, or they're not in the right location. That's not what the field engineer needs.

Some of our families have automatic points. But again, there's a whole process of sitting down

with them and discussing what points they need. Like we at the VDC group are not like, oh, we're providing your points and we know exactly where they are. Again, that's taking us back to our collaboration internally and talking with the superintendent, talking with the field engineer, and working with them, not necessarily just flatly providing that information.

**SHAWN MANCILL:** And ultimately what we're really trying to get to is that the field engineer will create his own points. He's not going to rely on me to send him a point for the center of a footing. That's not efficient. That's not effective. He needs to be able to get in that model, click the center of that footing, get his own information out.

So that's what we're trying to get to. I'm not going to tell you that we're there yet, because that just wouldn't be true. But we are very quickly approaching a time where we will be. So I think that's where you have to be. Yeah?

**AUDIENCE:** When you take the initial setup for the point layout, are you getting the surveyed point from the field engineer? Are you importing those as survey point into Revit to mark on that?  
[INAUDIBLE]?

**SHAWN MANCILL:** So generally what we'll do is-- generally we don't have the site coordinates ahead of time when we're creating the model. So we'll use APL to align our model to the field conditions. Now, that point generally comes from either a professional land surveyor that has gone out and established control points around the perimeter of the job. Some places, some industrial facilities especially will operate on their own coordinate system. But most of those places also have their own control setup on site already. So once we know that, we can really go back and just back validate and check the points.

What's really great about APL is if you're doing that on the back end, which is generally when it happens, it gives you a deviation. So if you establish that coordinate, it's going to tell you, hey, you're five feet off. What's wrong, to make you ask questions. Or it's going to tell you, hey, you're within tolerance, and you're good to go. And you'll know that within 30 seconds. It's about five button clicks to set your coordinate system up, once you have the right information.

Generally what I prefer to do when I'm setting up those coordinate systems is I'll use column intersections. I'll either get my field engineer to calculate the column intersections for me. Or a lot of civil engineers will go ahead and tell you, hey, column on A1 is this coordinate. Column on T1 or P10 is this coordinate. So you can go in and just use those column intersections to

align your building.

If you've done that, then you're going to know really quick if they moved a column line or if they've miscalculated their points. You can do a lot of different things really quick just by using APL. Does that answer your question?

**AUDIENCE:** Yeah, I guess I've not played around enough with APL enough to know what it can and can't do.

**SHAWN MANCILL:** Yeah. Honestly if you're dealing with coordinate systems, if you've ever dealt with coordinate system inside of Revit, you'll realize it's probably one of the most cumbersome processes in the world. APL streamlines it. So as long as you have two known points and you have those same two known points in your model, it'll take you about 20 seconds, 20 to 30 seconds to align your model to a new coordinate system. You never have to go touch the project base point. You never have to touch the survey point. It does it for you. And it's over.

**CONTESSA** [INAUDIBLE] mention how you can bring the points back in and see where we were off? Or did  
**HAYTER:** you talk about that?

**SHAWN MANCILL:** Yeah, and with APL too is if you go and back check where you go-- say you're checking anchor bolts and you want to make sure they're all in the right spot, you can take the points that have been collected from the total station, reimport them through APL, and do an overlay and make sure that you're within tolerance. So there's a lot of back checking ability in APL. If you don't have APL or you haven't messed with it, I recommend getting it. It's one of the most powerful layout tools that you can get, I think. It's really fairly simple to use.

**CONTESSA** Having that back check for your field engineers and like training them and then being able to  
**HAYTER:** see visually like hey, here's what we thought the points might be, here's what they came in as, I think that, again, and the buyin with the field team, and they want to start getting involved. They want to get in Revit. They want to be in charge of that. So I think that's huge for them.

And also like we're discussing for Grandview, historical data for the pour breaks, for QA/QC, and bringing that information back in is huge for us for historical data, and also creating those families so that we can better generate families that have points already associated with them based on what we are learning from the field.

**SHAWN MANCILL:** And I think too if you show your field engineers, what we're quickly learning is- like you show them Revit. You show them APL. You show them how you can get the model on the data

collector. And they're going to be like, I want that. I mean, I guarantee you that's what they're going to do, because every one that we've shown in the last year has been like, when can I get this new setup? When are you going to teach me how to do it? How am I going to do it. And they're all really gung-ho about it, because they're like, you're about to really streamline my job and make me way more effective. Other questions?

**AUDIENCE:** You guys talked about rebar earlier. Have you seen any of the fabricators in your area modelling rebar? Or have you guys actually taken the shop drawings and then modelling after that?

**CONTESSA** So there are a handful that we're starting to see modelled. Not all in Revit necessarily. There's  
**HAYTER:** other software some of them are starting to utilize. I think maybe bigger cities we're seeing that a little bit more. But also, currently, all the rebar you saw today in our presentation, we did in-house. So we took the shop drawings, and like I was saying on NASA, I would sit down with the rebar detailer, and we'd go through certain pieces of the job until we had the entire thing modeled the way he was going to build it.

**SHAWN MANCILL:** To kind of piggyback on that, a lot of our rebar retailers will offer the service, but none of them are offering it as a base service. It's always an add. And generally you get the models and they're too big to even use, or they don't match the shop drawings. So yes and no, I think, is the answer.

**CONTESSA** That's kind of why we've gone in-house a lot right now.

**HAYTER:**

**AUDIENCE:** What are you guys using for [INAUDIBLE]?

**CONTESSA** We're using Revit, and also use Tekla sometimes. And I've just committed an AU no-no. I

**HAYTER:** apologize. Anybody else have a question?

If not, thank you guys so much. Our emails are on handout as well. If you come up with anything, feel free. Or if you start to implement and you have questions or just need to express some frustration because somebody feels like one of these dinos, feel free to reach out to us. Appreciate it. Thanks guys.

[APPLAUSE]