ALAN JOHNSTON: I'm Alan Johnston. I'm from Hydratec, Incorporated. We've been in the sprinkler business for over 40 years. We started with a program that specifically did hydraulic calculations. I want to tell you three seconds about Hydratec. The most important thing to me about Hydratec is that it's built to be an enjoyable, challenging, and rewarding place to work. And there are a bunch of people that work at Hydratec. The average tenure of that bunch of people is over 20 years. And I use that to confirm in my own mind that it's not just enjoyable, challenging, and rewarding for myself, but for most of those other guys as well.

What we challenge ourselves with is sprinkler system design. And we develop software. We market it. We support it for the sprinkler industry. Most of our customers are sprinkler contractors. More and more these days our customers are also fire protection consulting engineers. I thought-- I've been to enough of these where they ask so how many of you are engineers? I'm not going to make you raise your hands. Usually, I only get a third of the class to raise their hands anyway. But Autodesk gave me enough information with company names and titles, no names, to let me make a slide to say, who are you?

And by the registration, more than half of you are consulting engineers. Actually, close to 3/4 of you are consulting engineers. Because the 21% that I say are existing customers, most of them that are registered are consulting engineers also. 100% of the people that registered, that are sprinkler contractors, are Hydratec customers. I'm very, very proud of that. 16% other was some very notable people from government, from Autodesk, and from a couple of other things. But I didn't want to break that out any further than that.

And I'm very proud, 7% of the people registered are friendly competitors of ours. Next two slides are obligatory. This is a class summary. It follows very closely what I said in the class description. But I'm going to summarize it. I'm going to model a system. I'm going to calc it. And I'm going to cost it. And I'm going to attempt to do it three times. And I'm just showing that that cycle is quick enough that you can actually afford to evaluate a system multiple times and get the best design by comparing the costs of those.

Also, if I can do this quick enough, I want to spend some time on some of the details that I did to make that happen. The Revit schedules are pretty exciting in my mind. Key learning objectives, I'm just going to put up there because I'm required to. You read them before you

signed up for this class. And it just says I'm going to teach you what I told you was in the summary. To do this demonstration I had to pick something for a canvas to work on. And that canvas came out of my head as a Butler building.

I made the base 30 feet by 30 feet. And I invented that building. And I drew it in Revit. And I'm very proud of myself for making steel and walls and doors and all of that stuff. I'm a sprinkler guy, so really my intent is to get the building and then start drawing sprinklers. But I'm Mr. Architect, I did that. Then to prove that it's actual real stuff-- not to prove, but by accident, I was driving up the highway to the airport and lo and behold there's a guy building the building just like I designed. I said, he stole my building.

But I get a lot of pushback from prospects and from sprinkler contractors, we don't ever do that kind of work. Well, somebody is because they're building a building like that. So I'm going to use that as an example. I tried to make it simple enough that we can get through it, and interesting enough that it's got some typical Revit challenges in it. Sprinkler pipe on a slope, with heads coming out the piping, a little tricky sometimes. I hope it's not too tricky for me when I'm trying to do it.

OK. So to create this model, I want to show you that I'm going to do it from scratch, no tricks up my sleeves. They gave me a shirt, no sleeves. So no place to hide the tricks. To get started, I'm going to open a project where I put in some elbows and T's and pipes and some sprinkler heads and some valves. Just open that project separate. Then open a brand new project as a blank template. And I'll copy that sample stuff into it. A more traditional way is to create a template that has all that stuff in it. But this is a way of getting what you need without depending on the template.

So I'm going to make use of that trick. And I'm going to insert my Butler building as an external reference. Then I'll draw my sprinkler system on top of that. So the good stuff is lay out the sprinklers, connect the sprinklers with pipes. In this building, I can take advantage of some of the typicality, I hope. And then I can stick the riser and the supply in there. So we're going to get down to business. I'm going to disappear behind the desk.

But you'll hear me talking from back here. And I hope I can make this-- it's a trade off here. I want to keep this interesting and keep you involved a little bit. And at the same time, I want to actually get through all this stuff. So I'm just going to do it and talk through it. I hope-- I'm planning to do it quick enough so that at the end we'll have some time for questions and

answers. Here I go.

So the first thing I'm going to do is open that sample tool box worth of stuff. And I put that in it's own little project. And that stuff has some schedules. And it has some elbows and T's and some pipes and stuff like that. I've got that open. I'm going to start a brand new project. And I'm going to use a raw out-of-the-box mechanical template. And then in this template, I'm just going to copy this stuff into it. So here's my pipes and valves and fittings and stuff.

So Control C. Control Tab. Control V. And I've just copied and pasted that stuff from my toolbox into this project. And I'm plunking it there. It's in my project. And look at this. Next thing I'm going to do is delete it. So what I've done is populated the families. That stuff is available to me. But I don't want that junk in my drawing. So that's a way of getting that stuff in here. Like I said, you could do that with a template. Next thing I'm going to do is create a new sheet.

And on sheets you can copy schedules. So I'm going to go back and collect my schedules. Now these schedules are already filled in with all the pipe and fittings and stuff that were in my toolbox. But when I copy them, Control C, Control Tab, Control V, you see they come over here. They don't have any stuff in them because this project doesn't have any stuff in it yet. Cool thing about schedules, as soon as you make stuff, it's in the schedule. So that's going to work out for us later.

OK. Next I'm going to get that background, that Butler building I invented. So I'm going to insert a Revit link of the Butler building. And then I need to do just a little-- well, let me show you the 3D view of that. I know it comes out a little bit gray. Hire me for the architect? If I can get in from all sides of the building and everything. The other thing I have to adjust, actually, is this is the level that came in from that schedule-- or from that template.

And I'm going to set the height of level two in the template to the height of the roof in this project. And then I'm going to make one more adjustment-- I think this is the last, we're ready to go then-- is I'm going to edit the view range so that I can use this floor plan to see all the way up to right about at the roof. OK. Cool. But now all I see is the roof. So I'm going to click on it and say Hide and View that element. And so now I can see the structure and everything for that building.

OK. There's some typicality here. And I'm going to start by laying out a typical area here. And to do that I'm going to go to an add in. Now I mean to show lots and lots of Revit stuff here. But I'm also showing some third party add in stuff that makes this quicker to help me get

through this. So if you ever see me pick one of these two H's, I'm cheating, and I'm using add in stuff. So I'm going to go to the sprinkler spacing tool that lets me describe what I want for spacing.

I want the heads no further than 15 feet apart. I want the lines no further than 10 feet apart. I don't want the head spaced over 100 square feet per. I want a density requirement of the sprinklers of 0.2, a minimum pressure of 7 coverage area. And then I can also say the pipe is on a slope and define the slope. So then, if I pick two corners to define where those sprinklers want to go, there's one, there's the other one, then that proposes a layout.

You could adjust this as part of this process, but I'm happy enough with that layout. So I'm just going to say insert sprinklers. So that puts the sprinklers in, connects them with pipes, and runs the pipes right to the end. And if I draw a section-- actually too soon where I could draw a section. But I'm going to go to the piping-- go to the piping and I'll draw a piece of main to connect those branch lines. And the main I'm going to make 3 inch. All those line pipes that just got drawn were made an arbitrary 1 inch.

I don't know the size of them until I do the calculations. So they're just in their at 1 inch. And the main, similarly, I don't know the size of it. I'm going to make it up as 3 inch. I know I want it at 13 feet high. And I want to use Schedule 10 pipe. So I'm going to go from the there to there. And that drew the main underneath the branch lines. I've got to make riser nipples. Little bit of a trick in Revit, but here's how I got around that. I'm going to make a little section.

And some of the things you have to get around, you later get used to. And you say, hey, this is a cool way to do it. And I'd say I'm pretty close to that. So here's our main. And here's our branch line. I'm going to click on the branch line pipe and say Create Similar. And then go from the end of there. And I can get it to go at a 90 degree angle. But I want it to connect into that main. So I'm going to align, using the main, that riser nipple. OK. It's lined up.

It's still not connected. I'm going to take the end of it and move the end onto the main. And one of those little yellow arrows went away. That was a good thing. Let me go to View and Split View. And I can get rid of my toolbox thing from before. And then I'll split the view again. And good, now I can see-- now I can see both at the same time. So I can just, in this view, move my section over here and say, look, I got another disconnected. So I'll click on it, Create Similar.

Put this at a 90 degree angle and then align. Using the main, I'll align the branch, the riser

nipple pipe. And then I'm going to take and make sure I get that connected in. I have a friend at Victaulic that registered for this class. And I can't see everybody's face so I don't know if he's here. But he taught me my favorite word for some of the operations in Revit, and that's, you have to find the secret handshake. So the secret handshake here is coming up again when I go to connect that thing.

I'm going to connect similar. And then I'm going to say Align. And I know I need to align to the main that riser nipple. The secret handshake is when you take this script and you find all kinds of stuff going on. You know which one, that one, is going to actually tap into the main. If you came from AutoCAD you miss oh snaps like heck for the first six months or something. And then afterwards, you say, this is such a much better way to do oh snaps.

But now I'm getting used to it. I'm liking it. I'll close this. I'm now in a position to take advantage of some of that typicality. I'm going to first, if you hover over a pipe, you can Tab, Tab, Tab, and select all the things that are connected to that. And that convinces me that I've got that stuff connected. I've got lines going up the slope and then going down the slope. And I don't want an elbow-- I don't want to bend the pipe at the top. I know there are guys in England that do that. They call it a crank.

But we use a-- by us, we use a swing joint. So I need to offset those things. So I'm going to take these pipes and move them this way 3 inches. And then I'm going to mirror them using the pipe that ends at the peak. And then I'm going to move what got mirrored this way six inches. Six feet's not so good. Let me go for six inches. So I'll go back 5 foot 6. 5 foot 6. OK. So now I've got a little space there for two elbows.

OK. And I'm going to do that by Create Similar-- one of my new favorite commands. And if I just start here, it's going to try and arbitrarily put this new pipe at 19 foot 11 and 3/64. What a great place to put it. And it'll have to put an up and down to do that. But I've got a better idea. I'm going to have it inherit the elevation. So it'll just put it at the same height as that pipe. And then I can connect these two. And I can connect these two.

OK. Now I can take advantage of that typicality, if I Tab, Tab, Tab. I've got all of those pipes. And I'm going to copy them. And I'm going to copy them multiple times. And I'm going to copy them from some arbitrary point. Welcome. 30 feet. And then I'm going to copy them again another 30 feet. And we've darn near got a sprinkler system. I got some pipes that aren't connected, so I'm going to go zoom in on them. And I'll just click this pipe and drag it onto the

secret handshake.

And then-- Amanda, I was telling these guys about you guys teaching me the secret handshake. And I'll connect this one into this one. And I'll connect this one into this one. OK. And I've still got four little yellow triangle Warning things. And if I select all the pipes, I'll get the pipes that include those Warning things. And if I limit myself to just the pipes, I can tell it to cap open ends. So now I don't even have any yellow Warning things. But I'm going to turn this one into a pipe for the supplies.

So I'm going to make it 4 feet long. And then I'm going to create a supply riser. So I'm going to go to piping. And I'll make the pipe 6 inch for the underground. And I'm going to make it be minus 3 feet because it's supplying it from under the building. And I'm going to use a pipe type for 6 and 8 inch pipe. And then I'm going to start here. And I'm going to draw outside the building. Another one of these things you have to get used to. Oh, gosh, I just drew a pipe and I can't see it.

Well, the view range determines that. And if I draw a section it'll be easy to see. And now I've got a new pipe that's not capped, so I'll just pick on it and cap that end. All right. I think also just for illustration purposes, I'm going to switch that to fine. Now I'm going to put some Victaulic fittings in here, best content ever. And I'm going to switch this pipe down to 4 inch for the riser. And then put an alarm valve on top of that.

So I'll go back to my favorite Victaulic fittings. I'm going to pick an alarm valve. We're working with Victaulic very closely. And things like this that are a little bit strange to me, I'm sure they're going to fix for us or explain to me what I'm doing wrong. But I found an easy enough way around this as I just draw it off to the side, get the pipe up to where I can make use of it, then I'll grab the valve and put it on top of there. Then I just need to make a connection on the bottom. So my favorite.

And another really cool tool that Victaulic has in their toolbar is you can take that fitting and put it right on top of that fitting. It doesn't need a pipe. OK. Well let me go back to the PowerPoint for a second. This is what we were going to do. We just did it. We've got a sprinkler system that's got lines that go up the slope, back down to the other side of the slope, on the swing joints. And then we've got a riser with valves in it.

So the next thing we're going to do is run a hydraulic calculation on this. Doing not too bad. So for a calculation, I need just three things. I need a connected model. I need operating

sprinklers. And I need a water supply. So water in, water out, and something to connect them. I've got the connected sprinkler system. And I just need the water supply and the operating sprinklers. And I'm clueing you where I'm going to put the water supply and where I'm going to operate the sprinklers. So let me go back over and do that.

The whole calculation process is a third party application we're using. But I'm going to select the supply point. And something that I wish that that knew how to do is always come in right side up. As it turns out, 1/2 the time it comes right side up and 1/2 the time it comes upside down. And always the wrong way for me. And then I'm going to put in a water supply, which is an annotation block, that includes how much water I want to leave for the fire department.

I'm going to put 500 there, what the static pressure is. I'm going to say the city is supplying 60 Psi static. And what the residual pressure is, and the city is doing 50 Psi at 1,200 gallons a minute. So I have a water supply. And I'm going to go back to my floor plan. And on that, I'm going to select those plus two more. All right. In that area, I've right now pipes and fittings and stuff. And I want just the sprinklers. So those 15 sprinklers I want to operate.

Part of bringing the tool box of stuff over, I got properties. And the properties I'm going to-- I've got mostly filled in. I'm just going to say those particular 15 heads are part of grid one. So they're identified as a remote area. And I'm claiming I now have my three things. I've got a connected-- I've got a connected system. I have a water supply. And I have operating heads.

So I'm going to tell it to do the hydraulic calculations. Darn it. I always forget this. He wants-- he wants me to save it. And I'm in the middle of a demo, it would be a good idea to have it saved anyway, wouldn't it? So let me go up to Practice Files. And I'm going to put it right in here. This is the real deal, finally. I had practice one, practice 27, and all that stuff. And I'm going to call it grid. OK. Then I got a Tab again to get that pipe selected. And then start the calculations.

AUDIENCE: What do you use for your add-ins?

ALAN JOHNSTON: I'm sorry?

AUDIENCE: What do you use for your add-ins?

ALAN Yeah. I feel like it's a little bit breaking the rules to say. Come and see me afterwards, I'll tell

JOHNSTON: you about that.

AUDIENCE: [INAUDIBLE] used in order to get the calcs?

ALAN JOHNSTON: You'll have to save your question, Ed. I'm on a forced march here. I'm sorry about that. So the main thing in here is I'm going to pick the heads that I want to operate. And I only have one group of heads called grid one. This stuff has to do with mapping the Revit pipes to the third party application pipes. And then I'll just continue and that reads the Revit drawing and creates the calc input. So this input got created now from the Revit model. And there's a half a dozen or more standalone calc programs.

And probably, all of you that are doing hydraulic calculations on sprinkler systems is using one of those standalone programs. This is the one that's hooked up to that third party application. And in here, I can start out by saying so where am I at? And I'm just going to run the calculation to find out where I'm at. And it says where I'm at with 1 inch lines, you see here, and with 3 inch mains that I put in, I'm 33 pounds over the curve. Red is bad. Green is good. So I got to do something about that.

And one thing I-- a thing I can do about it is down here I can specify, I want the lines to be an inch and a quarter. And I want the mains to be 2.5. And then I'm going to just pick OK. And you see the input changes. This one I didn't really want to change. As a matter of fact, these two, I'm going to leave at 4 inch as part of the supply. And in case I change the schedule again, I'm just going to say they're part of the supply. Don't change them by the schedule. And let's run the calc again.

OK. And after practicing this 400 times, is anybody amazed I knew what sizes to change that to? But I want you to know the cycle is there. I changed the pipes in here until I get this to work. Eight pounds is an OK safety margin. So I'm going to return to Revit and that'll place an answer block and the reference point. So all the things I need for my final report, which come out of that standalone application, all those reference points get put on the drawing.

And an answer block. There's the 800 gallons a minute at 46 pounds that we used in the 500 for hose. OK. So I told you I used 1 inch and 3 inch, how do you know? I told you-- I told you before, you believe me now. I'm going to use a pipe legend for sizes. And that's a handy little Revit tool that paints all the 1 inch pipes blue and all the 3 inch pipes purple. And all the 4 inch pipes and the 6 inch pipes two shades of red that you can't tell the difference between.

And that's adjustable in Revit. So I won't mess with that. What I want was 1.25 inch with 2.5 inch. So I'm going to go to add ins. And that tool says, resize the pipe diameters from the calcs. And now the blue means 1.25. The orange means 2.5. And the purple means 3 inch. You see that caps are-- the pipes to the caps are 3 inch? How come? They weren't part of the calculation. Right? They didn't have any water going through them. I could change it here.

I could simply click on that pipe and change it. Or I want to show you another cool thing. If I go to the Schedules, you see the schedule has 6 feet of 3 inch pipe in it. If I just-- and this is a cool Revit tool-- if I click on the 3 inch in the schedule itself, I can say, highlight in model. And here's the three pieces that are 3 inch. And I'll just make them 2.5. And so they get changed. And the main reason I wanted to show you that was it's the interoperability or interaction between the schedule and the model. Another super powerful thing about Revit models.

And so now look at this, I've got the cost of the pipe because I have pipes. And I've got the cost of all the fittings because I've got fittings. And I've got the cost of the sprinkler devices and the cost of the heads. And any idea why I made the sprinkler schedule red? Because I could do. OK. So what I want to do is make note of this then I'm going to change the thing around. Let me go back to my thing. I've got three schedules, the cost of the pipe plus the cost of the sprinklers plus the cost of the fittings plus the cost of devices, that's the cost of the system.

And I made a little crib sheet for keeping track of those costs by making up an Excel spreadsheet. And I'm going to record 3405 for the cost of the pipe. I'm going to record 1352 for the cost of the fittings. The sprinklers are 1375. And the accessories are 920. OK. So $7,000 material cost for the grid. Who thinks the tree is going to be less expensive? Who thinks the tree is going to be more expensive?

See, this raising the hands thing sucks. You can't get anybody to raise their hand. Who thinks they're going to be exactly the same price? OK. All right. All right. So to test that out, it's easy thing to just redraw this system. So I'm going to take the grid that we've already done, and I'll erase the connecting branch lines across the middle. And I'll add a feed main across the right end. And we'll have a tree. And then I can calc that, size it, and see whether it's more or less expensive.

And then I could just put one more pipe and turn that into a loop, recalc that, size it, and see if that's more or less expensive. So let's keep going. I'm going to get back to my floor plan. I'm going to do Save. And then I'm going to do File, Save As a project. And I'll give its name the

real deal loop. Why did I do that? I'm going to change my mind. I'm going to save again. I wanted to say loop. See if I make the same silly sound out of tree. So I've saved it as tree now.

And in order to turn this into a tree, I'm going to get rid of the calc information. And I can select Similar here and delete that, because I'm going to operate some different sprinklers. And I said I wanted to get rid of these pipes across the middle. And I've got a helper tool for that too that says delete pipes and fix fittings. Deleting pipes is wicked easy in Revit. But when I delete that pipe, what used to be at T is now an elbow. And that little helper function takes care of putting that back together.

And then these sprinklers over on the far side aren't connected in at all. So I'm going to get rid of this cap. And I'll make this some nice length, like 2 feet, and Create Similar. And I'm just-- for me, I'm going to do one more thing. I'm going to place a single reference point. I didn't do this at all. I let the computer come up with all the reference points before. But I'm going to call this one southeast. And then when I get to the hydraulic calculations there will be one guy I recognize. That one guy will be the transition between the main part of the system and the supply.

OK. I'm on my way to having the three things I need. But the operating sprinklers are different. Since they're not connected across here, I want a different 15 heads. I think those are them. Only got 12. Let me try that again. That should be 3, 4, 5. So we have 15 sprinklers. But they're all on one branch line where the branch lines used to go all the way across before. And those, I'm going to say, are a different area now. Those are called tree one.

All right. So we've got all three things. I can Tab, Tab, Tab. I've got a selected-- I've got a connected model. I've got sprinklers. And I got a water supply. So I can go to my add ins, calculations, and start the calculations. This time, I've got two different areas to pick from. I've got some grid heads left over from before, but I'm going to use the tree heads for this calculation. And here's all 1.25 lines and 2.5 inch mains left over from the sizing we happened to have before. Well, heck, maybe that just works. Let's run the calculation.

Doh. No. It doesn't work. So it's 62 pounds over the curve. What am I going to do about that? Let me take a look at where the 62 pounds over the curve is. Well, big part of it is the mains and another part of it is the branch lines. So I'm going to use a schedule to change that. I'm going to say, I want to make the branch lines not just all 1.25, I'm going to make it 1, 1.25, 1.25, 1.5, 1.5, 2, and I'm going to make the mains all 3 inch. And I'm going to set SE-- that's

that reference point I said, hey, I recognize that.

Dave, I recognize you. And Nick, I recognize you. And Ed, I recognize you. But most of the rest of the class came later, I didn't get to know everybody's name. SE I recognize. So I'm going to tell it that that pipe is 4 inch. I'm just trying to keep the riser the same all the time. And if I change the schedule again, I don't want it messing with that, so I'm going to make that feed. Let's calc it.

AUDIENCE: You've got 5 in [INAUDIBLE].

ALAN JOHNSTON: Thank you. That's kind of silly. So the change that back to 4 inch and calc it. Oops, still 10 pounds over the curve. So what am I going to do about that? And I'm going to say the biggest culprit is the main, so let me change that to 4 inch. But there's another decision point, I could make the line smaller, I could make the mains bigger, or mess with either one. But you see the sizing has changed in here. And when we run the calc again, 5 almost 6 pound safety margin. I had 9 pounds before on the grid. This is 6 pounds.

So they're, roughly, hydraulically equivalent. So I'm going to go back. I'm going to return to Revit. And I'm going to park the answer over here. And then I'm going to use that tool that said resize all piping from the calcs. And you see 1.25. Now I've got a longer list of pipe sizes. And this is interesting. You see 1, 1.25, 1.25, 1.5, 1.5, 2, but this is still all 1.25. Can you guys see that? And that's because these three pipes were calculated and all the other ones weren't.

It's time for a little break. Don't get up. The computer needs a break. And that's something I discovered late enough that I didn't want to go mess with other stuff to figure out. So I just have to get out of Revit and back in at this point. So what I wanted to do is change all the sizes. And the way to do that is with another helper function. So I've selected all the sizes. And I can go to my add ins and say, resize all pipe diameters.

And it's going to resize it using this schedule. And that schedule's already filled out the way we did for the calculation. So I forgot to tell them to do anything. I've got to go back there again. Resize all. It's all filled out. But I've got to tell them which one to apply it to. So I want them to apply the schedule to the mains and to the lines. OK. So now you see all the lines are adjusted for the sizing that we came up with in the calcs. And so now I can go to the scheduling sheet.

And you see we've got 1, 1.25, 1.5, 2 inch pipes on here. And the cost of our pipe has gone up to 4369. And the cost of our fittings has gone up to 2016. And the cost of our sprinklers has

stayed the same at 1375. And the valves have stayed the same at 920. Would you have guessed that, 25% different? Who said the same? I got somebody to raise their hand on the same. So pretty different. All right. I've still got a couple minutes.

I'm going to go back to my floor plan. I'm going to do a Save. I'm going to do a Save As. And I already used the word loop, so I'll just write over that. And to turn this into a loop, all I need to do is connect across the back here. So I'm going to get rid of that cap. I'm going to get rid of this cap. And then I'm going to Create Similar. All right. And I'm a keep moving here.

I still have a water supply. I still have operating heads. They're called tree one, but it's the same heads for the loop system as the tree system. So I have everything I need. I'm going to Tab, Tab, Tab, and start the calculations. And this time I still want to use the tree one heads. And if I calc this, we've got a 12 pound safety margin. The tree only had 5. So I could go get some credit back here. First, this time, I'm going to remember to make this be the feed from southeast. And then I'll change the sizing. And I'm going to change the mains to 3 inch instead of 4 inch.

And we'll rerun the calcs. And you see the sizes changed here and there. So 8 pounds. I could still tweak this a little bit more. But 9 pounds for the grid, 6 pounds for the tree, 8 pounds for the loop, these are roughly equivalent. I'll go back. I'll return to Revit. There's a place for an answer block. I like that answer block better than this one. And I'll tell it to resize all pipes from the calcs.

And 3 inch for the-- see that color is the 3 inch for the mains. So if I go look at the schedule now, the cost of the pipe changed and the cost of the fittings changed. So I'm going to go fill that in here. Pipe is 4535. 4535. And the fittings are 1650. And these two guys stay the same. So a whopping 2%. It's cheaper. But that's the point I wanted to make. You don't know until you test it. And don't take away from this class the grid is the cheapest.

Because it depends on the configuration, the size, and the water supply, and the demand, and everything else. And you can't-- sometimes you can't design a grid. Sometimes, you only have a choice between a loop and a tree or various configurations. But the point is, you can run the calculation cycle fast enough that you can evaluate all of those. I'm going to do an interactive thing here. I think I closed that before. I'm going to go get us back. Somewhere around there, close.

OK. So I had a few more minutes I wanted to spend on schedules because I created those

schedules that would do that automatically. Would you rather-- and you have to raise your hand or I'm going to make up my own mind here-- would you rather quit here for questions and answers, or-- I'll give you both choices-- or would you rather I charge on and talk to you more about schedules and stuff. Who would rather questions and answers? Who would rather more information on schedules? OK.

So now-- that's too fast. I want to look at the schedules. And I'm saying, I made up a schedule for the-- actually, when I started this class, when I offered this as a proposal for the class, I said, this would be cool, I can make up schedules. And that'll be easy because Rivet does schedules. Then I get to show off how that whole cycle works. And it will fit together, that's good. And so when I went to prepare for the class, I said, the part I don't know, or the part I know the least is the schedule, so let me go make those.

And I went to make a sprinkler schedule and I said, pretty easy. Let me show you how I did that. See I hit that darn-- that's not how I'm supposed to get out of there. I'm supposed to go this way. OK. So to make a sprinkler schedule, or any Revit schedule for that matter, you just go to View, Schedules, and they have various kinds, but schedule quantities is the most typical kind.

And then you've got millions of kinds of things you can get schedules for. So I'm going to pick sprinkler schedules. And I'm going to schedule the building components not keys, that's advanced stuff. And then I'm going to get the count and add it to my schedule. And I'm going to get the family type and add it to the schedule. And I'm going to take the cost and add it to the schedule. And then I'll pick OK. Look at that. There's a schedule. How cool is that?

Well $12, $12, $12, $12, that's kind of a lot of extra information. So under Sorting and Grouping, I could say, don't bother showing me every one, just show me the totals. And under Grand Totals, I could say and add them up when you're done. So poof. Now I've got a nice little schedule. I also want the cost to be totaled. So if I go to the formatting of the cost, I can add a thing that says calculate the totals for the cost. We're just doing great here.

Now let me go to appearance. And this is-- because I could, I'm going to go change the font that I've got for that. Red. I got a red schedule for the sprinklers. Redheads. Then, I want to-- now that I'm a genius in making schedules, I want to go make a schedule for the piping. So real easy, I just go back to View. And I go to Schedules, Schedules. And I say, the type of stuff I want to do is pipes. And it's a pipe schedule. Good. We're on our way, count, add. Family

name and type, that will give me the schedule 40 description and stuff.

And I want the diameter. And I want the length. Let's see length starts with l, so it's down there. And I want the cost. And then I want the total cost. The cost times the length would be the cost of the pipe. It's not just going to know the cost of that length of pipe. So I'll make a formula, a calculated value. And I'll call it total cost. Total cost. And I'll put it under common. And I'll say it's a number. And that's a formula.

And the formula is the length times the cost. I hope the cost was in there. Yeah. Times-- why is the cost not in there? I didn't add it. Silly me. I have to cancel. I didn't add the cost. I picked it here, I didn't pick add. So I can't make a formal with it not in there yet. OK.

So then I'm going to calculate a formula. And this is total cost, TC I'll make it. And the formula is length times cost. OK. Inconsistent units. So one of the things you've got to deal with in Revit Schedules is you can multiply a length by a length, or you could add a length to a length. You could take a cost and a cost, but you can't multiply a cost by a length.

AUDIENCE: Divide it by 1.

ALAN JOHNSTON: I made a unit length called unit length. And I give it a value of 1, and I divide by that. So that's a way to get around that units inconsistency stuff. But the other problem-- let me just say I'll come back to that problem and make this schedule. OK. So the cost hasn't been filled in yet, so let me fill it in. I'll say the cost of 2 inch pipe is 222. Do you want to change that for all of them? Oh, sure, of course. Oh, wait a minute, the cost of 2 inch pipe is 222. The cost of 1.5 pipe is 222. The cost of 1.25 pipe is-- that's just not right.

So I went and looked. The cost property is a type property. So you only get one for all of those pipes. And 1, 1.25, 1.5, those are all the same type so they all get one price. Wa. OK. I can get around that. I'll just make another property called unit cost. And I'll make it an instance property. I did that. I'll share it with you without dragging you through it. That's a pain in the neck because then every piece of pipe has its own unique price. And for me to price it, all I have to do is type a price in for every individual piece of pipe.

And if I add four more pipes I've got to type in four more prices. That's wa, wa. That's even worse. So I said, OK. They don't have a size property. There's a type property and an instance property. There's not an in between. I want to make one. What do I know to do that? What I know is that the price of pipe ought to be-- I'm just making this up-- ought to be related to the

cost-- the diameter. The bigger the diameter, the more the cost. And if I'm lucky, there's a nice straight formula for that.

Well I went and got the cost of 1 inch schedule 40 pipe, 1.25, 1.5, and 2 inch. Those are what you see on the little table I made there. And then I graph them on a piece of paper. And the diamonds are where I graphed them. And sure enough, the higher the diameter, the higher the cost. And you could do this eyeballing it. You can draw a pretty darn straight line between those points. And then you could use that drawn line to get a slope and an intercept of that line.

That's what I did. Well, actually, I got even fancier. And I looked up the formula for a line that best fits a set of data. And that gave me a slope and an intercept. Then I created a property for the slope, type property. I created a property for the intercept, a type property. And then I could make a formula that said the cost is the slope times the diameter plus the intercept. And it comes back with numbers that are within 3% to 5% of the actual costs.

And if each individual one is within 3% to 5%, the 23% for the grid is representative. And as a result, I only had to type two numbers-- and I did it over in my other project-- two numbers for each pipe type, and two numbers for each fitting type. And I could get all of those things in by typing about 20 numbers. So that's the trick I used for that. And that's what I have to say about that. Good. I've still got five minutes for questions and two minutes for my finale here.

Here's my finale. I told you what I was going to tell you. I spent an hour telling you. Now this is what I told you. There's a way you can model it. You can calc it. And you can cost it. And if you can do that fast enough, you can afford to do it multiple times and get the best design. And I can't help but get excited about that. So excited I put it to a song. It sounds like you're ready.

Sprinkler tools, sprinkler tools, for Revit all the way. Model it and calc it too and cost it all today, hey. Sprinkler tools, sprinkler tools, for Revit all the way. Model it and calc it too and cost it all today. For the model to define, the ribbon does just fine, to insert sprinkler heads in pipe and make them all align. Oh, sprinkler tools, sprinkler tools, for Revit all the way. Model it and calc it too and cost it all today, hey. Sprinkler tools, sprinkler tools, for Revit all the way. Model it, calc it too, and cost it all today.

To size the pipes just so, to the calculations go, and size them all for pressure loss accounting for the flow. Oh, sprinkler tools, sprinkler tools, for Revit all the way. Model in, and calc it too, and cost it all today, hey. Sprinkler tools, sprinkler tools, for Revit all the way. Model it and calc

it too and cost it all today. To cost each sprinkler head, we schedule them in red, now do the pipes and fittings to, let's use black instead. Oh, sprinkler tools, sprinkler tools, for Revit all the way. Model it, and calc it too, and cost it all today.

The best part-- excellent. The best part of that is my grandkids loved it. And I have hopes and designs on them being in the sprinkler business. And I need to compete with [INAUDIBLE], who has a trucking business with a front end loader and a dump truck. And that's what I could do to compete. I got them singing it anyway. I didn't leave enough time for questions. We've got a little bit of time afterwards. But Ed, you had a question that I--

AUDIENCE: [INAUDIBLE]

ALAN JOHNSTON: Oh, look at that.

AUDIENCE: [INAUDIBLE]

ALAN JOHNSTON: HydraCALC for Revit. Yeah. And so most of the times I was picking something it was from that add in. That's been around for almost four or five years. But it's-- the and so it's matured an awful lot. And I feel like, in a lot of ways, it's been the best kept secret in the Revit world. I appreciate you guys coming so that you could learn a little bit more about it. Any other questions?

AUDIENCE: Is the calc feature-- because I know you guys do stuff for CAD too. Is the calc feature the same as the [INAUDIBLE]?

ALAN JOHNSTON: Precisely. Oh, wait a minute. You were supposed to remind me. Repeat the question. Is the calc-- is the calc portion of this, that standalone calc, the same as is used elsewhere? And there's another product that deals with AutoCAD. And the answer was yes, it's precisely the same. And the other question was, what add on did we use? And the answer was the HydraCALC for Revit. Another question?

AUDIENCE: Do you need to create [INAUDIBLE]

ALAN JOHNSTON: The question was do we can create any parameters outside of this? That HydraCALC for Revit program creates those for you. But in my demo, I had already done that in that toolbox project. So they came in from over there. But as far as the calculations are concerned, that add on does that for you. Another question?

AUDIENCE: Does the calculation add in use anything from the connector settings at the sprinkler heads?

ALAN JOHNSTON: The question was, does the calc program use anything from the connector settings? I want to answer that no. I don't know that I'm technical enough to truly answer that question. But it is in no way-- that the add in is in no way dependent on the source of the content. We very much prefer the Victaulic content. But we've used it on virtually any other kind of content. So for that reason, more than my technical knowledge of the details, I'd say no, it doesn't require anything of those settings.

AUDIENCE: Even if the pressure drops?

ALAN JOHNSTON: The question was even if the pressure?

AUDIENCE: The pressure drops for the fittings.

ALAN JOHNSTON: The pressure dropped for the fittings. When that first-- the question-- so even do you need anything special in the connector settings even for the pressure drop in the fitting? And the answer to that question is no, because we're recognizing that it's a T. And then we're mapping the Revit pipe types to Hydratec pipe types that have been used forever in the sprinkler industry. And those pipe types have got E and T and F and G, all that stuff is defined in the hydraulic calculation program. It comes across from that mapping.

AUDIENCE: [INAUDIBLE]

ALAN JOHNSTON: I'm sorry, say again.

AUDIENCE: [INAUDIBLE]

ALAN JOHNSTON: The valves. I'm sorry. The valves, right now, are handled by just a letter that matches the hydraulic calculations in the comments field in the valve itself. So I would create those valves and put the comment in there for the equivalent length of that fitting. What we're attaching to is a standalone hydraulic calculation program that's been around for 40 years. All that stuff is in there. So it's just a matter of peppering the Revit model with the pointers to that stuff. And we do that in the comments. Rob?

AUDIENCE: You mentioned those letters for fittings and for valves, those are relating back to NFPA tables,

is that correct?

ALAN JOHNSTON: Rob is asking if those letters, I was just referring to, refer to NFPA tables. The NFPA tables-- yes and no. Because the NFPA tables have 10 items in them or 15 items in them and the industry has 187,000 of them. So the program has as a way of defining additions to what's normally in the NFPA standards. I don't know that we're going to get kicked out. So let me keep going. Any other questions? A question over here.

AUDIENCE: Yeah. My question is around the software [INAUDIBLE] in the calculator to use an iterative process to design an application based off the [INAUDIBLE]?

ALAN JOHNSTON: OK. So the question is there's costing in there. And there's pressure drop in there. And could the application eventually automate that process so that as soon as the configuration change it just goes and recalculates or something like that. And that is so main stage. That's what they were talking about Monday morning or Tuesday morning on the main stage where we're going to do 10,000 designs. And then pick the most cost effective on of the 10,000 designs.

I don't think this is to the stage of supplying Airbus 320 parts yet. But I think you can-- I would agree with you, that's a natural progression, a natural direction to go. I think there are probably some other important things online before we go to that. But Carl Bass and company have defined where we should be going. And I learned 20 years ago, sign up and go there. Question?

AUDIENCE: Do the calculations comply with the British Standards?

ALAN JOHNSTON: The question is, does that calculation comply with the LPC rules and the British Standards? Hydratec has customers in England and Ireland and the UK that use the calculation program. But I caution just a little bit, although we've got those things figured in there, I think there are codes and applications unique enough to your area that you'll have to pay attention when you go to use this application.

AUDIENCE: When in comes to doing listing for fabrication, how is that handled?

ALAN JOHNSTON: OK. The question is, when it comes to doing listing for fabrication-- you've got to be one of the really small percentages of people in the room-- how many in the room are interested in listing this material? See all the contractor related guys. So I don't know your name or your background, but that's a contractor question. That's a product that Hydratec has under

development is HydraCALC four Revit. HydraLIST for Revit is next.

AUDIENCE: Do you know when that's coming out?

ALAN JOHNSTON: I represent a software developer. If I knew, I wouldn't tell you. But there's no way I could know, unless it was already done. And I'll tell you that, it's not already done.

AUDIENCE: Is the software certified by [INAUDIBLE]?

ALAN JOHNSTON: Try me one more time.

AUDIENCE: Is the software certified by civil defense?

AUDIENCE: Is the software certified by civil defense?

AUDIENCE: Yeah.

ALAN JOHNSTON: Is not certified--

AUDIENCE: When you present your calculations for civil defense for review--

ALAN JOHNSTON: OK.

AUDIENCE: [INAUDIBLE]

ALAN JOHNSTON: OK. The question was about is that hydraulic calculation program certified for civil defense or for a particular application? And I'd answer that question by there are about a half a dozen programs that are being used within the sprinkler industry, within the fire protection industry, none of them are particularly or specifically certified to my knowledge. And I have one of my friendly competitors confirming that. But that all of those programs have been in use for so long I can warrant to you that the print out which follows precisely, in the case of NFPA, the requirements of the format.

It follows those. And it's been accepted all over the world already. That's not, we're making it up. That's been happening for 20 years.

AUDIENCE: They're asking for standpipes [INAUDIBLE]?

ALAN JOHNSTON: For what pipes?

AUDIENCE: Standpipes.

ALAN JOHNSTON: Standpipes. Exactly the same workflow for standpipes. The question was, is there anything like this for standpipes? The only difference is how you model it. You model the standpipe, you identify the flowing post flows, and it'll run the calculation just like it did.

AUDIENCE: [INAUDIBLE]

ALAN JOHNSTON: Absolutely.

AUDIENCE: [INAUDIBLE]

ALAN JOHNSTON: Yes. Absolutely. So no matter how many standpipes there are-- the question was, even if there are more than one standpipe or more than five, no matter how many standpipes there are, you can operate hose valves on all of the standpipes. You can operate two on every standpipe and select the hydraulically most remote and then reduce down to just one on each of the rest. And I don't see anybody coming to chase us out. But we're definitely over time. I so appreciate all of you guys that stayed.

I've got couple more obligatory slides. This one's obligatory please, please fill out the surveys. The guys that left, good. They're not here. I'm not telling them to fill out the survey. You folks may recognize this slide.

I doctored it up to give you an encouragement. They're recording. The presentation and the handout is already on the AU website so you can download those. The schedules and the background thing, I will make available to you. But you'll need to email me to get those. So there's my email.

I have 100 business cards here. So if anybody wants a business card, I've got that. And with that, I'm just going to say, thank you, thank you, thank you.