THE Best Practices™ COURSE
Helping ArchiCAD users get the most out of their software

Training Lesson TRANSCRIPT

BEST PRACTICES COURSE – WEEK 12 – PART 6
Case Study: Additional Techniques for Drafting Property Lines

Hello, this is Eric Bobrow, and in this lesson, we'll continue on with studying how to bring in a PDF drawing of a property survey. And we'll use as a case study a property that was submitted by Dale Paegelow, an architect in upstate New York, one of the Best Practices course members. He sent this to me, and it actually introduces a few variations on the techniques that I explained in the previous lesson, so I think it would be very useful to go through this as another additional exercise. [0:00:36]

So here we have a blank project. Let's take a look in Photoshop at what Dale sent me. He sent me two PDFs. You can see this one on the left is a part of the property survey, and the one on the right is a different part of it. If I move this one down a little bit, you can see that the area on the lower right that is a building, that matches the one in the left-hand drawing, but of course it's rotated a bit. And the upper right area of this PDF, you can see has a wedge-shaped piece of the property, and that matches the one up above. [0:01:11]

So what I did in Photoshop was I created a view which had the first one, and expanded the canvas, and then I brought in the second one and overlaid it precisely to match. Now in order to do that, I had to rotate it. So you can see now the bounding box, and I rotated that and moved it until it carefully aligned. Now to facilitate that, I used a Photoshop feature called 'opacity', where I basically reduced the opacity of the drawing. And I will just zoom in on this here, so you can see what I was looking at. And I basically use the opacity control to be able to make sure that this overlaid nicely. I moved it around as needed, and then of course ended up with it being fully opaque when I was done, and creating a PDF version of the composite. [0:02:08]

I cleaned up a few other things as well that were messy, but basically took the two images and combined them together. So let's go to ArchiCAD and do that process. I will create a new worksheet, right click on the worksheet folder in the Project Map and say that I'd like to create a new independent worksheet, and call it "Survey". And then I'm going to change the scale of this to something that might be appropriate for surveys. I don't really know what this survey should be; I'm just going to make a guess. This is not that critical, but at some point it would be good to set this up for the paper size for being able to put onto the sheet, and we'll need to adjust that before we do that. [0:02:52]

But by having done this, it will affect the placement of the PDF and its scaling. So I'll go to the File, External Content, Place External Drawing. And then I'll pick the "Survey" and say I'd like to place it. Now

it will place it at 100% of what it thinks is the real size, which is huge. But we really don't know what this size is, because I don't have a scale from what Dale sent me. So what I need to do is actually scale it to match. So if I zoom in on this area, you'll see that this particular boundary is 155.80'. And so what I'll need to do is scale this. So I've got the PDF selected, and I'm going to scale it by going to the Edit menu, Reshape - actually, let's see. [0:03:46]

I don't have it selected, let me select it here, then go Edit, Reshape, and Resize. Or Command+K or CTRL+K. And I will say I want to do it graphically. And then I'm going to zoom in very carefully on this, and say that from this point here, and then go back to my previous view and zoom in on this other end, and get it as close as I can visually and go back to the previous view. It's supposed to be 155.80'. So I'll type in 155.80. Now even though it was in feet and inches, I can type in decimal feet. It won't display it that way, but it will accept it. And when I hit Enter, you can see it's gotten much smaller. So now if I zoom in on this area, and I do the Measure tool, and I go from this corner to the other corner, you can see that it says 155 - just a hair under 156. [0:04:53]

So it's scaled it just precisely. Now the bearing, this says that it's on a certain bearing, like this, that degree, I need to figure out how am I going to make what we see on the survey and what we see on the screen match up? Now there is a little bit of a clue here. You can see that Dale had written just sort of an approximate North arrow here. And here 1 inch equals 20 feet. I guessed right that it is the right one. But the PDF didn't come through matching that. So you can see now, having rescaled it, how it works. So what I need to do is to draw a line that should be along this bearing. And then figure out how much different this survey orientation is from what I've got in ArchiCAD's project setup. [0:05:52]

So let me again zoom in on this, and I'll go and this time, activate the Line tool and go click to start drawing a line. Now this line should be South 69, but it's - oh, here, I'm getting my distances and angles in feet and inches and decimal degrees. So I need to change that. I'll go to the Options, Project Preferences, Working Units, and quickly change it to Decimal Feet. If you were in metric, of course you might want to change it there in terms of the level of accuracy. Here we do want to change it to "Surveyors Units", so that it will reflect the survey properly. [0:06:33]

So now as I click on this, you can see that it is showing me this is South 6°, instead of South 69°. So I will obviously need to input this and then see what difference it is. So I will just type in the distance, let's see, the distance, which is 155.80, so 155.8, and then hit the Tab, and this is going to be S 69 56 26 E, and you can see that line went off to the side. So what that means is that the North position, in relationship to this, is offset. Now all I have to do is zoom in on this. Perhaps let me just drag it, and I will go and rotate this. So I'm going to rotate this. And let me say that I'm going to rotate it from this corner point, and we'll zoom in on this here along here. [0:07:42]

And I'm going to take that angle, and I will rotate it around until it hits the bearing that I entered. So now you can see that if I zoom in on it, that that line is precisely overlaid. So I now can tell the angle that I need to offset. So this was rotated around a certain number of degrees. I can read it off in here; it says that it was rotated 76.73°. So if I wanted to have it going straight up and down - that was 76.73°, just want to remember that - I'll just undo the rotation, 76.73°. And what I'd like to do is move the North

that 76.73°. So I'll go to the Options, Project Preferences, Levels and Project North, and I want to move the North 76.73° clockwise. [0:08:45]

So that would mean that it would end up being 13.27° here. So you can see that this actually, I just subtracted that from the 90°, and it gives me this angle. So this actually now matches. And if I want to verify that, or to make sure that it's working, I'm going to draw a line from the same point, and let me zoom in so I get distances and angles right. So I'll type in the 155.80, and type in S 69 56 26 E, and you can see that line is precisely on top of the survey's. So in other words, now with the North having been placed in this correct orientation, and I enter my bearings, the drawing will precisely overlay. [0:09:39]

Now it didn't move this original line, because that line used the angle when I inputted it. But it wasn't attached to the north; it wasn't smart to rotate when I changed the north. However, if I go to the North Arrow tool, which is in the Object tool, if I do a search under Find Library Parts, and I type in "North" and click Find, you will see that here is a North symbol, one of the standard ones. And let me just pick an option that I like here. If I tell it to follow Project North, then when I click to place it, you can see how it follows and indicates where I have placed the North. So we know that the North is in the right orientation, the bearings are going correct. [0:10:24]

So let's just now do some more of the boundary, and we'll go to the Line tool and click here to place it. And I'll just read off this number here, I need to go 8.29 and N4 40 50W, and you can see it's drawn that line. Now it's a little bit hard to see these lines, so what I'm going to do is create temporarily in the Pen Set, I'm going to create a pen that is very thick and stands out. Now I checked, and the thickest one in the U.S. setting is 1mm here. But I want it to actually be a little bit thicker, so I'm going to go create a new custom pen. So I will just click in this custom pen, edit the color, make it red, and make it 2mm. [0:11:13]

So it's going to be a very thick one. And I'll select these two lines here that I've already drawn, and I'll change them to that pen that I've just created. And I don't see a change, because I'm not seeing it in true line weight. So I'll go to the View, Onscreen View Options, True Line Weight. And now you can see it's easy to see those lines. And I'll eyedrop it so that the next line that I draw will be like that. So now I can go down here, and let's just type in 106.05, and S 65 23 28 E, and you can see how it very precisely matches that. [0:11:48]

Now the next segment is a curve. And in fact, this is why this particular survey requires some different approaches than we had previously. If you look closely, you'll see that the curve that I'm about to do next is concave towards the center of the property, whereas the curve that meets it in the other direction is convex, and the other one would be concave. It actually faces away from the property. Now in both of these cases, the adjacent property line is the line that goes to the center of the arc. So instead of specifying a cord, an angle of bearing for the straight segment and then telling us what the curvature should be, it just says what the curvature is and what the length of these lines are in the perimeter. [0:12:44]

So having understood that, I'm going to actually create this first arc for you. And then if I zoom out, we're going to do the straight segments on the other side. And we'll do all of these arcs in relationship

to the adjacent property boundaries, and then move the two halves together, because essentially, each of these arcs is determined by the adjacent property line, and can't be calculated from where it meets the other arc. So let me demonstrate that. [0:13:18]

I'll go now and zoom in on this area, and you can see that this says that it's got a certain angular displacement, 13 43 28, a certain radius, and a certain length. So let's see how that works. I'm going to draw a line now, and I'm going to make this one dashed instead, just so we can see it differently, and I'll make it a different color. And this line, I'm going to go up in this direction, and its distance is going to be the radius of the circle. So this will be the 324.79. And I'm locked in on the angle of bearing of the property line, and I'll hit Enter. [0:14:02]

And that now created this dashed line, which you can see. And when I zoom out, you can see it extends way out in the distance. And now what I want to do is draw an arc here. Now when I do this, it measured it not in surveyor's measurements, but it measured it in degrees, minutes, seconds. So that's what we need to work with here. So that's why this particular example required a different approach. So I'm going to start the arc here. I'm going to say that its center is there, and that this is the radius, you can see the 324.79. And let me zoom in on this, and we'll see what it reads off. So it says that the angle is going to be 13°, 43 minutes, 28 seconds. [0:14:53]

And you can see as I move it in this direction, its showing me something like that but with a minus. So I'm going to type in a minus for the angle, and then the 13 43 28. And that now has drawn a segment that looks like it's going to be quite correct. If I zoom in on it, we'll see that the other end is very close to the PDF. Now remember the PDF was scaled by eye, so really I want to rely on the numeric measurements and just use the PDF as a guide, make sure that I'm on the right track. So at this point, let's just very that this is the right length. So if I press down on this, and say that I want to change how long it is, and I pause here, you can see that the arc length in the Tracker is 77.80'. [0:15:52]

So the arc length matches perfectly. We know the radius was the 324.79, and the angle that was subtended was 13° 43 28. So I've got it just perfect, the way that it was done in the survey. And I'll go with it selected and just change this now to match the other ones so we can see it similarly. So now let me go and create the other side here. And actually, we'll go to this side here. So this one is a little hard to see at first glance, but the curvature is going out in the other direction, in other words, the radius. So what I need to do is draw a line that is going along this angle. And so I can either in ArchiCAD 15, click on the little red orange dot, or simply by stroking along it, I will get a guideline. [0:16:55]

Now with the guideline indicated, I can go point in the direction that I want and tell it I want this line to be whatever the radius is, which is the 185. So that now created a line going way out in space here you can see, and I'm going to now do the arc from that endpoint. So this is the center of that arc. And I'll zoom in back again to start it at this point, and go around here. And you can see that the angle matches very nicely. It's supposed to be 439.06, so I'll type in -439.06 and hit Enter. And that looks just perfect. I'll select this line arc here, and I'll put it into the special pen that I've got for all of these lines, so we can see it. [0:17:51]

So now we've got one side of this carefully laid out, and I need to do the other side. And I'm going to start with the straight segments, and do the arcs, and then I'll fit the two halves together, I will make sure that they work, because undoubtedly when I start over here with the straight segments, it's not going to be exactly precise, because I'm using the PDF as the trace. So let me just zoom in on this, and this line here, I'll start it approximately right, and I'll go up this way. Oh, I have to change my measurement back to the Options, Project Preferences, Working Units; I have to change it back to Surveyor's Units to be able to get the bearings. [0:18:36]

And so now I can go and click this line, go up about here, and the distance is, I'll just point at it with my cursor, 70.89. It's not the one that's printed, because that actually extends further off to some other point. So I am going to type in the 70.89, and then the bearing going to be N 59 37 40 W. And you can see that that looks nice. Let me just put it into the color that will make it work. So now I can go in and eyedrop that and do the next one. So this is going to be the 20.72. And now here, it was measuring it, and it says south and west. And when I go in that direction, it says north and east. [0:19:30]

This actually isn't a mistake; it's just that they were measuring it in the other direction. So you have two choices. You can either put this distance in, so let's say the 20.72, and then type in what they have, the S 38 28 59 W, and then it will go off and the other direction. And you can select it; drag it from this end back on top, that will work. Or we could enter it this way. I simply look at what I'm getting and realize that has to be north and east. And then I'll type in the bearing as N 38 28 59 E and it will precisely go in the right direction. And just to verify that, I'll just go say in the other direction using the Measure tool, and you can see that it has the S 38 28 59 W, so that is precisely correct. [0:20:31]

So let me now go to the Line tool again, and we'll go and do this one here. And if the distance of 58.52 and the bearing, it was south and east, and I'm seeing north and west, that works fine. So I'm just going to do the N 4 44 4 and W, so I'm reversing both the first and last directions. And I guess the overall length here was not the 58.52, but is - no there's a 58. Oh, I typed in 38.52, so I want to make it 58.52. So there we go. Okay, so that was my mistake in terms of entering that. And then we go up one more, and this is going to be going up in this direction here. And it turns out it's the 140.27 we're seeing, not the 170, because that's going off there. [0:21:40]

So now I'll do the 140.27, and just type in the bearing here. And now it's getting little bit off in terms of the visual, because remember, this survey is a PDF, but it's as close as I can get it based on the visual that I've got. So let's go ahead and do the arc here. So the arc, it says has a radius of 170.27. So I'm going to go and change to my other line type to indicate that this is not actual property boundary, but it's a construction line. And I'll go down along here, the 170.27. And we'll zoom out so I can see where that ends. You can see it goes to this point. And I'll go to the Arc tool, start it here, go along from the other end snapping, and then we'll read off this direction. [0:22:53]

So in order to do that, I actually need to get back to the preference where the degrees, minutes, seconds are showing. So I'll have to cancel out of that and switch back to the working units and switch to surveyor's units, which is degrees, minutes, seconds. And then again start the arc here, and we'll zoom in on this. And tell it to go let's say, the -30 32 10. So you always have to look and see plus and minus

may be confusing. In this case, it's going clockwise, which is considered a minus direction. Counterclockwise is considered positive. So we would want to go in this direction, so I use the minus sign. [0:23:44]

And just know that this will calculate the distance properly. Let's just select it, and put it into that color that I had, and let's just zoom in on it, and we'll see that yes, it's looking very nice. Now this point and the other one are not quite aligned, so I will need to move that entire left side with this arc into position. So let's just do that. I'm going to go and select all of these lines here. I don't want to move the survey necessarily, so I'll deselect that. And I'll select this arc. And I'm going to zoom in on this, and drag this point. So I will say I want to drag the whole unit around, and I'm going to drag it right on top of the adjacent one there. [0:24:39]

So now, these are precisely aligned. I were to turn off True Line Weight, we can see that they are precisely touching each other. So let me put it back to the True Line Weight here. And let's just check that last one that we need to do. So the last one that we need to do, we'll see if it closes up right. The last one is the curvature is facing away from the property. So what I need to do is draw a line, and I'll go along this edge and in versions before 15, it would automatically, as long as I stroke the mouse it would create a guideline. In 15, I have to click on the orange dot to get the guideline. [0:25:23]

Now that I've got the guideline, I can point it in this direction and type in the radius that I want, which would be the 374.79. So that, if I zoom out, we'll see that that's very far away from the property. And then I'll create the arc going from this point. And we'll zoom in, and I'll snap it here and type in my angle that it says, which is the 7 57 40. Remember I type the minus sign, because I noticed it going in this direction, it was a minus. And I'll hit Enter. And we're going to see that this line, when I make it the right color, is precisely on top of the other one. So here is this one, you can see the dot. When I select the other one, the dot is right on top of it. [0:26:18]

They are exactly right. Let me just put it into the - turn off True Line Weight - and I'll deselect, select the right-hand one, you can see that dot, select the left-hand one, it's the same place. So within the level of accuracy of surveys. And in fact, if we zoom in on this, we will see that the difference here is so minuscule, obviously it would be considered correctly closed. So at this point, I have now drafted a survey that matches what we have printed. And what I'm going to do is, just to verify this, I'm going to use again the Dimension tool, and I will just put in a few of these measurements quickly to verify this. [0:27:10]

So we'll go and say that I want to go along an angle. And I would like to make the dimension preferences before I do this. Under the Dimensions, I would like to make them for Site Survey here. And then I'll go from this point to this point, and double click, and make sure that it's going in line, and you can see here the 106.05. And of course, we have the, if we were to put our working units here back to surveyor's units, if I go and measure from, let's see. I think we would want to go down in this case. I'll just use the Measure tool and go down along here, and you can see that the angle, if I hit the Tab key, if I hit "A", it will highlight the angle, it's the 65 23 28 E. [0:28:15]

So I'm going to copy it, so I just did Command+C or CTRL+C, then I can go in and put in some text. And let's just use the text tool and paste. And you can see how it has this. And I could rotate this around to match, so I'll just take this and say Rotate from the horizontal. And then I'm going to go along this edge and get a guideline, and then I can snap it. So now it's precisely in line. And move this into position. So you can see how I can verify and put in some annotation easily. Let's check the arc length here. So I'll go to the Dimension tool, and we're going to dimension along the outside. So this is a special setting for the Dimension tool. It's not as frequently used, where you want to measure the perimeter. [0:29:14]

And I'm going to click on the edge of this, there is a Mercedes. I will click, and you can see it has put bullseyes at the two ends. And I will just double click to say I'd like to place this in. And let me just move this a little bit down. You can see here's the 77.799. So instead of 77.80. So if we rounded it up in our Dimension preferences to a distance, let's say of two decimal places for the decimal feet, then we're going to see, now here's the 77.8, so it's taken off the zero. So what we would want to do, is make sure, if we cared about this, that we don't hide zero decimals, and that this now would show correctly here. [0:30:05]

And we've already verified of course that the arc length, the subtended angle is correct. And we could copy that from the editing window if we wanted to verify that. So I could go in here. And when we're saying that we want to change its width here, we can see if I hit the Tab key or hit the A for the angle, actually, we'd again have to switch our preferences back for working units to degrees, minutes, seconds, if we wanted to do this. And I could go and copy the angle. So we could hit A and copy. And then we can go and use the Text tool and paste. And you can see how it's getting that information. Of course, I just take off the minus sign there. [0:31:08]

So there you have it. These are some additional tools that you might need to do from time to time when you have arc segments that are defined based on property boundaries where you need to create a radius in relationship to that property line, either going in towards the property or away, but along that angle. And this is sometimes going to require some extra construction lines, as you can see, to do that. But ultimately, we've ended up with a survey that is precisely measured exactly as the paper drawing or the PDF was done. It doesn't require the PDF that I did in order to input it, but it is a very nice double check. It's very nice to be able to zoom in and out and see what the drawing shows. And to make sure that we are really on the right track as we move along. [0:32:10]

As you can see, it really looked totally perfect in this area and only as we got up far in this upper corner did it even start to diverge. And in fact, the divergence here is so small visually even; you can see this line is just off barely the thickness of a line from the actual dimension. So this concludes my supplemental lesson on doing property surveys. I want to thank Dale Paegelow for submitting this interesting challenge. I hope you found it of use. I thank you for your time in watching it, and I look forward to your comments and questions on the page down below. This has been Eric Bobrow, and thanks for watching. [END OF AUDIO 0:33:00]