AUTODESK UNIVERSITY

GEN20664

Data Mining in AutoCAD with Data Extraction

Ben Rand
Job Industrial Services, Inc.

Learning Objectives

- Learn how to use Data Extraction to create tables based on drawing data
- Learn how to use Data Extraction to extract data across multiple drawings
- Learn how to link Excel spreadsheets with extracted data
- Learn how to customize data extraction using sorting, filtering, formulas, and totals

Description

Your drawings are a potential gold mine of information. Learn how to get the most out of your AutoCAD drawings using the powerful Data Extraction tool. Learn how to build automated bills of material, drawing title sheets, coordinate tables and more. Learn how to extract data to AutoCAD software tables or Microsoft Excel files. This session features AutoCAD.

Your AU Expert(s)

Ben began his career in AutoCAD as a part time job while studying English at Brigham Young University. After a year of teaching 6th and 7th grade, he returned to architecture and AutoCAD. He taught himself to program first in AutoLISP, then VBA to speed up repetitive drafting tasks. He taught as an Autodesk Certified Instructor at Salt Lake Community College, covering AutoCAD, LISP and VBA programming for AutoCAD, and 3DS Viz and Max. In 2002, he took a job as CAD Manager for an industrial engineering firm, and has worked in that industry ever since. Ben now spends most of his professional time developing in C#. At AU 2013, he won the overall AUGI Top DAUG prize, not bad for someone who hasn't done production drafting in many years. He is currently an AutoCAD Mentor All-Star, helping AutoCAD and AutoCAD LT newbies during their software trial. Ben was a speaker at AU2015, is an avid reader, and also enjoys tennis, racquetball, volleyball, and pickleball.

Introduction

We all know that our drawings are valuable tools used to convey information about our design to other people so that what we design can be built. Some of this information is easy enough to read by looking at dimensions and other annotations on the drawing.

But did you realize that there's a potential gold mine of other information lurking in your drawings? Unfortunately, designers often don't realize they have some very powerful tools for digging out this valuable ore, and putting it to work for them.

In this class, we'll be exploring the powerful Data Extraction tool and how you can put it to good use in your drawings. Along the way, we'll also look into some other related tools that can help boost your productivity.

Data Set

The sample data set provided with the class materials includes several drawings and a sheet set named **AU2016.dst** which I'll be using throughout the presentation. The sheet set isn't important for working through the examples, but does it make it easier to open the referenced files as you follow along. The sample data set includes:

- Floor Plan Sample.dwg—an architectural floor plan
- MH-1115-FC-109.dwg—a structural foundation location plan
- Landscaping.dwg—a landscaping site plan
- Arch Drawings\A-00 Index to Drawings.dwg—part of an architectural set of drawings
- Arch Drawings\A-01.dwg—part of an architectural set of drawings
- Arch Drawings\A-02.dwg—part of an architectural set of drawings
- Arch Drawings\A-03.dwg—part of an architectural set of drawings
- Arch Drawings\A-04.dwg—part of an architectural set of drawings
- Mechanical - Data Links.dwg—a Piping and Instrumentation diagram
- Mass-balance.xls—an Excel file
- 104.dwg—an instrument mounting detail
- 301.dwg—an instrument mounting detail
- 403.dwg—an instrument mounting detail
- D01.dwg—a drawing with a border to be used to create a details drawing
- Keynote Sample.dwg—a sample to demonstrate architectural keynoting
- CSI.xlsx—an Excel file

Use Data Extraction to Create Tables Based on Drawing Data

Let's start with an architectural example ***Floor Plan Sample.dwg***. In this drawing we have a floor plan of one floor of an office building. The plan includes offices, cubicles, and other rooms, and identifies where major furniture (desks, chairs, etc) are located along with standard office equipment such as phones and computers.

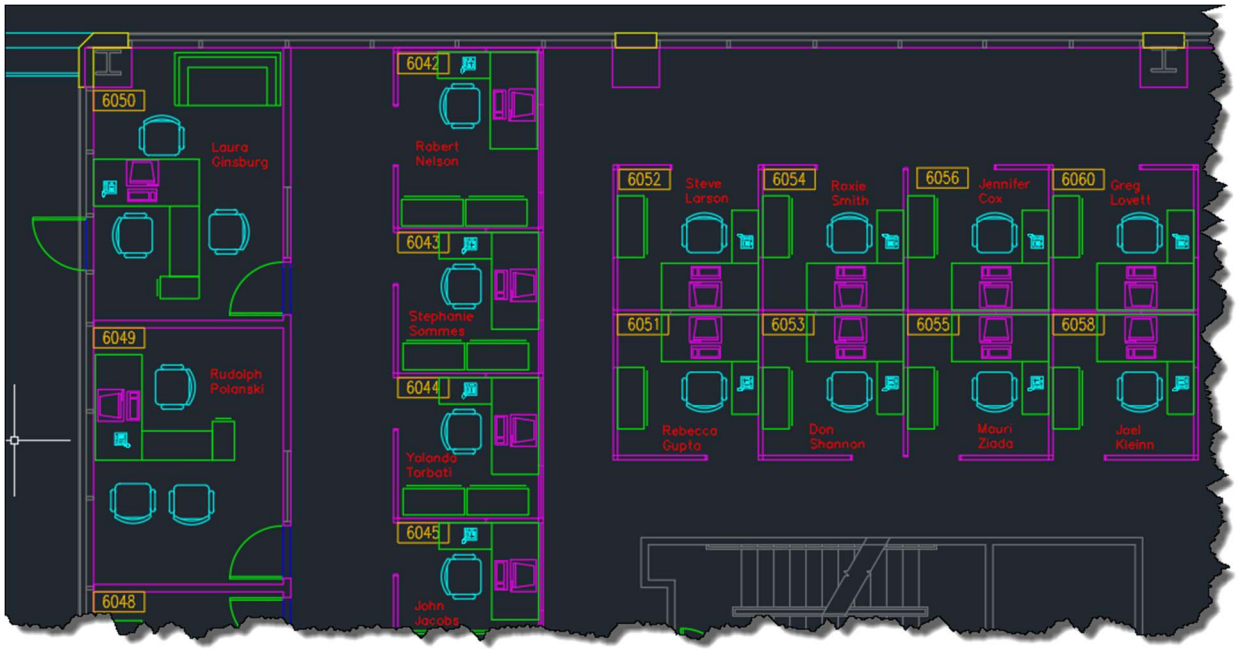


FIGURE 1 FLOOR PLAN SAMPLE

Suppose you are given the task of counting how many desks, chairs, phones and computers are in the layout. How would you proceed? Would you zoom into one corner of the building, make a count of all the phones in that area? Then pan around the drawing until you had them all counted, and write it down? Then start over to count the desks and so on? If that sounds tedious and error-prone, good. It is. Surely there are better ways.

Recommended Drafting Practices

Before we get into Data Extraction, let's look at some recommended drafting practices that help facilitate good results from Data Extraction.

First, notice that each desk, chair, phone, computer, door, etc. in the sample drawing is a block. Blocks allow us to compose common geometry such as lines, circles, etc., into reusable symbols. Blocks can also have *attributes* which are a special type of text that can be changed with each instance, or insertion, of a block. For example, a door block might have a DoorNumber attribute which can be changed to a unique number for each "door" symbol inserted into the drawing.

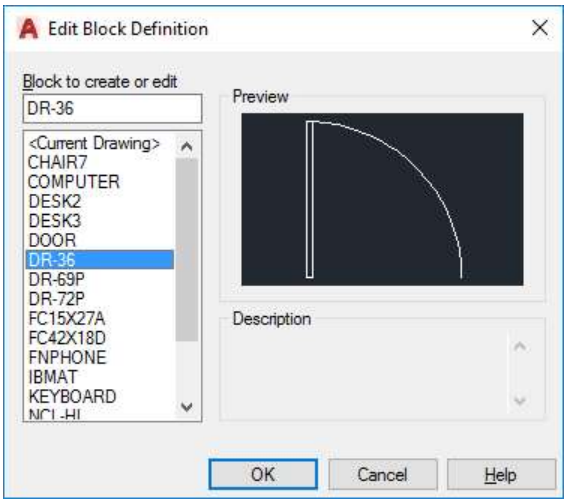


FIGURE 2 BLOCKS COMBINE SIMPLE GEOMETRY TO FORM REUSABLE SYMBOLS

Second, notice that items have been placed on layers which help separate drawing elements by their function, not their appearance. Open the Layer Property Manager and you'll see layer names like Phones, Chairs, Furniture, and CPU.

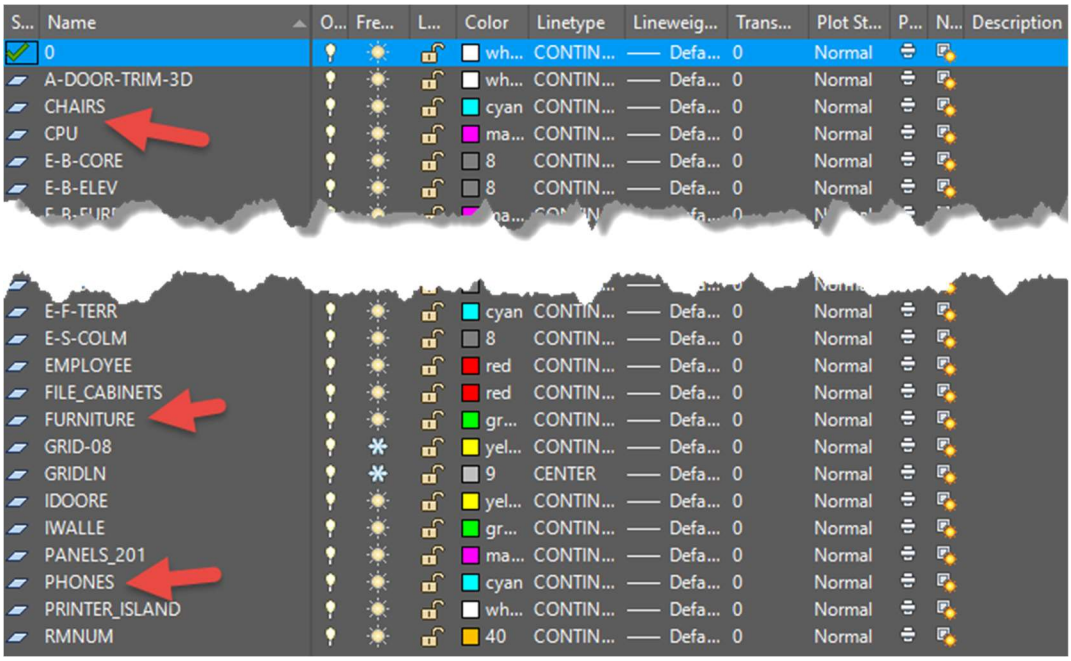


FIGURE 3 GOOD LAYERING SEPARATES GEOMETRY BY THE FUNCTION IT REPRESENTS

To summarize: use blocks to represent symbolic geometry as much as possible, and use layers to separate items by function or type rather than by appearance.

Layer Isolate / Layer Unisolate

Isolating layers is a good way to see what content is on them. Let's try using this command to find how many phones are in the design.

Exercise:

1. Select **Home tab > Layers panel > Isolate** (the **LAYISO** command).

FIGURE 4 LAYER ISOLATE COMMAND

2. Select the **Settings** option, then choose **Off** twice.
3. Select any one of the phone blocks and press Enter.
4. Zoom to Extents (**Z** <space> **E** <space> at the command prompt) and draw a selection window around all the phones.
5. Right-click and choose **Properties** to see a count of the phones.

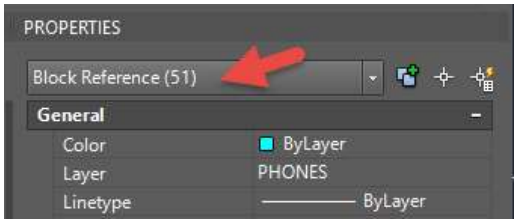


FIGURE 5 SELECTED OBJECT COUNT IN PROPERTIES

Did you find 51 objects? If so, that's great. However, that answer really only tells you that 51 objects were placed on that layer. You can't be sure that these are blocks of the exact type (FNPHONE) you're looking for.

6. Select **Home tab > Layers panel > Unisolate** (the **LAYUNISO** command) to undo the layer isolation.

FIGURE 6 LAYER UNISOLATE COMMAND

Quick Select

Quick Select is a handy tool to use when you need a quick answer. For example, what if you need a quick count of how many "DESK3" blocks there are in the drawing? Isolating the FURNITURE layer as we did previously would be less helpful because there are many different furniture symbols on this layer. Let's try using Quick Select for this answer.

Exercise:

1. On the ribbon, go to **Home > Utilities**, then click **Quick Select** (the **QSELECT** command).

Figure 7 Quick Select

2. Change **Apply to** to **Entire drawing**.
3. Change the **Object type** to **Block Reference**.
4. Change the **Properties** to **Name**.
5. Verify the **Operator** is set to **Equals**.
6. Change the **Value** to **DESK3**.

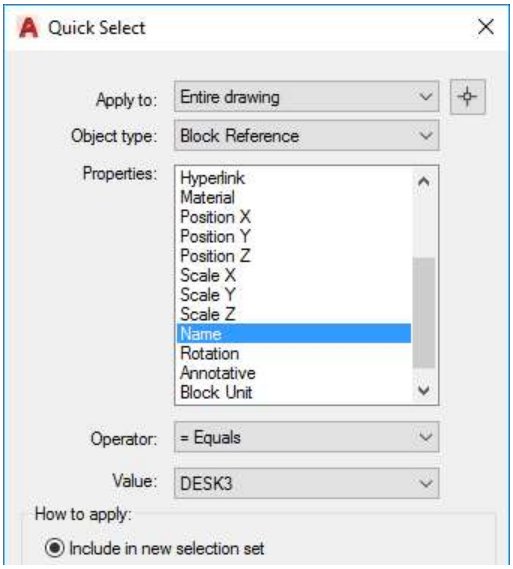


FIGURE 8 QUICK SELECT SETTINGS

7. Click OK.

All the DESK3 blocks are selected in the drawing, and a count is displayed—8 in our sample.

While both of these techniques have value, especially for quick answers, the output is not exactly reusable or updateable in a meaningful way. What if we need to have this information show up in a report or a table on the drawing? What if the design is still evolving and we later need to recount? We'd have to repeat all these steps to get an updated count. Too much work.

Create tables using Data Extraction

Continuing with our architectural example ***Floor Plan Sample.dwg***, let's do something more practical: build a room schedule which will appear as a table in our drawing.

Exercise:

1. Create a layer named Schedules and make it the active layer.
2. On the ribbon, go to **Insert > Linking & Extraction**, then click **Extract Data**.

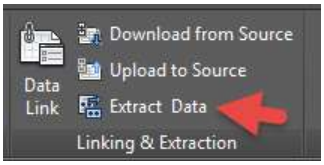


FIGURE 9 EXTRACT DATA COMMAND

3. Select Create a new data extraction, then click Next.

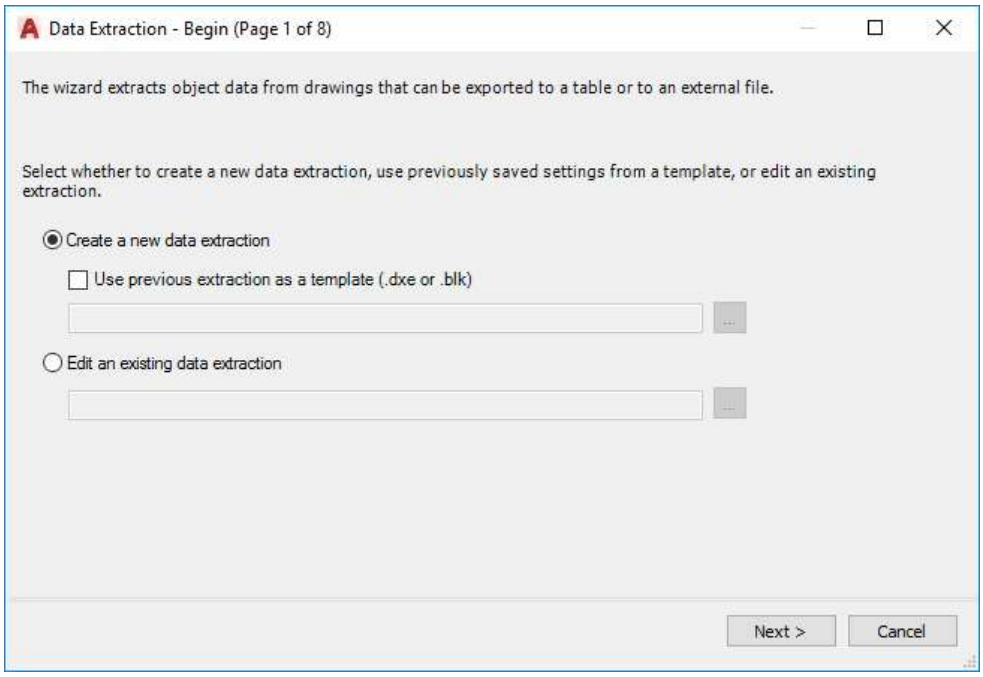


FIGURE 10 DATA EXTRACTION, STEP 1

4. Select a folder and file name for your DXE file, I'll name mine ***RoomSchedule.dxe***[1]. Click **Save** to move to the next step.
5. By default, Autocad includes the current drawing as the Data source, but you can also include other drawings, which we'll look at later.

[1] Typically I like to keep my DXE files in the same directory as the source drawing(s), but this is not strictly required.

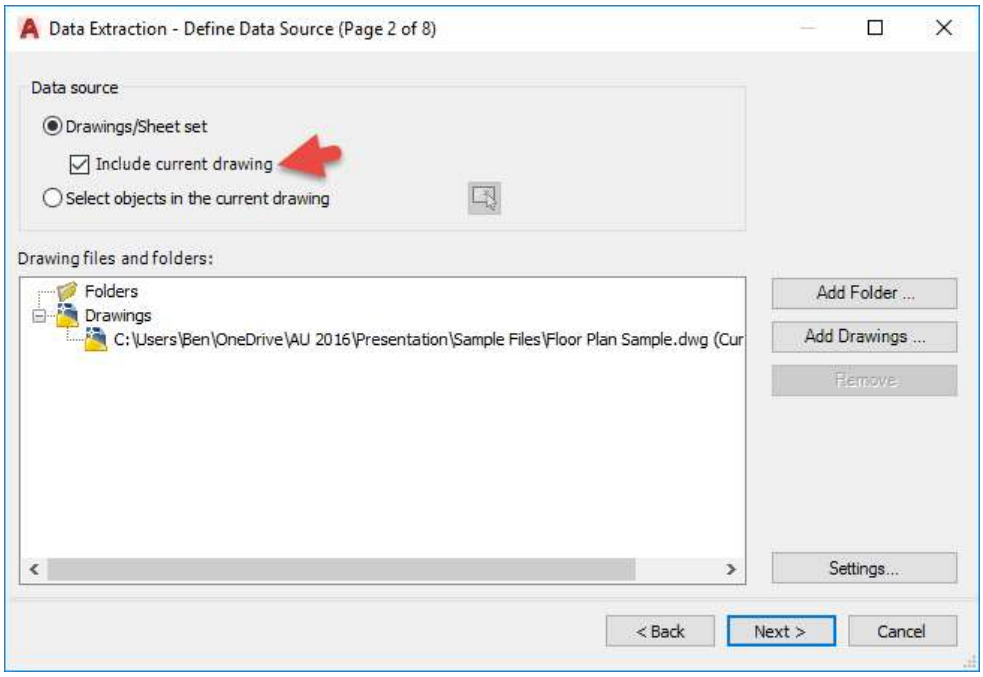


FIGURE 11 DATA EXTRACTION, STEP 2

6. Click **Next**.
7. Right-click the list of objects and choose **Uncheck all**.
8. Locate the **RMNUM** block and check it, then click **Next**.

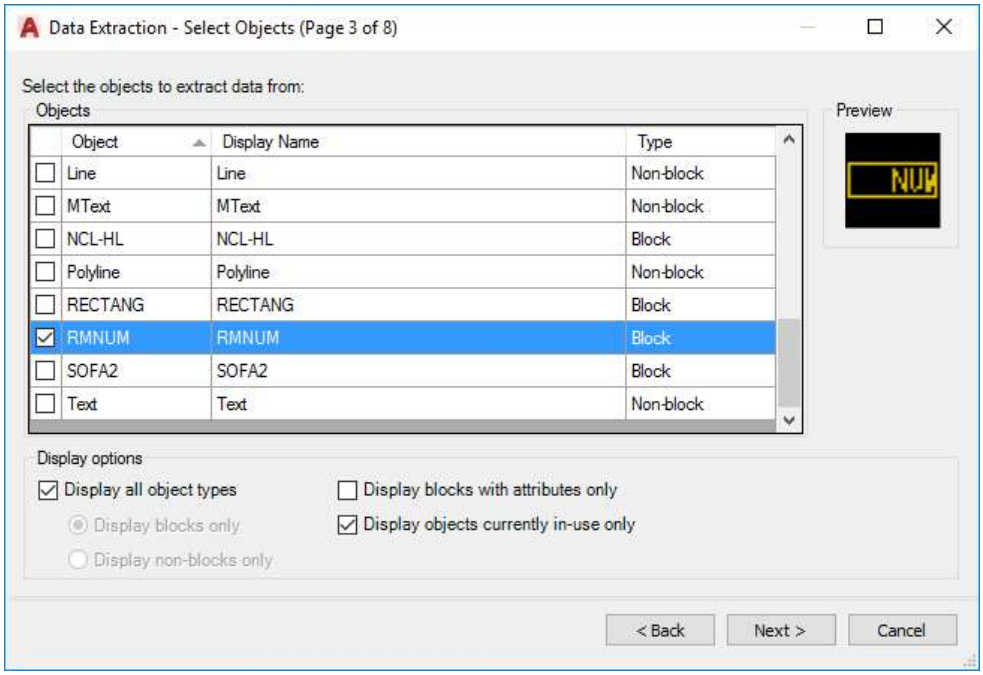


FIGURE 12 DATA EXTRACTION, STEP 3

9. Scroll through the list of available properties to see what is available. When you're done, uncheck all properties except for the **NUMBER** attribute, then click **Next**.

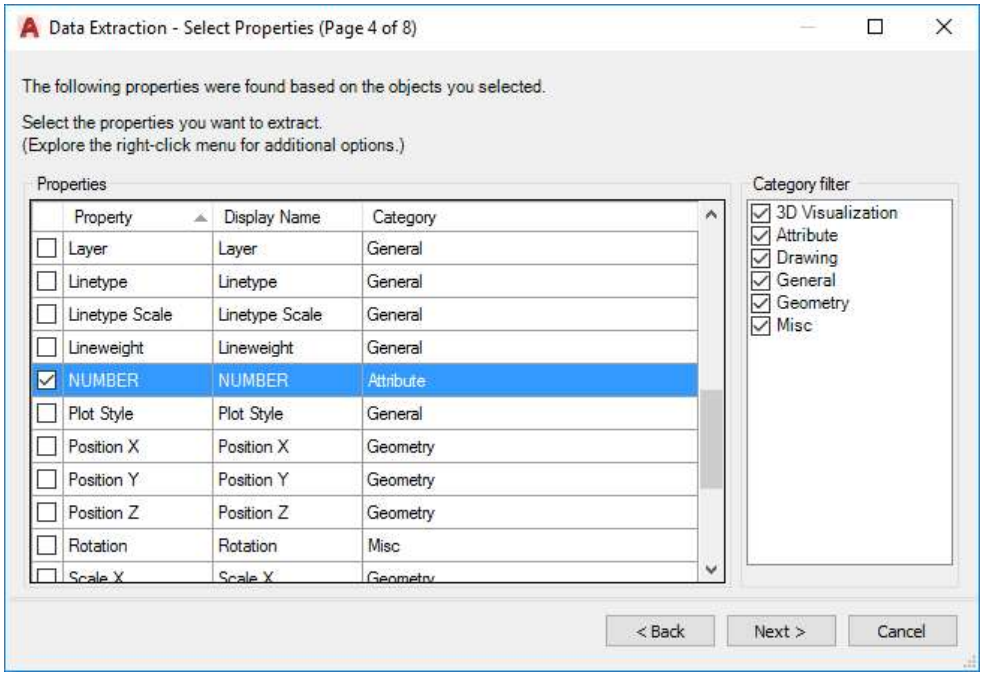


FIGURE 13 DATA EXTRACTION, STEP 4

10. Uncheck the **Show count** and **Show name** column boxes.
11. Click on the NUMBER column to apply sorting, then click **Next**.

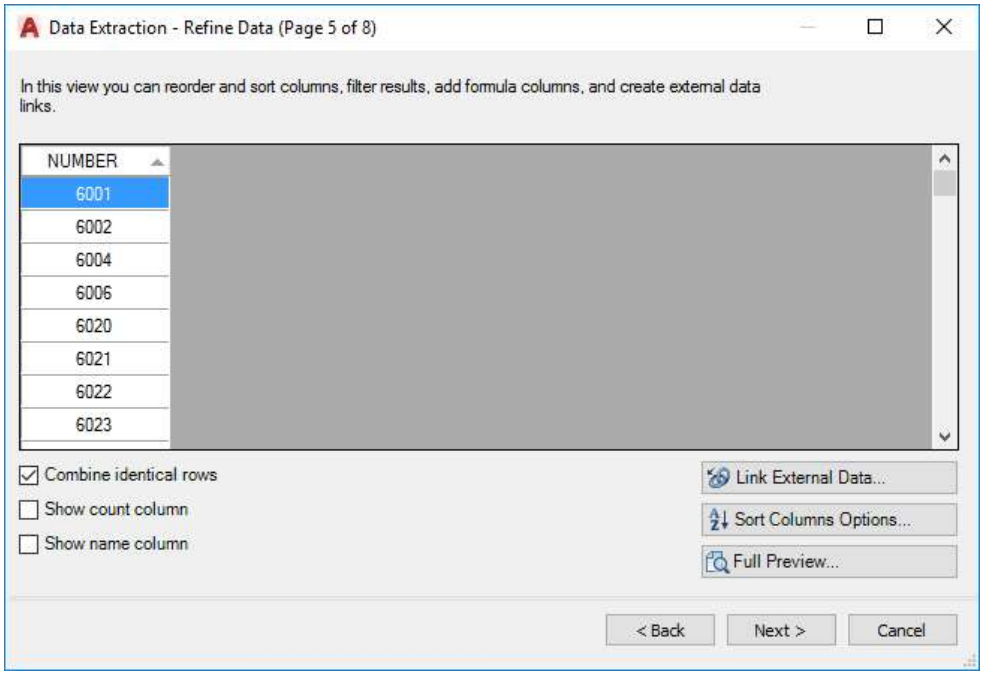


FIGURE 14 DATA EXTRACTION, STEP 5

12. Check the Insert data extraction table into drawing box, then click Next.

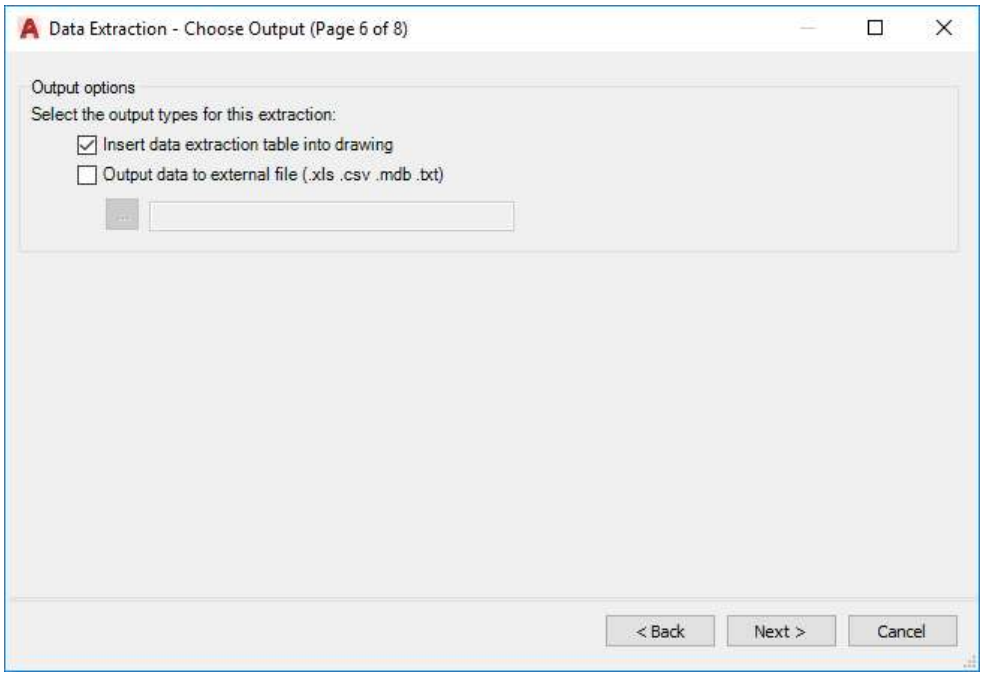


FIGURE 15 DATA EXTRACTION, STEP 6

13. Select the Standard table style, then enter ROOM SCHEDULE for the title, then click **Next**.

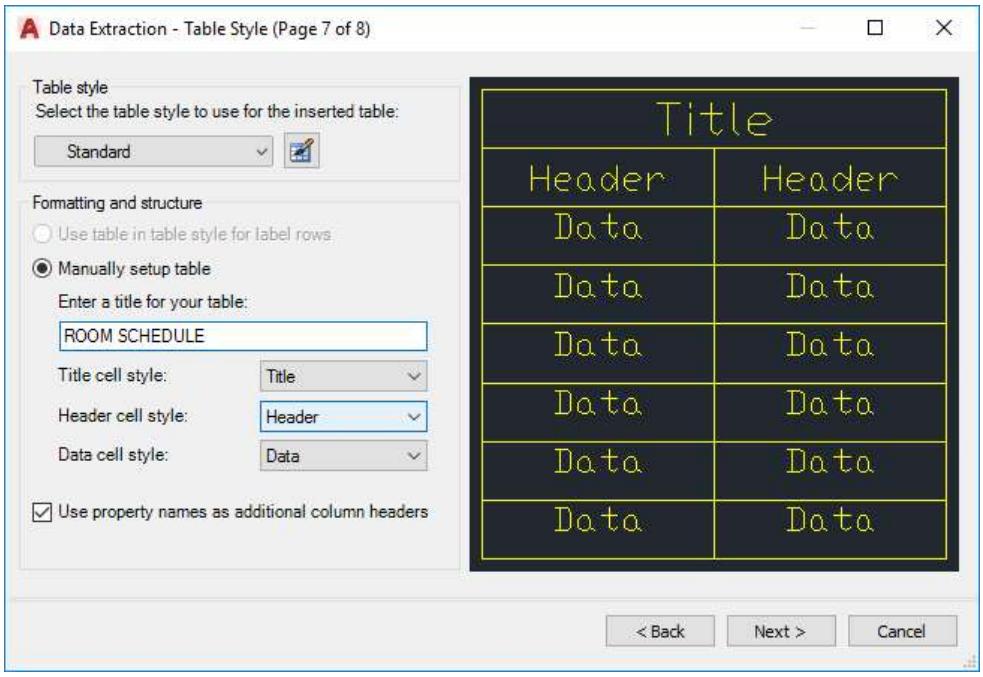


FIGURE 16 DATA EXTRACTION, STEP 7

14. Click **Finish** and place the table somewhere in your drawing.

Don't worry for now if the table is quite small. While functional, our room schedule leaves a bit to be desired. First, it's a very lengthy table that will be hard to fit on paper when we print this out. Let's take advantage of table breaking to help us out.

15. Select the table.
16. Using the grip at the very bottom middle of the table, drag up until you've created three roughly equal columns.

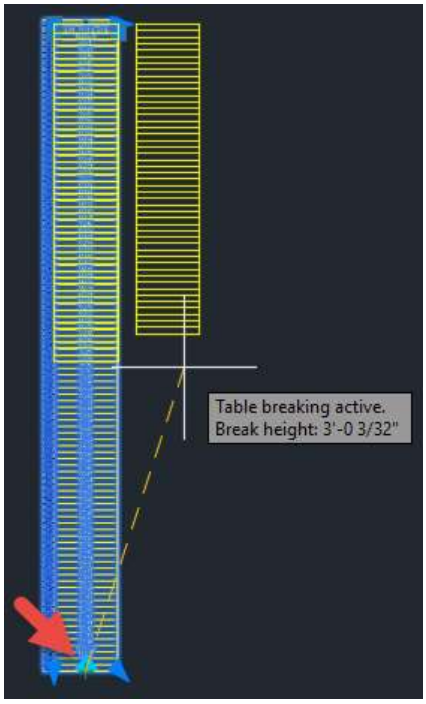


FIGURE 17 RESIZING THE TABLE

17. Select the table, right-click and choose **Properties**, then set the **Repeat top labels** property to **Yes**.

FIGURE 18 REPEATING COLUMN LABELS

The second problem with our Room Schedule is that there just isn't very much information available. Seems like it would be more useful if we could see who is assigned to each room. However, that attribute was not available on the RMNUM block. Let's update the block definition to carry more useful data.

Find Command

Find is a very helpful command that lets us search any text in our drawing, be it in DText or MText, dimensions, attributes, or buried in xreferences.

Exercise:

1. On the ribbon go to **Annotate > Text**, then enter “6050” in the **Find** box, then press **Enter**.

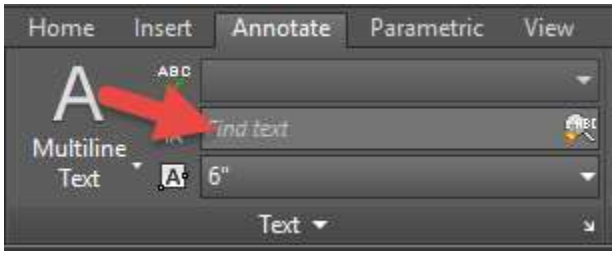


FIGURE 19 FIND COMMAND

2. You should zoom right to a RMNUM block with the text “6050” in its attribute. If you happen to zoom to the table we just created, click **Find Next** and you should zoom to the correct location. Click **Done** when you get to the block shown below.

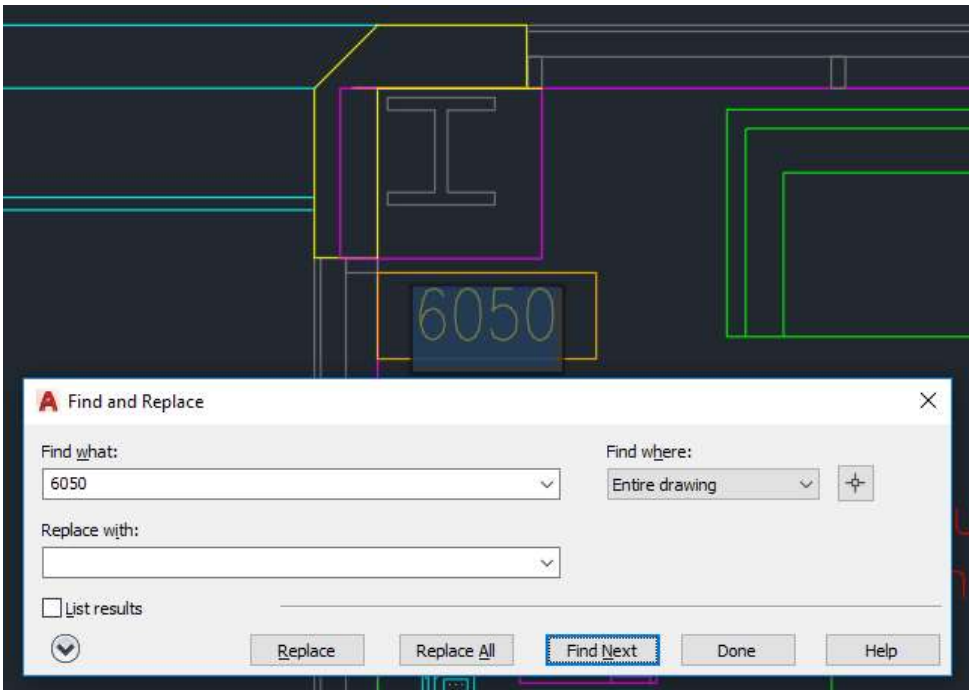


FIGURE 20 LOCATING A BLOCK VIA ATTRIBUTE TEXT

Block Edit

Block Edit is a great tool that helps you edit block definitions for blocks defined in the drawing you are working in.

Exercise:

1. Select the block, then right-click and choose **Block Editor**.

2. Copy the NUMBER attribute and paste a copy below the rectangle.
3. Double-click the new attribute and set the **Tag** to “Occupant”, **Prompt** to “Name of Occupant” and **Default** to “-”, then click OK.
4. Select the attribute, right-click and choose **Properties**.
5. Set the **Invisible** property to **Yes**.

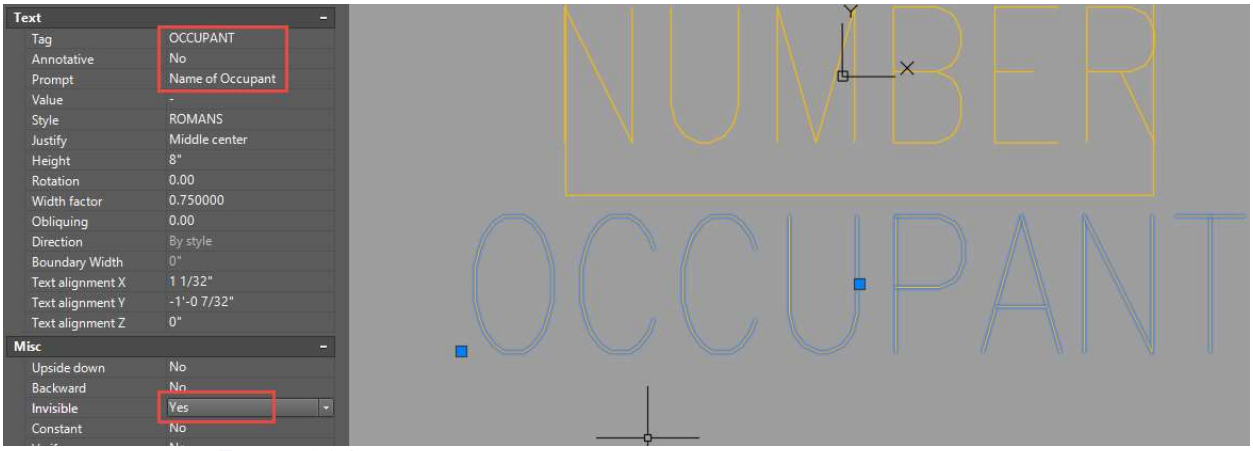


FIGURE 21 ADDING AN ATTRIBUTE TO A BLOCK DEFINITION

Of course, it may be useful to have the Occupant attribute displayed on the drawing. This would make having the “extra” text version on the drawing obsolete, and the approach I would likely use myself. Here though, I want to demonstrate that attributes don’t have to be visible on the drawing to be extractable.

6. Click the **Close Block Editor** button then choose **Save changes**.
7. Double-click one of the RMNUM blocks to edit the attributes.

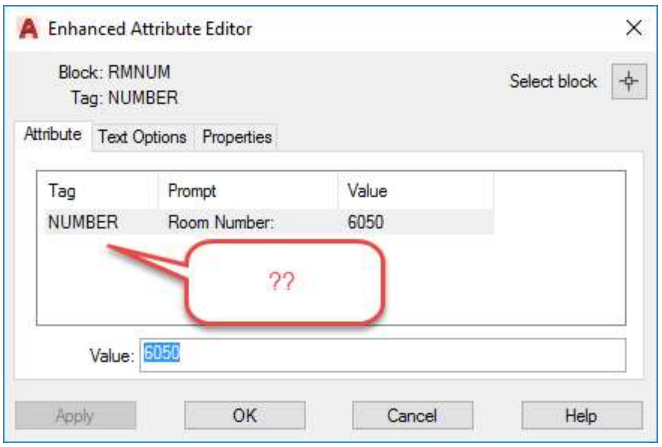


FIGURE 22 WHERE'S THE NEW ATTRIBUTE?

Wait. Shouldn’t there be two attributes now? Whenever you add or remove attributes from a block which has already been inserted into the drawing, you need to use the ATTSYNC command to synchronize any existing block references with the attributes in the block’s definition.

8. Click Cancel to exit the Attribute Editor, then go to **Insert > Block Definition**, then click the **Block Definition** drop-down, then choose **Synchronize** (or type ATTSYNC).

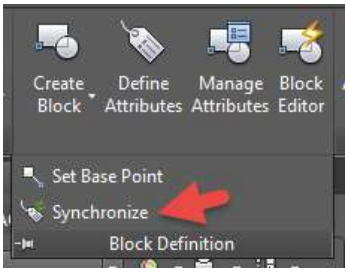


FIGURE 23 SYNCHRONIZE AFTER ADDING NEW ATTRIBUTES TO EXISTING BLOCKS!

9. Choose **Select**, then select a RMNUM block, then select **Yes**.
10. Double-click one of the RMNUM blocks again and you should see the new attribute available for editing.

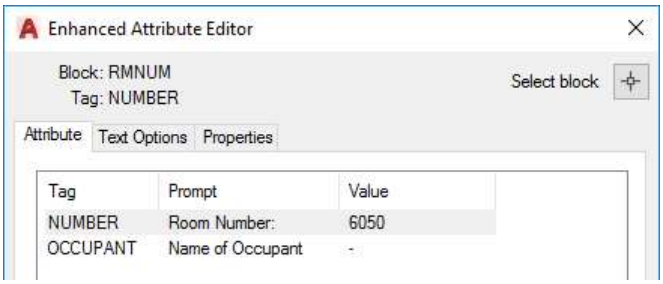


FIGURE 24 NEW ATTRIBUTE APPEARS AFTER SYNCHRONIZE

Take a few minutes and add the occupant name (red text in the room) to the Occupant attribute of several RMNUM blocks. You don't need to do them all, but do several so we can see them on the Room Schedule table.

We now need to update our Data Extraction (dxe) file to include the new attribute we just added.

Exercise:

1. Select the ROOM SCHEDULE table, then select one of the cells within the table.

For some reason, this allows the Data Extraction submenu to appear when we right-click, whereas it does NOT appear if the whole table is selected.

2. Right-click and choose Data Extraction > Edit Data Extraction Settings….

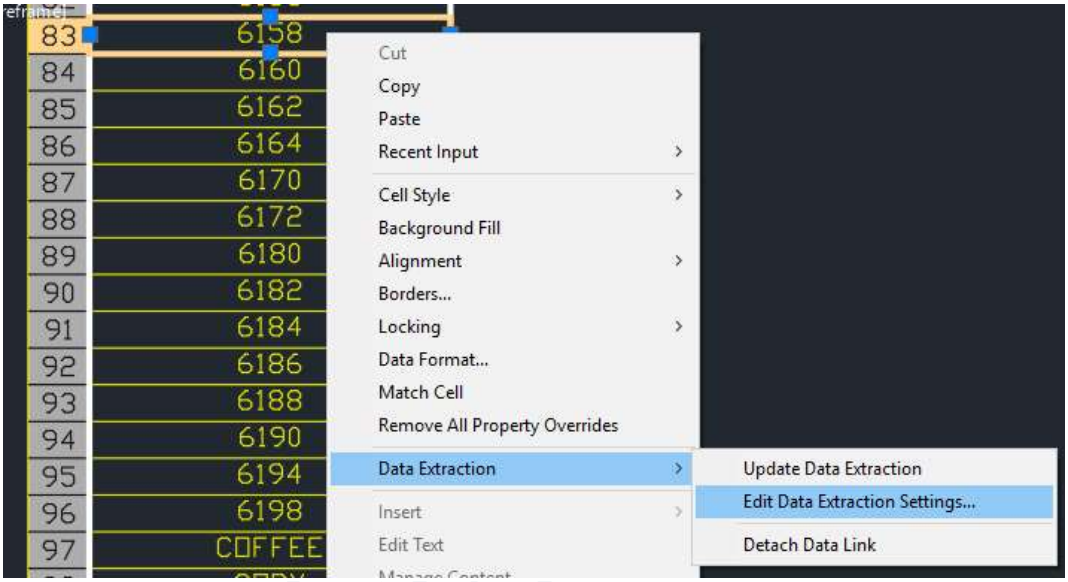


FIGURE 25 EDIT DATA EXTRACTION SETTINGS

3. In Step 1, verify that your drawing is listed, then click **Next**.
4. In Step 2, verify that RMNUM is still selected, then click **Next**.
5. In Step 3, check the **Number** and **Occupant** attributes, then click **Next**.
6. Click the **Full Preview** button to see a preview of your table. Close the preview when you're finished.

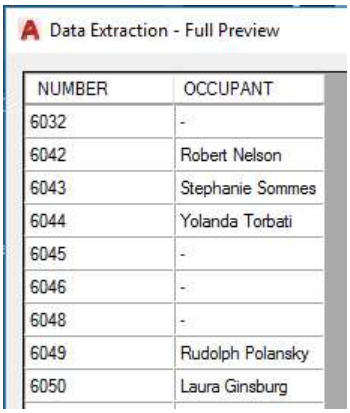


FIGURE 26 DATA EXTRACTION PREVIEW

7. Right-click the **NUMBER** column and choose **Rename Column**, then change the column name to **ROOM #**.

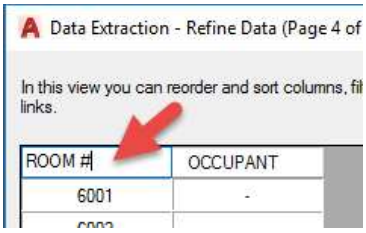


FIGURE 27 CHANGING COLUMN NAMES

8. Click **Next** three times, then click **Finish**.
9. Select the table (not a cell within the table!), then right-click and choose **Update Table Data Links**.
10. Resize the columns to fit the data using the grips as before.
11. To resize the row heights, select the rows, right-click and choose **Properties**, then set the **Cell height** to something very small (like 0.1"). Autocad will set the height as small as possible while still fitting the text + the specified cell margin. You may need to do this a few times to "reset" any affected rows.

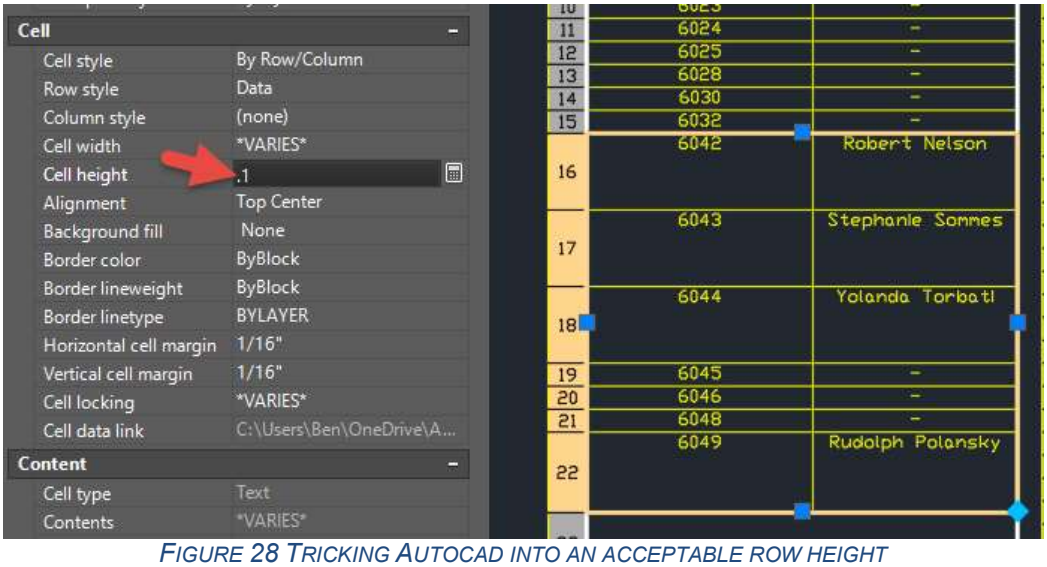


FIGURE 28 TRICKING AUTOCAD INTO AN ACCEPTABLE ROW HEIGHT

Let's create another data extraction table to get some quantity take-offs. We'd like to report on how many computers, phones, chairs, desks and filing cabinets are on the plan.

Exercise:

1. Use the **Data Extraction** command, this time starting a new data extraction. I'll name mine ***FurnitureTakeOff.dxe***.
2. In step 3, check **Chair7**, **Computer**, **Desk2**, **Desk3**, **FC15X27A**, **FC42X18D** and **FNPHONE**.
3. In step 4, uncheck all properties except **Layer**. We don't really want this in our output, but the wizard forces us to choose something. We'll hide this in the next step.
4. In step 5, right-click the **Layer** column and choose **Hide column**.
5. Drag the **Name** column to the left of the Count column.

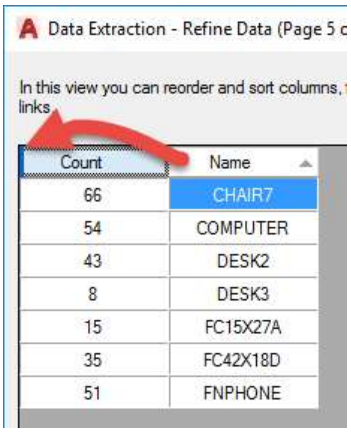


FIGURE 29 REARRANGE COLUMNS USING DRAG AND DROP

6. Click on the **Name** column to sort on that column.
7. Be sure that **Combine identical rows**, **Show count column** and **Show name column** are all checked.
8. In Step 6, check the **Insert data extraction table into drawing** check box.
9. In Step 7, enter the title **FURNITURE TAKE-OFF**.
10. Finally, select an insertion point somewhere in the drawing.

One of the terrific benefits of using data extraction to create tables is that as your design evolves, your tables are easy to update.

11. Try copying some of the furniture a few times somewhere else in the drawing.
12. Select the take-off table, right-click and choose **Update Table Data Links**.

"Scaling" tables for output

I promised earlier we'd discuss the table text size issue. When we draw in model space, we should ALWAYS draw the design to full scale. We then use Layouts (aka paper space) to setup our paper for plotting, using Viewports which are like windows through which we can see our (model space) design. Viewports can be scaled to a precise scale so that our design fits on the piece of paper we intend to print to.

If we put annotations in model space, we have several options. One is to change the size of the annotations to match the intended viewport scale. Another is to use Annotative scaling to accomplish this for us. Personally, I find both of these options more difficult than they're worth. In general, I recommend putting most annotations, such as text, dimensions and tables on the Layout. However, since we started the Data Extraction command from model space, the workflow we used here didn't really give us an option to put the table on a Layout, and because we didn't change our text style height, we wound up with tiny tables.

Still another option available is to create a separate viewport through which to view the schedules, and set the schedule viewport scale to 1:1. Then if we wish, we can simply use the CHSPACE command to change the tables from model space to paperspace. The Data Extraction links will still work, even though the table lives on a layout and our data source lives in model space. Let's see how this last option works.

Exercise:

1. Activate **Layout1**, then right-click the Layout tab and choose **Page Setup Manager**.
2. Modify the default page setup to a paper size of **Arch D (36.00x24.00 Inches)**.
3. Change the existing viewport scale to **1/16”=1’-0”** and resize the viewport as necessary so you can see the entire floor plan.
4. From the ribbon, go to **Layout > Layout Viewports**, then click **Rectangular** to create a new viewport.

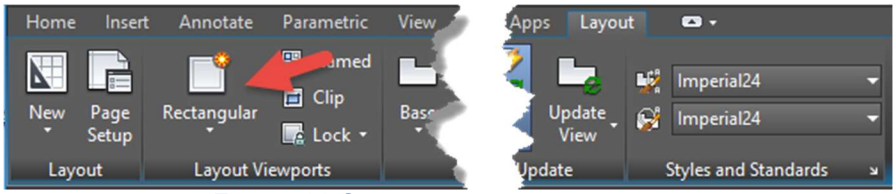


FIGURE 30 CREATING A VIEWPORT

5. Activate the viewport and zoom in on one of the schedules, then set the viewport scale to **1:1**.

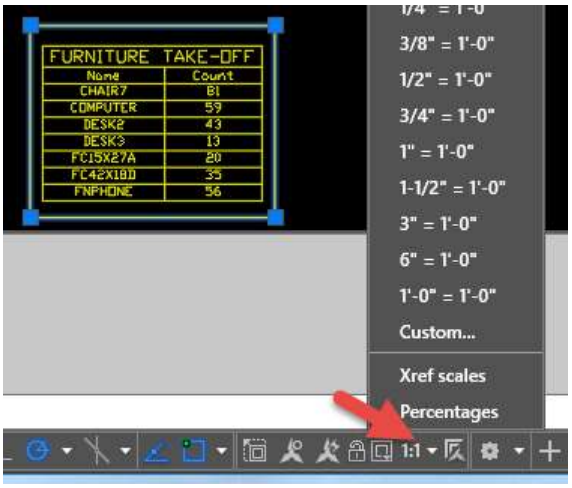


FIGURE 31 SETTING VIEWPORT SCALE

6. You’ll probably need to resize the viewport and move the viewports around a bit to get everything to fit.
7. Repeat this process to add the Furniture Take-Off table in its own separate viewport.

Use CHSPACE to move tables to Paperspace

Because I prefer my annotations (including tables) to generally reside on a Layout to keep modelspace focused on my design, let’s “move” the tables from modelspace to paperspace.

The key to making this command work is scaling the viewport to the correct size first, then using CHSPACE. We’ve already set the scale of the viewports so we’re ready to proceed.

Exercise:

1. Double-click inside either viewport where your tables are visible.
2. On the ribbon, go to **Home**, click the **Modify** drop-down, and then choose **Change Space** (or type CHSPACE).

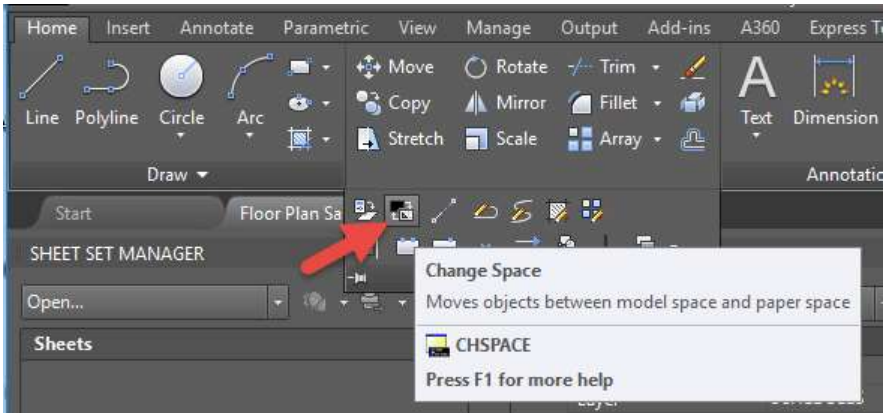


FIGURE 32 USE CHANGE SPACE TO TRANSFER OBJECTS BETWEEN "SPACES"

3. Select the table, then press Enter twice (once to end selection, the second to accept the viewport you're already in).
4. Autocad puts you back in paperspace at which point you can erase the viewport. Repeat for the other table.

At this point your tables are in paperspace, but are still linked for data extraction.

Overriding extracted values

Let's work through another example from another discipline, this time from a structural footing drawing. This example is interesting because in addition to attribute data, we'll also include geometric data (the X, Y and Z values) in our data extraction. We also want to override some of the extracted values with some manually entered data.

Exercise:

1. Open the ***MH-1115-FC-109.dwg*** file.
2. Use the **Data Extraction** command to start a new dxe file, and name it the same as the sample drawing.
3. In step 3, select the **FootingPoint** block.
4. In step 4, select the **FTG** and **POINT** attributes, as well as the **Position X**, **Position Y**, and **Position Z** geometry properties.
5. In step 5, uncheck the **Combine identical rows**, **Show count column** and **Show name column** check boxes.
6. Rearrange the columns in the following order: **Point, Position X, Position Y, Position Z** and **FTG**.
7. Rename the columns as follows:
   a. **Point Number**
   b. **Northing**
   c. **Easting**

d. **Elevation**
e. **FTG**

8. Click on the **Point Number** column header to sort by the point numbers.

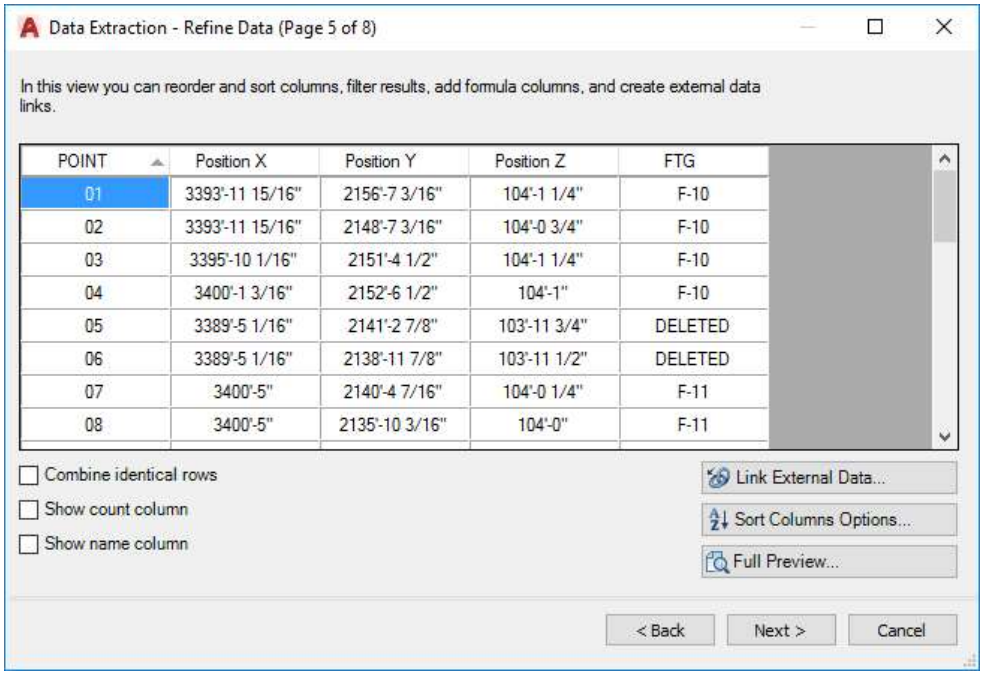


FIGURE 33 REARRANGED AND RENAMED COLUMNS

9. In step 6, select **Insert data extraction table into drawing**.
10. In step 7, enter the table title **Misc Pipe Supports**.

After the table is inserted, you'll notice that points 05 and 06 indicate that the FTG is "DELETED." In these cases, it does not make sense to report the X, Y and Z values, so we'll override the extracted values. In order to do this, we must unlock the cells we want to override.

11. Select cells B7:D8, then right-click and choose **Locking > Unlocked**.

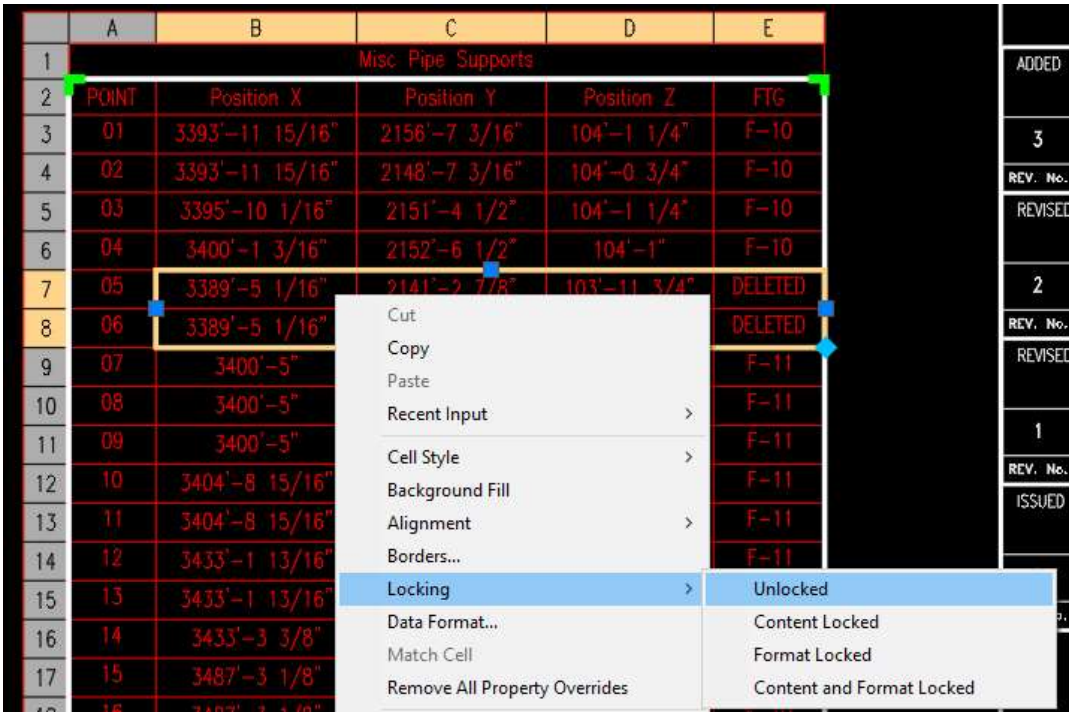


Figure 34 Unlocking cells to override extracted values

12. Select one of the cells you just unlocked and notice the change in the cursor badge.

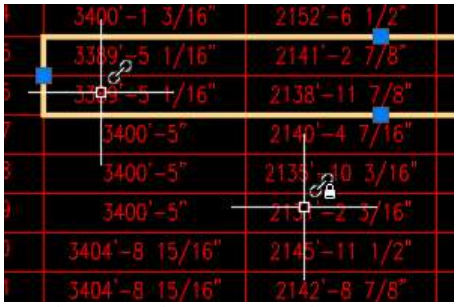


FIGURE 35 UNLOCKED (TOP LEFT) VS LOCKED (LOWER RIGHT) CURSOR BADGES

13. Double-click cell B7 and replace the value with "-".
14. Repeat step 13 for cells B7:D8.

So, what happens when we later need to update our table? Autocad detects the overridden cells and gives you the option of updating the contents (i.e. back to extracted data) or to retain the overwritten contents.

15. Select the table, right-click and choose **Update Table Data Links**.
16. When prompted, select **Retain the overwritten contents**.

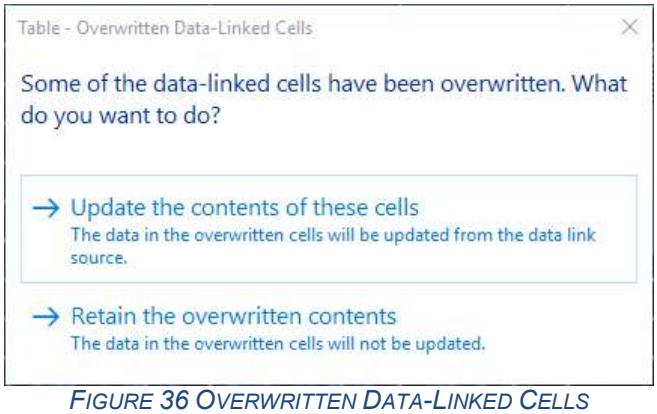


FIGURE 36 OVERWRITTEN DATA-LINKED CELLS

Learn how to customize data extraction using sorting, filtering, formulas, and totals

When we use data extraction, we frequently need to do additional things with that data, such as sorting or filtering the data, or adding formulas and totals.

Exercise:

1. Open the ***Lanscaping.dwg*** file. This sample has a site plan from which we want to get the square footage of various elements.
2. Use the **Data Extraction** command to start a new dxe file, and name it the same as the sample drawing.
3. In step 3, select **Hatch** as the type of objects to extract data from.
4. In step 4, select **Area** and **Layer** as the properties to extract.

Step 5 of the wizard we've seen before, but this time we want to have our table display the summed total of the area of "like" hatch objects ("like" being hatches on the same layer should all be summed together). We also need to convert the area from square inches to square feet, and format the output appropriately.

5. In step 5, uncheck **Show count** and **Show name**.
6. Rearrange the columns so **Layer** is first.
7. Click on the **Layer** column header once to sort in ascending order.
8. Verify that **Combine identical rows** is checked.
9. Right-click in the **Area** column and choose **Combine record mode > Sum values**.
10. Right-click in the **Area** column and choose **Set column data format**.
11. Select **Decimal** and set the precision to **0**.
12. Click on **Additional Format**, then set the **Conversion factor** to **0.0069**, **Suffix** to " **s.f.**", and set the **Thousands** separator to **',' (Comma)**.

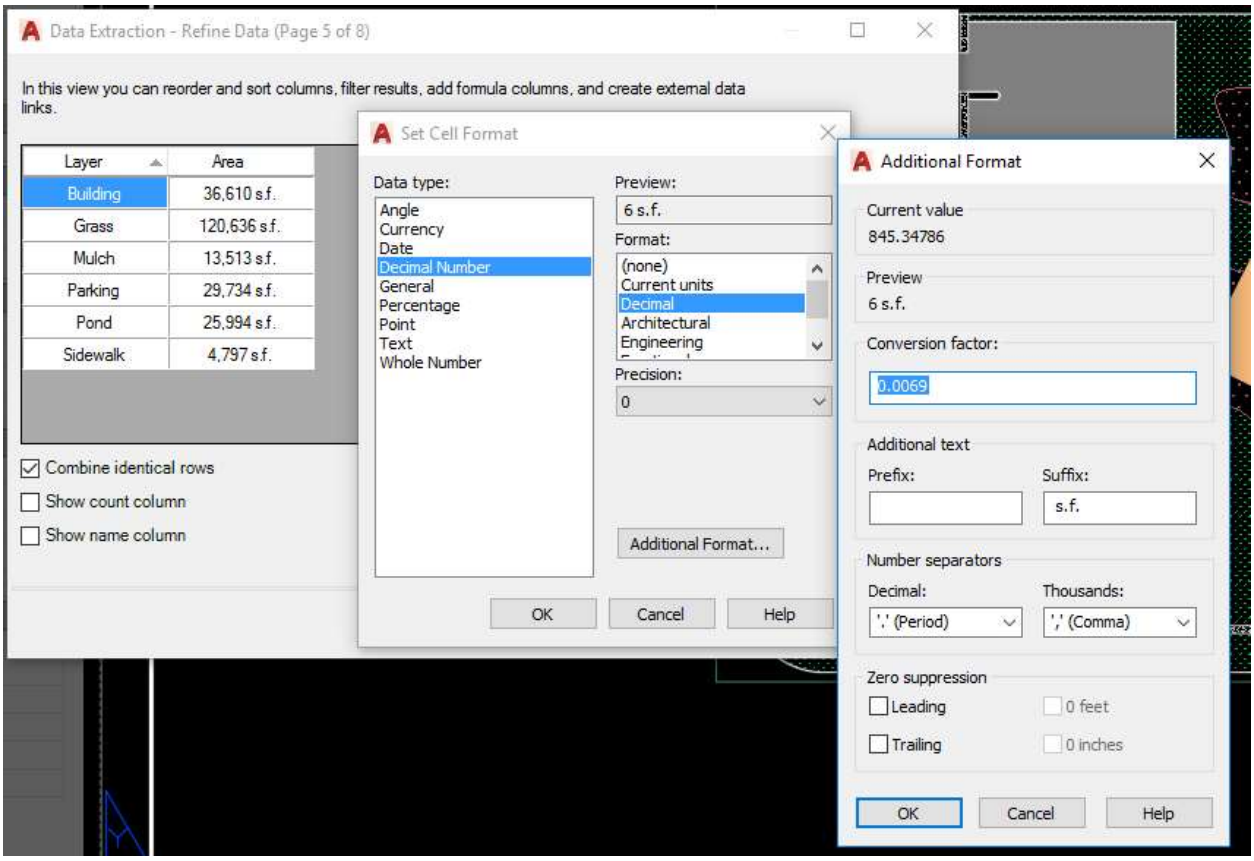


FIGURE 37 CONVERTING AREA TO SQUARE FEET

13. Click OK twice to return to the Data Extraction wizard.

We're pretty close, but what if we wanted to exclude hatches on certain layers? For example, maybe we don't want to report the Building footprint. We can accomplish this using Filter Options.

14. Right-click the **Layer** column and choose **Filter Options**.
15. Uncheck **Building** and click OK.

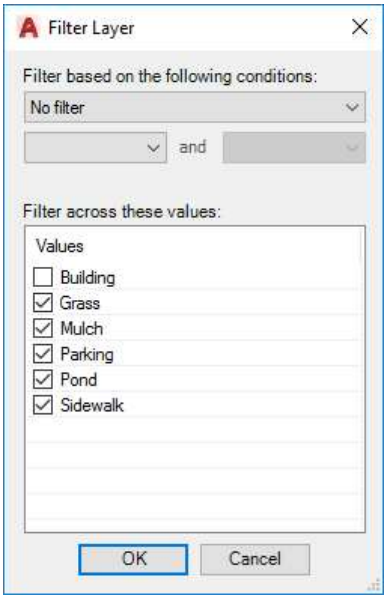


FIGURE 38 FILTERING A COLUMN

To see a total of the "landscaped" areas, we need to add a footer row with a formula to sum the **Area** column values.

16. Right-click the **Area** column and choose **Insert totals footer > Sum**.

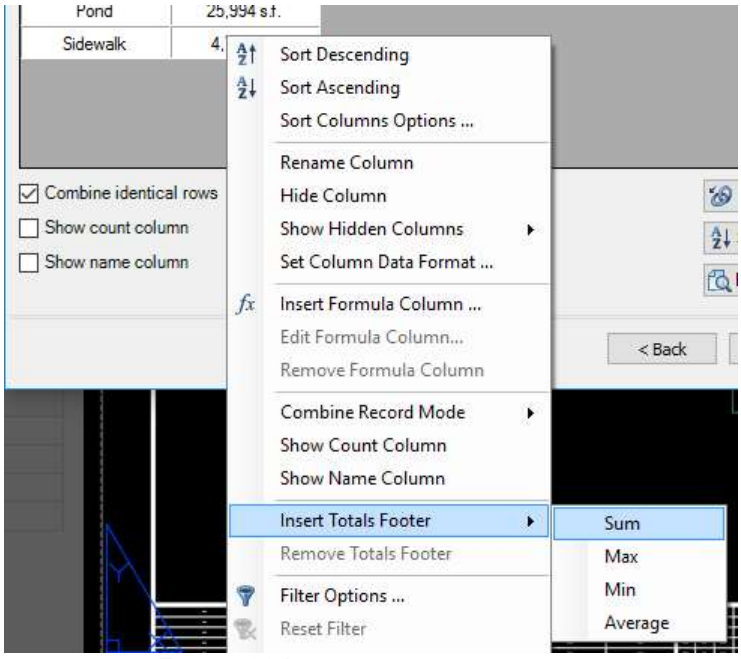


FIGURE 39 INSERTING A TOTAL FOOTER

17. Click **Next** to proceed to the next steps, and insert a data extraction table into the drawing.

Integrating Fields with Text Objects

While we're working with the Landscaping example, it's worth pointing out another option for reporting information. Frequently we add annotations to our drawings to call out information, for example we might add callout labels to identify the square footage of each area. Far too often, we create these labels using static text. So each time there's a design change, we have to go back and update the labels. It's tedious, error prone, and easy to forget to update.

Fields allow us to link annotation text to properties of objects in our drawings, or even to properties of the drawing file itself. We'll just work through a quick example here so you can see the power of fields.

Example:

1. While still in the ***Landscaping.dwg***, verify that you're on the 36x24 layout tab, working in paperspace (not inside the viewport).
2. Go to **Annotate > Text > Multiline Text**[2].

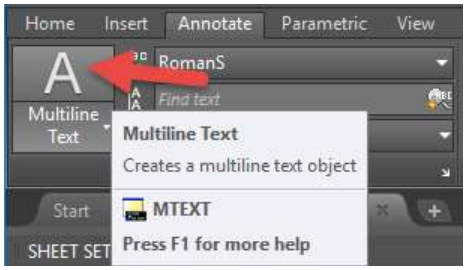


FIGURE 40 CREATING MTEXT ANNOTATION

3. Draw a small bounding box for the MText over the pond in the lower left corner of the property.
4. Type "**POND: "** in the MText box (do not include the quotation marks), then click the **Field** button on the **Text Editor** tab.

FIGURE 41 ADDING A FIELD TO AN ANNOTATION

5. Under **Field Category**, select **Objects**.
6. Under **Field Names**, select **Object**.
7. Under **Object type**, pick the **Select Object** button, then pick the pond. And yes, Autocad correctly identifies the hatch object within the viewport, even though it isn't active!
8. Under **Property**, select **Area**.

---

[2] Single Line Text (aka DTEXT) is also OK, though there may be slight differences to the steps described here.

9. Under **Format**, select **Architectural**.
10. Under **Precision**, select **0.00**.
11. Click **Additional Format**.
12. The **Conversion factor** is retained from our previous use of this dialog box. If not, set it to 0.006944.
13. Under **Suffix**, set it to " **SQ. FT.**" (again, not the quotation marks).
14. Under **Thousands**, set it to **',' (Comma)** if it's not already.
15. Click OK once to return to the Field dialog box.

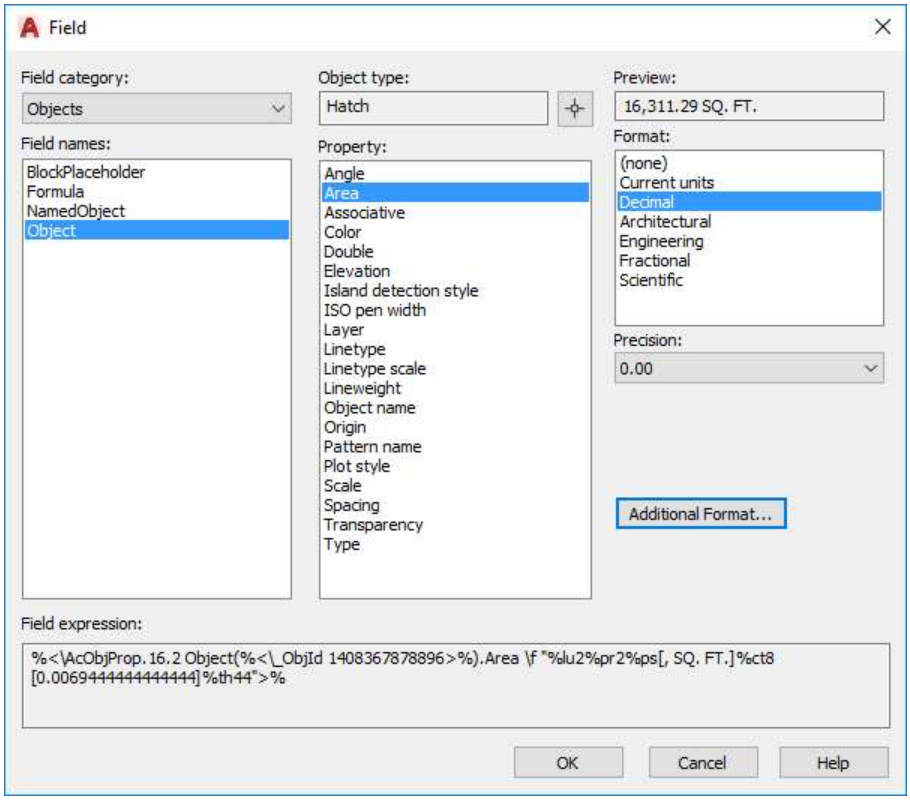


FIGURE 42 USING A FIELD TO REPORT HATCH AREA

16. Click OK to return to the drawing.
17. Adjust the MText box size if necessary.
18. On the **Text Editor** tab, click **Mask** to set masking options for this text object.

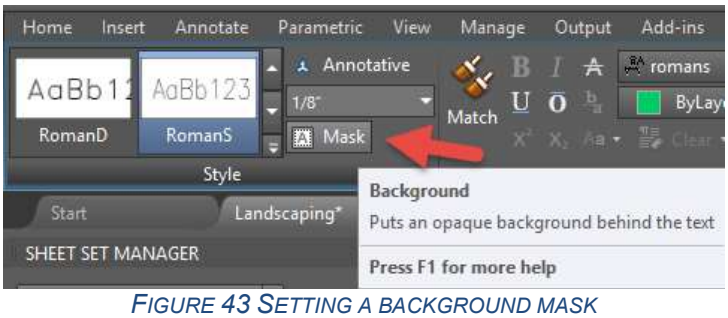


FIGURE 43 SETTING A BACKGROUND MASK

19. Check **Use background mask**, and **Use drawing background color**, then click OK.
20. Click **Close Text Editor** on the **Text Editor** tab to finish editing.

FIGURE 44 FIELDS UPDATE WHEN YOUR DESIGN CHANGES!

Now that the field is linked to our "pond" hatch object, any change to the pond's shape will automatically[3] and accurately update in our drawing.

Learn how to use Data Extraction to extract data across multiple drawings

Data Extraction is a very powerful tool, and can be used across multiple drawings. In this section, we'll build a drawing index by extracting title block information.

NOTE: Yes, I'm aware that you can generate a Sheet List Table using sheet sets. I wanted to demonstrate how to duplicate this functionality for those who may not use sheet sets. And, there are plenty of other things we might want to report on across multiple drawings that sheet sets don't track.

Exercise:

1. Open ***A-00 Index to Drawings.dwg***. This drawing contains an empty title block.
2. Start the Data Extraction command and create a new data extraction file. I'll name mine ***Index to Drawings.dxe***.
3. In step 2 of the wizard, we can click **Add Drawings** to select additional drawings to act as data sources. This is relatively straightforward, so I won't demonstrate this. Instead, click on **Add Folder**.

The **Add Folder** button allows you to add one or more folders as the data source. There are some powerful options when you add folders as the data source. Let's peek at the options.

4. Click on **Add Folder**.
5. Click the **…** button next to the **Folder** box. Browse to the **Sample Files\Arch Drawings** folder and click **Open**.
6. Check **Automatically include new drawings…**. Any new drawings you add to the target folder will be added to the data extraction.

[3] Automatically meaning each time you use the REGEN, SAVE or PLOT commands. Note that the REGEN command only updates objects in the current "space" so you either need to regen on the specific layout tab, or use the REGENALL command to regen all "spaces".

If you were to look in the **Sample Files\Arch Drawings** folder, you'd find several drawings starting with A-*nn*, as well as drawings named **Exterior Elevations**, **Grid Plan**, and **Wall Base**. These last three all serve as xreferences for the other drawings and should not be included in our Index to Drawings. Fortunately, we can easily filter these out with wild-cards.

7. Check the **Utilize wild-card characters to select drawings**, then enter **A*.dwg** in the box.

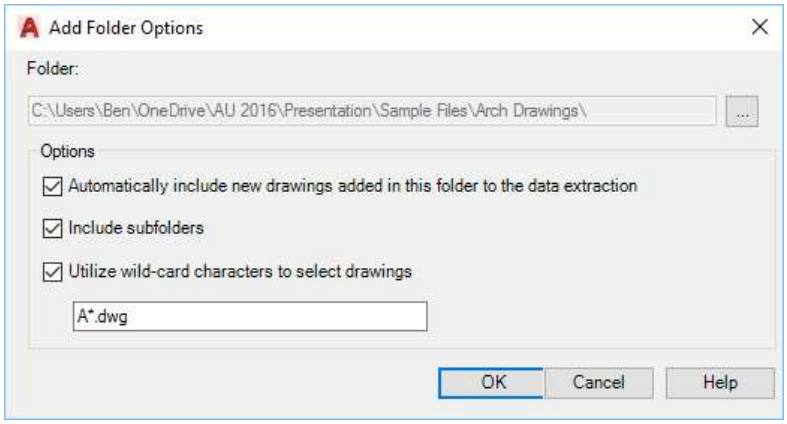


FIGURE 45 ADD FOLDER OPTIONS

8. Click **OK**.

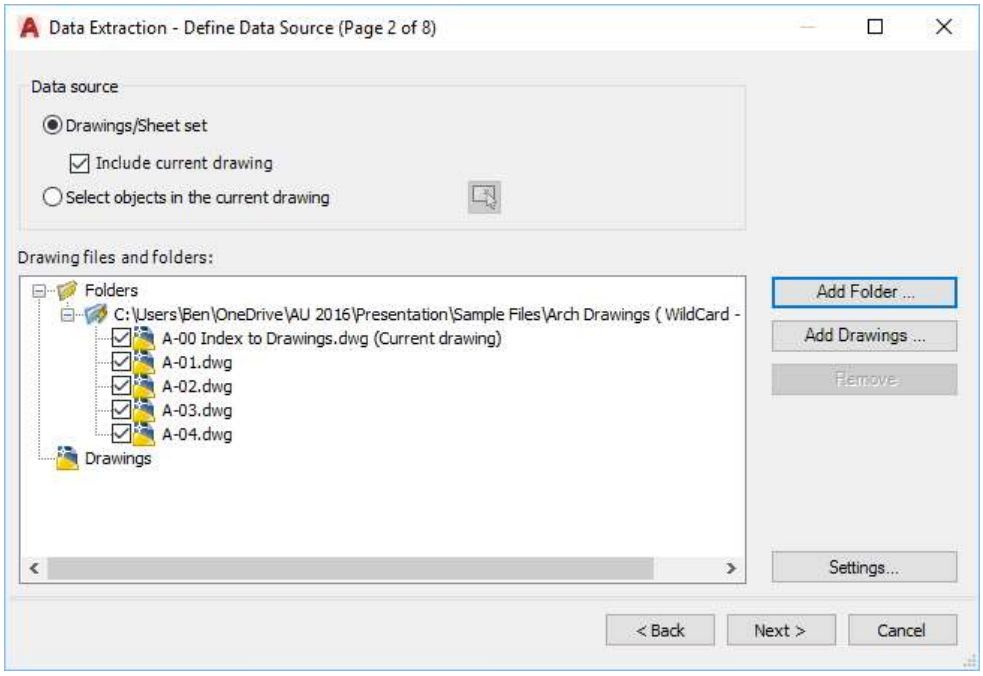


FIGURE 46 USING A FOLDER AS A DATA SOURCE

As you can see above, all drawings starting with **A** are included. Notice that we can still uncheck individual drawings to exclude a particular drawing if needed. While we're here, we should probably check the **Setttings** options.

9. Click on **Settings**.

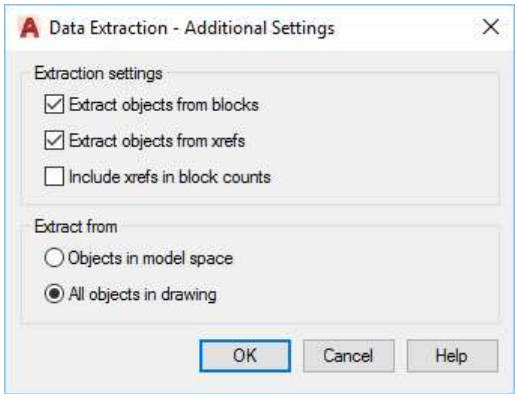


FIGURE 47 ADDITIONAL SETTINGS

Here, we can include or exclude blocks, xrefs, or choose to target only model space. We don't need to change the default settings, but it's nice to know they are available.

10. Click **OK,** then in step 3 of the wizard, select **Title** and **title**[4] as the objects to extract data from.
11. In step 4 of the wizard, select **X**, **Sheet_Content1**, and **Sheet_Content2** (attributes) as well as **File Name** (drawing).
12. In Step 5 of the wizard, uncheck **Show count** and **Show name**.
13. Rearrange the columns in order: **File Name**, **X**, **Sheet_Content1**, **Sheet_Content2**.
14. Rename column X to "**Drawing #**".
15. Rename column Sheet_Content1 to "**Title 1**".
16. Rename column Sheet_Content2 to "**Title 2**".
17. Sort on the **File Name** column so A-00 appears first.

[4] One of the drawings in our data set (A-04) had the name of the block capitalized. Both blocks have all the same attributes, so I thought it would be interesting to see how Data Extraction handles this somewhat odd scenario.

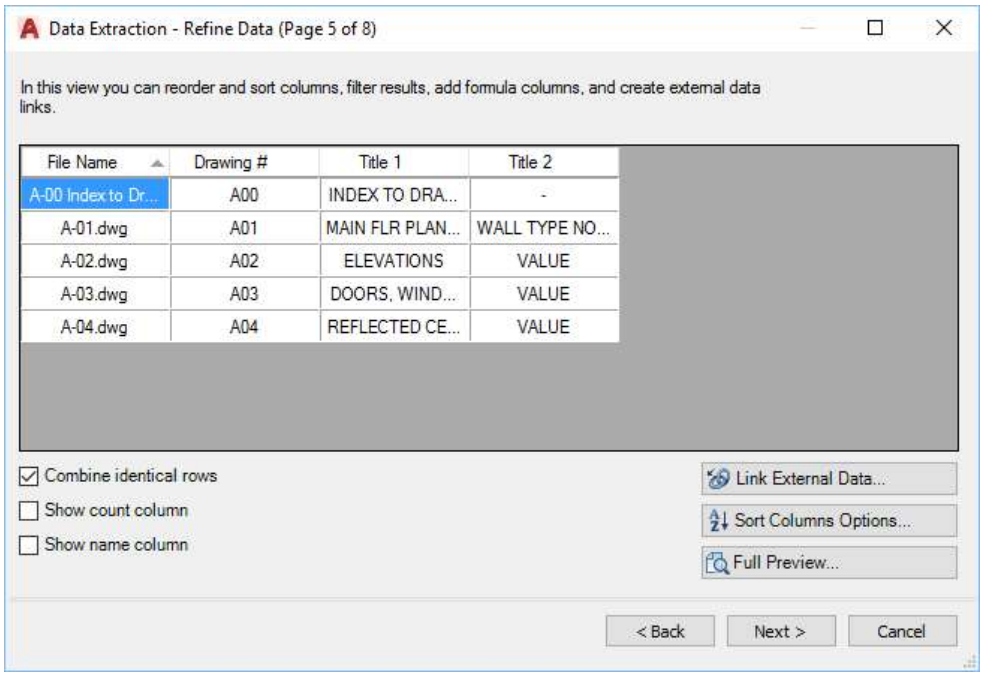


FIGURE 48 STEP 5 OF DATA EXTRACTION

18. In step 6 of the wizard, select **Insert data extraction table**.
19. In step 7 of the wizard, enter the table title "**Index to Drawings**".
20. Select an insertion point in your drawing.
21. Open drawing ***A-04.dwg*** and do a Save As to create drawing ***A-05.dwg*** in the same folder.
22. Close the newly created A-05 drawing.
23. Select your Index to Drawings table, right-click and choose **Update Data Table Links**.

Index to Drawings			
File Name	Drawing #	Title 1	Title 2
A-00 Index to Drawings.dwg	A00	INDEX TO DRAWINGS	-
A-01.dwg	A01	MAIN FLR PLAN, SECOND FLR PLAN	WALL TYPE NOTES
A-02.dwg	A02	ELEVATIONS	VALUE
A-03.dwg	A03	DOORS, WINDOWS AND ROOMS	VALUE
A-04.dwg	A04	REFLECTED CEILING PLANS	VALUE
A-05.dwg	A04	REFLECTED CEILING PLANS	VALUE

FIGURE 49 NEW DRAWINGS ADDED TO THE FOLDER APPEAR WITH AN UPDATE

Thanks to the Add Folder options we selected earlier, your new drawing appears on the list. Awesome!

Learn how to link Excel spreadsheets with extracted data

We'll switch gears a bit now to discuss how to get data *into* our drawings by linking to Excel spreadsheets. A common workflow in many offices is to input some data into a spreadsheet, then look for ways to link or insert the spreadsheet into a drawing.

The drawing we'll use in this section is called **Mechanical – Data Links**. This drawing is a process flow diagram, commonly used in the oil and gas industry to describe a process and the major equipment involved.

Exercise:

1. Open ***Mechanical – Data Links.dwg***.
2. On the ribbon, go to **Insert > Linking & Extraction > Data Link**.

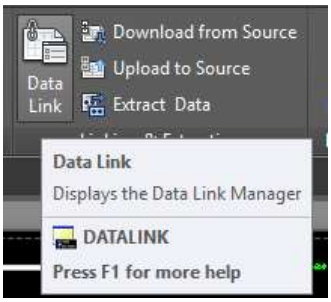


Figure 50 Creating a Data Link

3. Select **Create a new Excel Data Link**, then enter the name **Mass Balance** and click OK.
4. Click the **…** button next to Browse for a file, then select the ***mass-balance.xls*** file.
5. Under **Link options**, verify that **Sheet1** is selected, then choose **Link to range** and enter "A1:W18".
6. Click the More Options button at the bottom of the dialog to view the **Cell contents** and **Cell formatting** options.
7. Check the **Allow writing to source file** check box, then click **OK**.

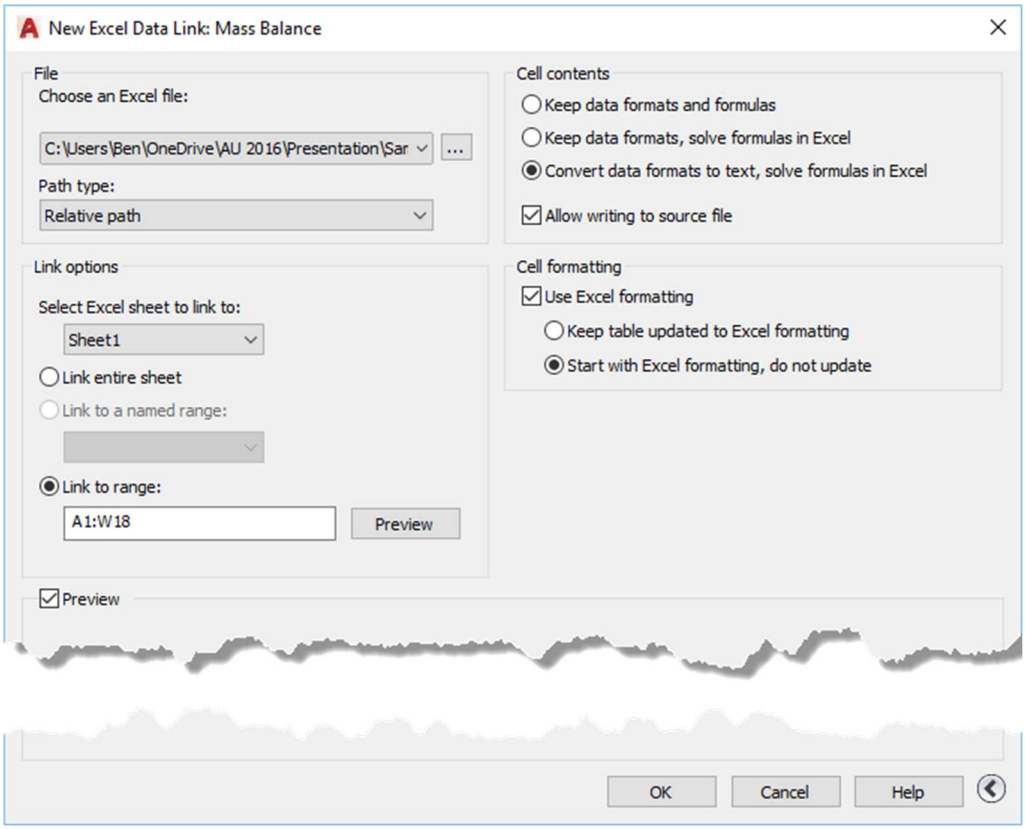


Figure 51 Excel Data Link options

8. Click **OK** to dismiss the Data Link Manager.

At this point…nothing new appears in your drawing. All we've done so far is create a data link, but we haven't linked it *to* anything. Next, we need to create a table and associate it with the data link.

9. From the **Annotate** tab, **Tables** panel, click **Table**.

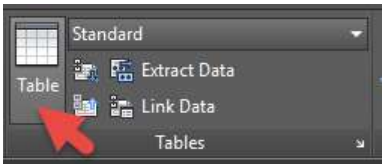


FIGURE 52 INSERTING A TABLE

10. In the **Insert Table** dialog, select **From a data link**.
11. Select **Mass Balance** from the drop-down list, then click **OK**.

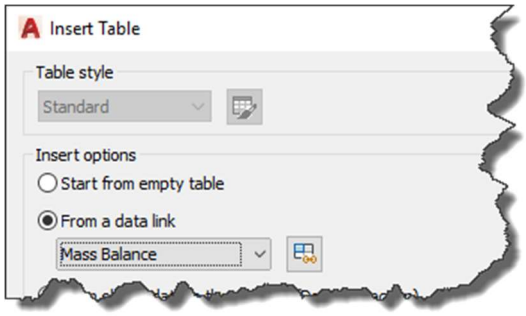


FIGURE 53 LINKING A TABLE TO A DATA LINK

12. After a brief pause while Autocad retrieves the data from the Excel file, pick an insertion point in the drawing.

Formatting a linked table

The default column widths and row heights leave a lot to be desired, so we'll have to adjust these. This is a little tricky, so follow along carefully.

1. Select the table, then double-click the upper left-hand corner.

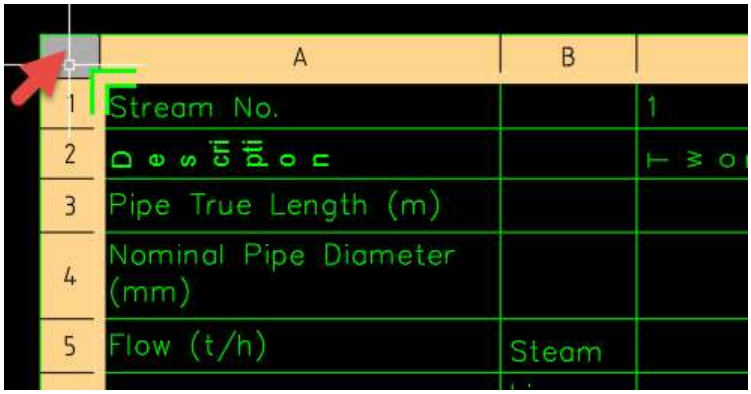


FIGURE 54 CLICK THE UPPER LEFT CORNER OF THE TABLE

2. Click on the row header for row 2, on the left edge of the table.

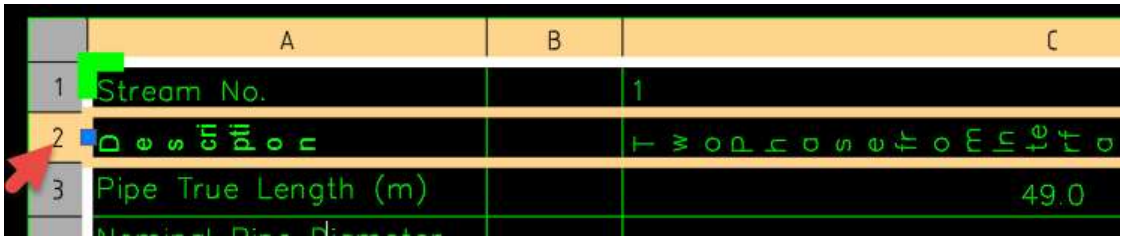


FIGURE 55 CLICK THE ROW HEADER TO SELECT THE ENTIRE ROW

3. In the Properties panel, enter a cell height of **35**[5].

[5] There are a bunch of "magic" numbers in this section for column and cell widths and heights. Really it was just a bunch of trial and error to get this to work right. Sadly, no magic.

4. Click off the table to deselect it.
5. Zoom out so you can see the entire table. Don't worry if you can't actually *read* the table, you just need to be able to see it.
6. Reselect the table as you did in step 1.
7. Draw a crossing select that encompasses columns **C:W**.
8. In the Properties panel, enter a cell width of **20**, which is wide enough to avoid wrapping the data in rows 3 to 18.
9. Select column **B** and set the cell width to **25**.
10. Select column **A** and set the cell width to **75**.
11. Now select rows **3 to 18** and set the cell height to **0.1**. Autocad won't really size it this small, but it will shrink the row heights as small as possible, while still displaying the content.

Stream No.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Description		Two Phase from Interface to HP Separator	HP Steam to Scrubbing Line	HP Steam Scrubbing Spray Water Supply	HP Steam Scrubbing Line	HP Steam Condensate Pots	HP Scrubber Condensate	HP Steam to Power Plant Bifurcation	Ejector Steam	HP Steam to Turbine Strainer 1	HP Steam to Turbine Strainer 2	HP Brine to LP Separator Control Valve	LP Steam to LP Scrubbing Line	LP Steam Scrubbing Spray Water Supply	LP Steam Scrubbing Line	LP Steam Condensate Pots	LP Demister Condensate	LP Steam to Power Plant Bifurcation	LP Steam to Turbine Strainer 1	LP Steam to Turbine Strainer 2	LP Brine to Reinjection Pumps	LP Brine Reinjection Pumps Discharge
Pipe True Length (m)		49.0	7.0	150.0	160.0	N/A	N/A	90.0	10.0	4.0	24.0	55.0	12.0	150.0	93.0	N/A	N/A	76.0	4.0	20.0	73.5	TBA
Nominal Pipe Diameter (mm)		1050.0	1200.0	80.0	1200.0	750.0	100.0	1200.0	250.0	750.0	750.0	750.0	1200.0	80.0	1200.0	750.0	100.0	1200.0	900.0	900.0	600.0	600.0
Flow (t/h)	Steam	472.5	474.8	–	472.8	–	–	472.8	22.2	225.3	225.3	–	176.8	–	176.3	–	–	176.3	88.1	88.1	–	–
	Liq. Water	1387.7	9.7	9.7	12.4	7.2	5.2	0.0	0.0	0.0	0.0	1384.7	0.5	3.5	4.6	2.9	1.7	0.0	0.0	0.0	1207.3	1207.3
	Impurities	3.6	0.0	–	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	–	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	NCG	11.1	11.1	–	11.1	–	–	11.1	0.5	5.3	5.3	–	–	–	–	–	–	–	–	–	–	–
	Total	1875.0	486.6	9.7	496.3	7.2	5.2	483.9	22.7	230.6	230.6	1384.7	177.3	3.5	180.9	2.9	1.7	176.3	88.1	88.1	1207.3	1207.3
Upstream Pressure (bara)		12.0	11.6	TBA	11.6	N/A	11.5	11.4	11.3	11.3	11.3	11.6	2.1	TBA	2.0	N/A	2.0	1.9	1.8	1.8	2.1	TBA
Downstream Pressure (bara)		11.8	11.6	TBA	11.6	N/A	11.4	11.3	11.3	11.3	11.3	11.7	2.0	TBA	2.0	N/A	1.9	1.8	1.8	1.8	2.5	11.0
Temperature (°C)		187.2	186.1	37.6	185.9	185.9	185.5	185.0	184.8	184.8	184.8	186.5	120.9	37.6	120.6	120.6	119.6	119.0	118.5	118.5	120.9	120.9
Superheat (°C)		N/A	0.0	N/A	0.0	N/A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	N/A	0.0	0.0	N/A	0.6	1.2	1.4	1.4
Upstream Enthalpy (kJ/kg)		1300.0	2779.7	157.5	2731.2	789.5	2758.8	2780.3	2779.8	2779.8	2779.8	791.8	2700.9	157.5	2651.1	506.5	2685.3	2705.3	2704.7	2704.7	511.3	511.3
Downstream Enthalpy (kJ/kg)		1299.9	2779.7	157.5	2730.4	N/A	2758.6	2780.3	2779.8	2779.4	2779.8	2779.6	2700.9	2700.8	157.5	2650.4	2685.3	N/A	2705.3	2704.7	2704.6	2704.4
Average Steam Quality		0.25	1.00	0.00	0.97	0.00	0.99	1.00	1.00	1.00	1.00	0.00	1.00	0.00	0.97	0.00	0.99	1.00	1.00	1.00	0.00	0.00
Superficial Steam Velocity (m/s)		25.9	20.8	–	20.8	N/A	–	21.2	22.9	26.2	26.2	–	38.7	–	38.9	N/A	–	42.3	38.4	38.4	–	TBA
Average Fluid Velocity (m/s)		28.4	20.8	0.9	20.8	N/A	0.3	21.2	22.9	26.2	26.2	1.0	38.7	0.3	38.9	N/A	–	42.3	38.4	38.4	1.4	TBA

FIGURE 56 TABLE CREATED VIA DATA LINK

We've now created an Autocad table, data linked to an Excel spreadsheet. If the contents of the Excel workbook change, we can update the Autocad table with a couple of clicks. Let's see how this works.

12. Select the table in Autocad, then double-click the upper-left corner again.
13. Right-click and choose **Data Links > Open Data Link File…** to open the file in Excel.
14. Change the value in cells W17 and W18 to a "-", then **save** the Excel file.
15. Switch over to Autocad, and you should see a balloon notification indicating that a data link has changed. Click the hyperlink to update your table.

FIGURE 57 DATA LINK HAS CHANGED NOTIFICATION

We now have one-way communication from the Excel file to Autocad. And in certain scenarios, this may be exactly what you want. For example, in the scenario we're working through, it may be a process engineer's job to maintain the mass balance spreadsheet, while it is the process designer's job simply to link the spreadsheet into the drawing, but should not edit the content.

In other scenarios, you may want two-way communication, allowing a designer to make changes in the Autocad table and push those back to the Excel workbook. To enable this two-way communication, we need to "unlock" the table in Autocad.

16. Select the table in Autocad, then double-click the upper-left corner again.
17. Right-click and choose **Locking > Unlocked**.
18. Change cells W17 and W18 in the Autocad table back to "TBA".
19. Right-click the table and choose **Write Data Links to External Source**. If you do this without closing the Excel workbook, the command prompt will inform you that 1 data link(s) could not be written out.

```
1 object(s) found.
1 data link(s) could not be written out.
0 data link(s) written out successfully.
```

FIGURE 58 SOURCE EXCEL FILE OPEN, DATA LINK COULD NOT BE WRITTEN OUT

20. Close the Excel workbook and repeat step 29. This time you should see a message indicating that 1 data link(s) written out successfully.

```
1 object(s) found.
1 data link(s) written out successfully.
```

FIGURE 59 SUCCESS!

One and two-way data exchange with Excel, very nice.

Additional Examples

We've covered many different ways of extracting and displaying information in and from our drawings. If we have additional time in class, I wanted to share some other examples to help get you thinking of other ways they might be of benefit.

Creating a Detail Bill of Materials

In my business (industrial engineering) we frequently use standard instrument details that explain how instruments are to be mounted. To keep the drawings clean, we use numbered callout bubbles which are referenced by a Bill of Materials table. Each detail drawing is maintained in its own separate DWG file that we typically print out on letter-size paper for our internal standards manual, and these pages frequently are submitted as-is with other project deliverables.

Sometimes, though, we prefer to copy and paste several of these detail drawings onto a D-Size sheet as the deliverable, with one combined table of contents on the new sheet displaying the Bill of Materials for whichever details were hand-picked to appear on that sheet. We struggled with various ways to do this, until we realized that Data Extraction could help us in this situation with a little bit of outside-the-box thinking.

Example:

1. Open sample drawings ***104.dwg***, ***301.dwg*** and ***403.dwg***.

Each drawing contains a different detail, with callout bubbles and a table. Note that the bubbles are all in modelspace along with the actual detail drawing. Also, each bubble consists of additional invisible attributes (you know, the kind you can't see) containing the Description, Size, Material, Quantity and Comments for each item the bubble points to.

You might think having the bubbles in modelspace rather than paperspace contradicts what I said earlier about putting annotations in paperspace (it does). But we made an exception in this case to make it easier to copy and paste these details into a custom detail sheet, as I'm about to demonstrate. The tables were created using standard Data Extraction techniques we've already seen.

2. In the ***104.dwg*** activate the viewport and select everything you can see, the detail, the bubbles and the callout block.

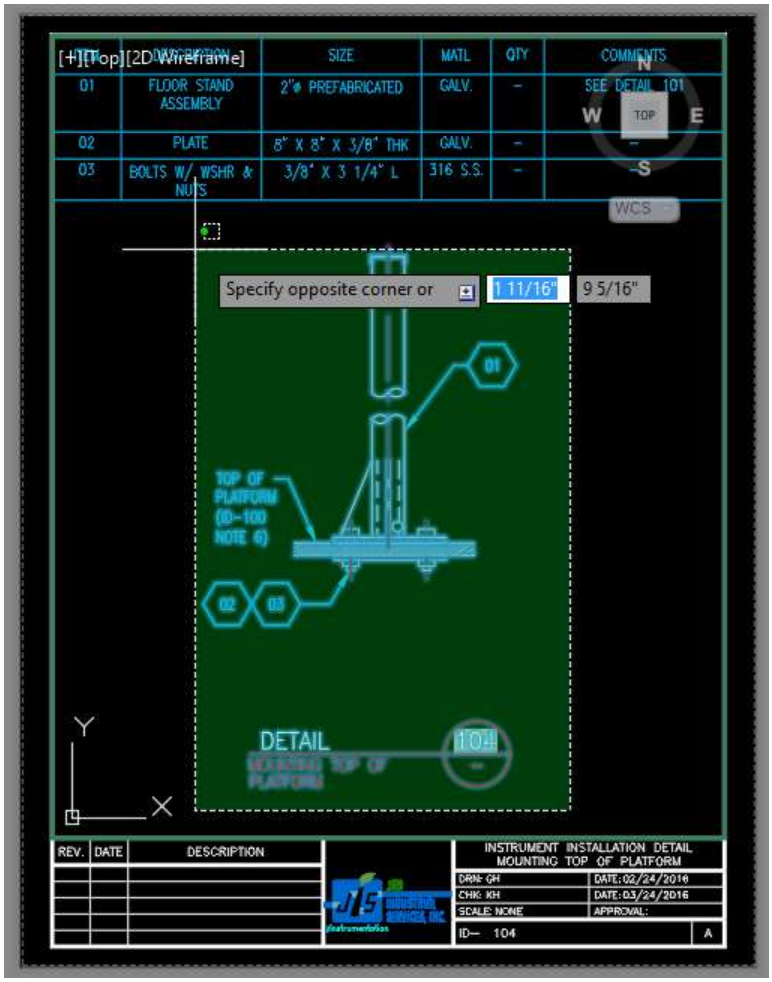


FIGURE 60 SELECT THE MODEL SPACE CONTENT TO COPY

3. Right-click and choose **Clipboard > Copy**.
4. Open ***D01.dwg*** and activate the viewport.
5. Right-click and choose **Clipboard > Paste**, then select an insertion point in the upper left corner of the viewport.

6. Repeat steps 2-5 for the detail in the ***403.dwg***. Place this detail close to the lower left corner of the viewport.
7. Repeat steps 2-5 for the detail in the ***301.dwg***. This is a rather large detail, so fit it in the viewport where you can, but try to preserve the upper right corner of the drawing as much as possible.

The bubble numbers copied in from each detail overlap, but the attributes of each bubble are not identifying the same components. We need to renumber the overlapping bubble numbers so they're unique to each detail. We'll use the detail in the upper-left corner as our starting point, but leave those numbers the same.

For the detail in the lower right corner, change the bubble numbers as follows:

8. Change **01** to **04** (one of these).
9. Change **02** to **05** (two of these).
10. Change **03** to **06** (two of these).

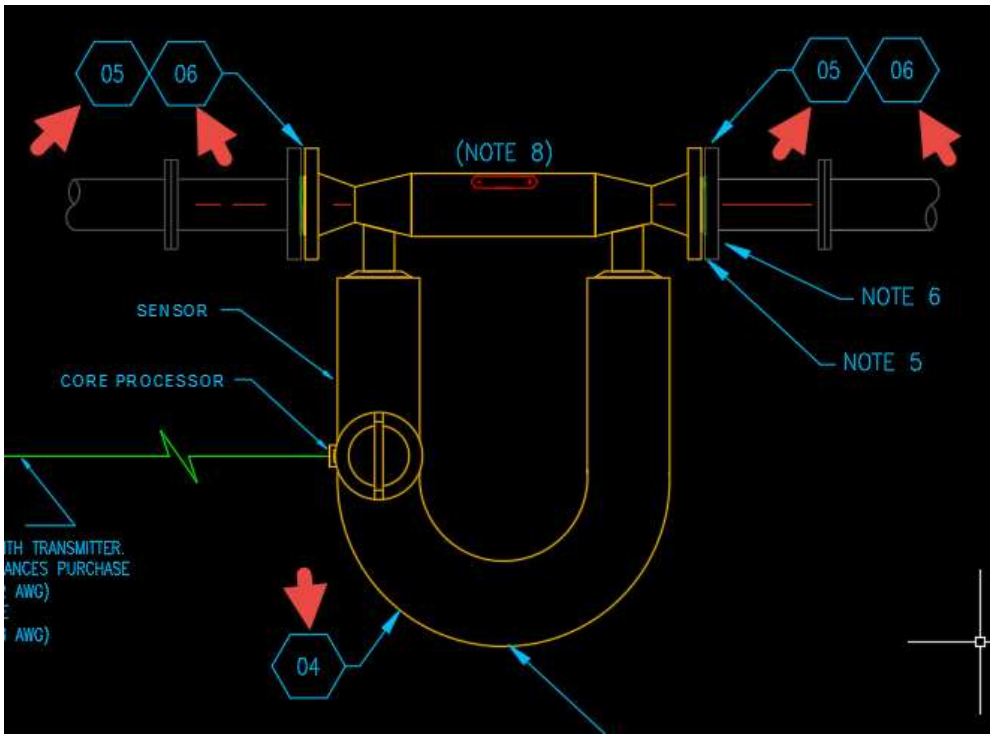


FIGURE 61 CHANGES TO DETAIL 403 (LOWER LEFT CORNER)

For the large detail, we'll again make several bubble number changes. But this time, let's use Find and Replace.

11. On the **Annotate tab > Text panel**, click the **Find text** button.

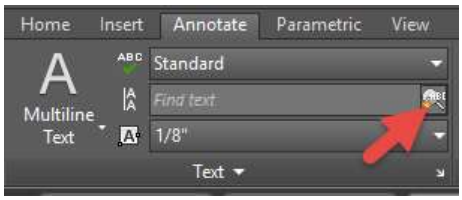


FIGURE 62 FIND BUTTON

12. Enter **01** in the **Find what** box, then enter **09** in the **Replace with** box.
13. Click the **Select objects** button next to the **Find where** drop-down box.

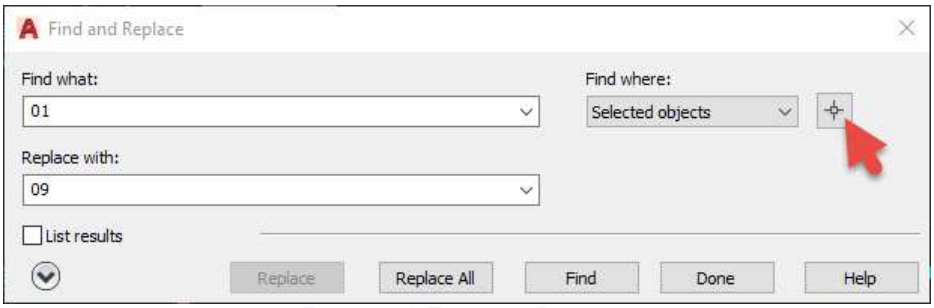


FIGURE 63 FIND AND REPLACE

14. Select a window encompassing the entire 301 detail (right side of the drawing). You don't need to be overly precise here, just be sure to include all the detail bubbles in your selection.
15. Click **Replace All**. You should get a notification that 1 item was changed.
16. With the **Find and Replace** dialog still open, change **Find** to **02** and **Replace** to **10** and click **Replace All**.
17. Change **03** to **11** (one of these).
18. Change **04** to **12** (one of these).
19. Change **05** to **13** (one of these).
20. Change **06** to **14** (one of these).
21. Leave **07** and **08** unchanged.

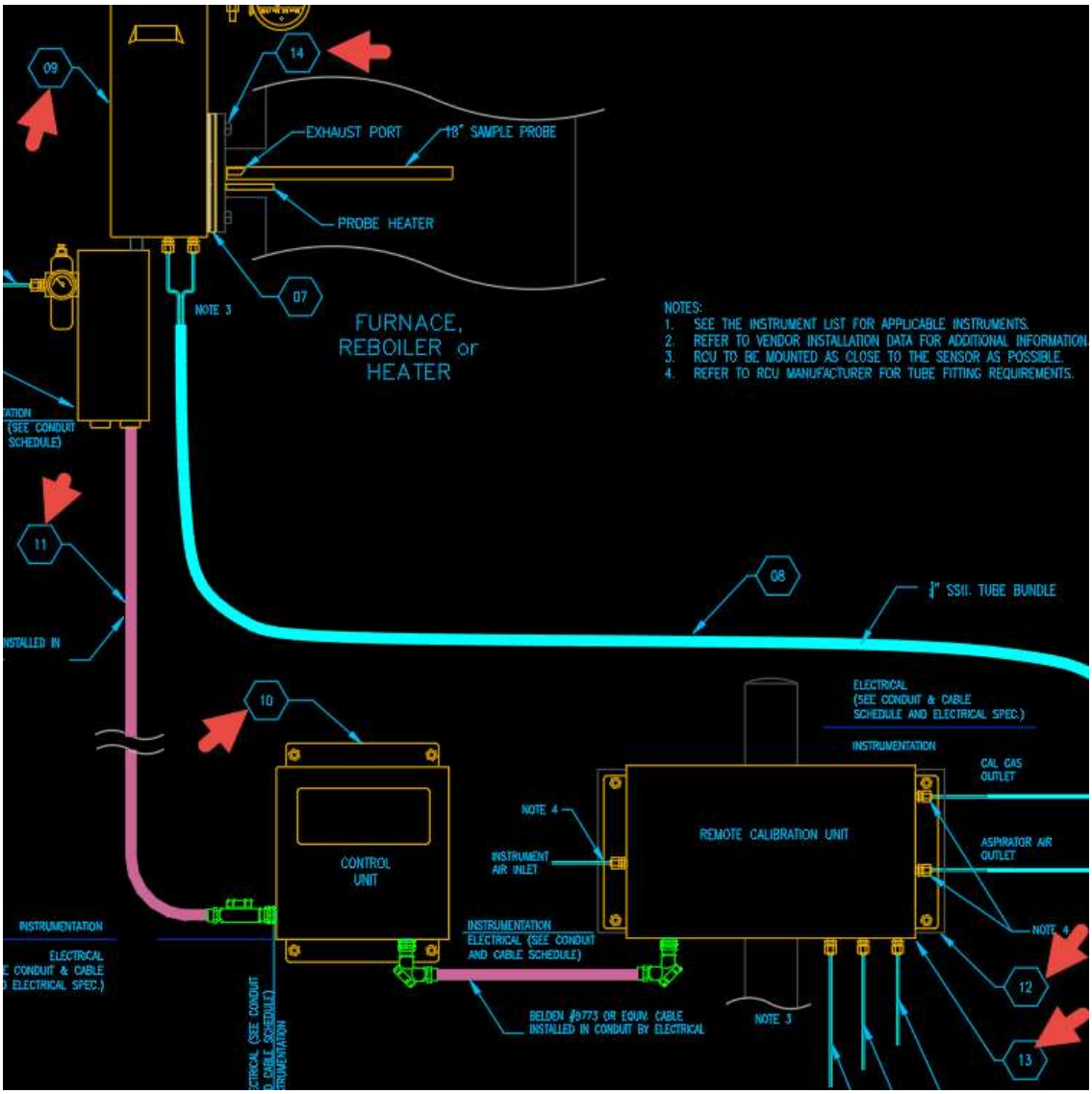
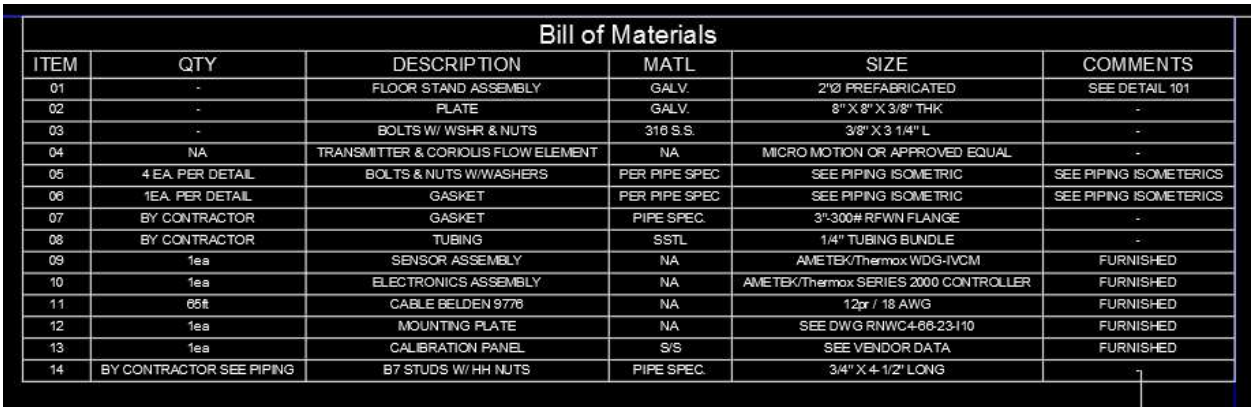


FIGURE 64 CHANGES TO DETAIL 301 (RIGHT SIDE)

Now, let's run through the Data Extraction wizard.

22. On the D01 Custom Details tab, activate paperspace (double-click outside the viewport), then start the **Data Extraction** command.
23. In step 1, create a new data extraction, and save the file as ***D01 Data Extraction.dxe***.
24. In step 2, verify that the current drawing is selected.
25. In step 3, select the **InstrumentCalloutTag** to extract data from.
26. In step 4, select all the **Attribute** category items (6 total attributes).
27. In step 5, uncheck **Show count column** and **Show name column**.
28. Rearrange the columns in the following order: **Item, Qty**, **Description**, **Matl**, **Size**, **Comments**.
29. Sort on the **Item** column.
30. In step 6, check **Insert data extraction table into drawing**.
31. In step 7, enter the title **Bill of Materials**.

32. Insert the table in the upper left corner of the drawing area. You may need to make some adjustments to get everything to fit properly.



Bill of Materials

ITEM	QTY	DESCRIPTION	MATL	SIZE	COMMENTS
01	-	FLOOR STAND ASSEMBLY	GALV.	2"Ø PREFABRICATED	SEE DETAIL 101
02	-	PLATE	GALV.	8" X 8" X 3/8" THK	-
03	-	BOLTS W/ WSHR & NUTS	316 S.S.	3/8" X 3 1/4" L	-
04	NA	TRANSMITTER & CORIOLIS FLOW ELEMENT	NA	MICRO MOTION OR APPROVED EQUAL	-
05	4 EA. PER DETAIL	BOLTS & NUTS W/WASHERS	PER PIPE SPEC	SEE PIPING ISOMETRIC	SEE PIPING ISOMETERICS
06	1EA. PER DETAIL	GASKET	PER PIPE SPEC	SEE PIPING ISOMETRIC	SEE PIPING ISOMETERICS
07	BY CONTRACTOR	GASKET	PIPE SPEC.	3"-300# RFWN FLANGE	-
08	BY CONTRACTOR	TUBING	SSTL	1/4" TUBING BUNDLE	-
09	1ea	SENSOR ASSEMBLY	NA	AMETEK/Thermox WDG-IVCM	FURNISHED
10	1ea	ELECTRONICS ASSEMBLY	NA	AMETEK/Thermox SERIES 2000 CONTROLLER	FURNISHED
11	65ft	CABLE BELDEN 9776	NA	12pr / 18 AWG	FURNISHED
12	1ea	MOUNTING PLATE	NA	SEE DWG RNWC4-66-23-I10	FURNISHED
13	1ea	CALIBRATION PANEL	S/S	SEE VENDOR DATA	FURNISHED
14	BY CONTRACTOR SEE PIPING	B7 STUDS W/ HH NUTS	PIPE SPEC.	3/4" X 4-1/2" LONG	-

FIGURE 65 COMPLETED BILL OF MATERIALS TABLE

This is, admittedly, a strange way to go about this. But it allows us the flexibility of creating customized detail sheets with some easy copy and paste and a little bit of bubble renumbering. Far better than having to retype the Bill of Materials table by hand each time.

Potential "Gotchas" Using Data Extraction

In this class we've created several data extraction files. When you create a data extraction link, Autocad maintains a *reference* to the DXE file, kind of like an xreference. In fact, DXE links show up right on the Reference Manager palette.

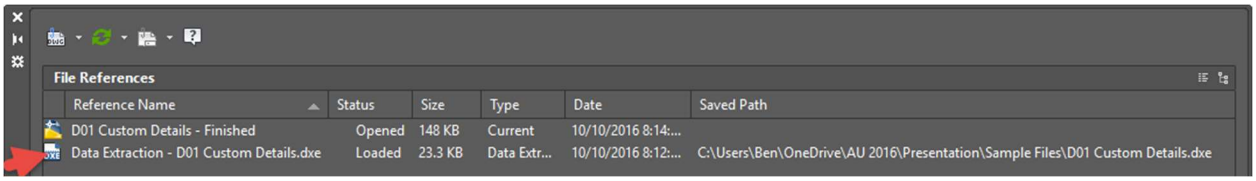


FIGURE 66 DATA EXTRACTION CREATES A REFERENCE!

One thing you need to watch out for when using data extraction is renaming or moving your drawing files. If you rename or move a drawing file, you may need to update the Saved Path. A really good trick is to change the **Saved Path** from a full path to a *relative path* by replacing the entire path (except the file name) with **.** as shown below.

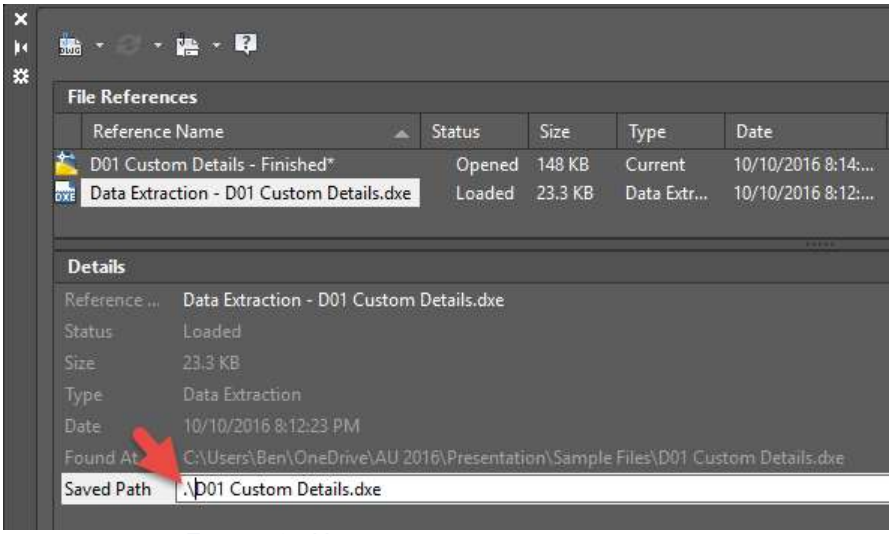


FIGURE 67 USING A RELATIVE PATH REFERENCE

When Autocad sees this, it looks in the same folder as the drawing for the DXE file, and resolves itself. This is particularly important to keep in mind when you transmit drawings (and the DXE files!) to a client or collaborator.

Unfortunately, this is not all you need to do. Remember that the DXE file also contains a link to one or more drawings that act as data sources. Renaming or moving files invalidates these links. Fortunately, it's fairly easy to fix.

Select any cell in a data linked table, then right-click and choose **Data Extraction > Edit Data Extraction Settings**. In Step 1, verify the drawing names and locations. Most likely you'll need to replace the old drawing path(s) with new ones. *I've found that it works best to add the new drawing paths in first before removing the old drawing paths*. Sadly, there is no way to do the relative path trick here as we did with the link in the DWG file. Once you've updated the file path(s), you should be able to click **Next** through the rest of the wizard.

And speaking of transmitting drawings, you may be wondering if **Etransmit** picks up the Data Link Files. By default, it does, although this can be turned off in the **Modify Transmittal Setup** dialog. I recommend always using Etransmit when transmitting drawings from one office to another.

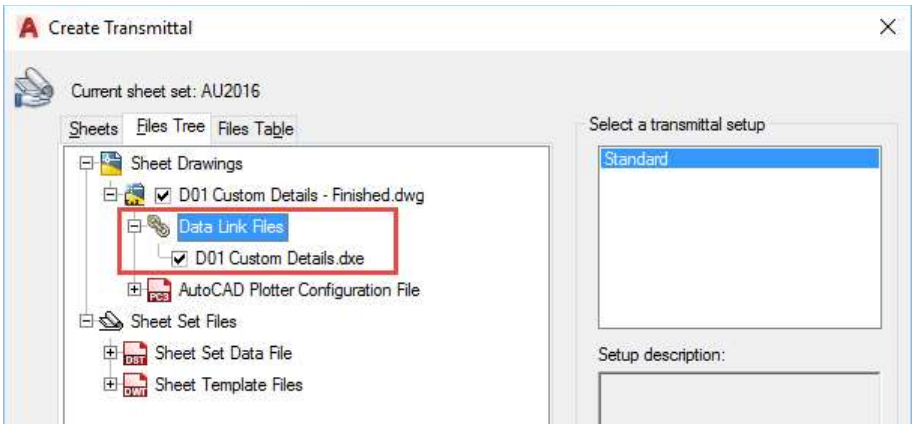


FIGURE 68 ETRANSMIT DETECTS DATA LINK FILES

Combining Autocad and Excel Data

One final example. In some cases, we may want to "merge" data from our drawing with data in Excel. A good example of this would be architectural keynotes. Suppose you have an Excel file with CSI keys and descriptions as shown below:

	A	B
1	ID	Description
2	044223	Truss Supported Stone Cladding
3	045700	Masonry Fireplace
4	052119	Open Web Steel Joist Framing
5	057113	Fabricated Metal Spiral Stairs
6	064629	Wood Fascia and Soffit

FIGURE 69 SAMPLE CSI KEYNOTES IN EXCEL

In your Autocad file, you use a "Keynote" block with an attribute to identify the key, as shown below:

FIGURE 70 A "KEYNOTE" BLOCK WITH ATTRIBUTE

The trick is to combine two things we've already seen, data extraction and data link.

1. Open the ***Keynote Sample.dwg*** file from the sample data set.
2. A few keynote blocks have been inserted on Layout 1.
3. Start the Data Extraction command and create a new DXE file named ***Keynotes.dxe***.
4. In step 3, select the **Keynote** block.
5. In step 4, select the **Keynote** attribute.
6. In step 5, uncheck the **Show Count** and **Show name** columns.
7. Click **Link External Data**.
8. Click **Launch Data Link Manager**.
9. Click **Create a new Excel Data Link** and enter the name **CSI**.
10. Browse to the sample files directory and select ***CSI.xlsx*****.**

11. Verify that **Sheet1** is selected and **Link entire sheet** then click OK twice.
12. Select **KEYNOTE** in the **Drawing data column** and **ID** in the **External data column**, then click **Check Match**.

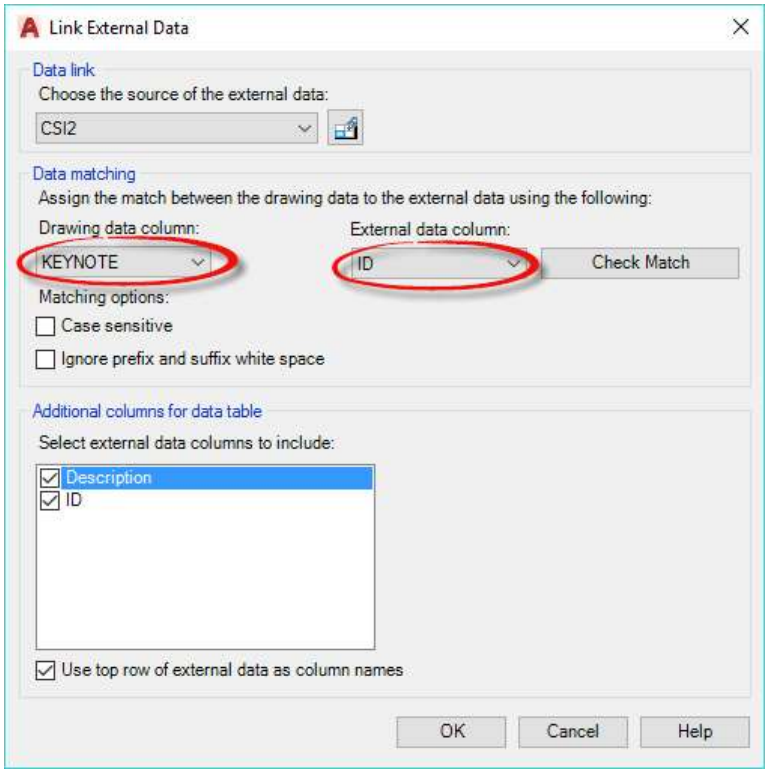


FIGURE 71 DATA MATCHING

Identifying these "keys" is crucial for getting the external data to link up. Your Excel file must contain *unique* values in the external data column ("ID" in the example used here). Autocad matches this up with the value you identify as the drawing data column ("KEYNOTE" in the example shown here).

13. You can select any additional columns from your Excel file to add to any data you're extracting from Autocad itself.
14. Click **OK** to return to step 5.

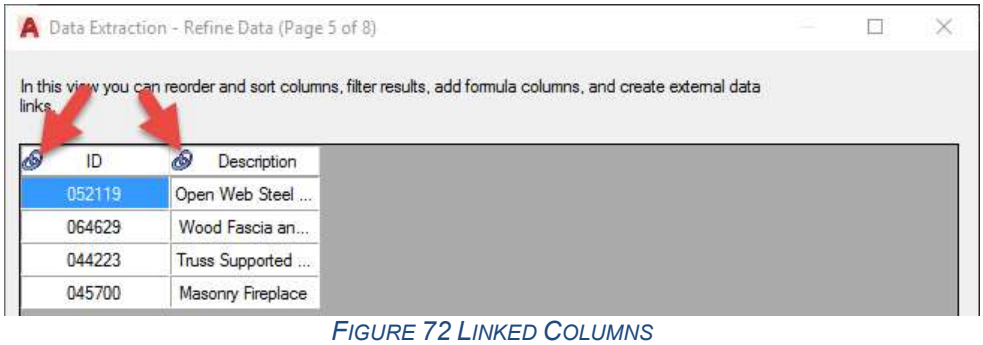


FIGURE 72 LINKED COLUMNS

15. Rename the ID column to “KEY” and sort on that column.
16. In step 6, select **Insert data extraction table**.
17. In step 7, enter **KEYNOTES** for the table title and proceed to insert the table.

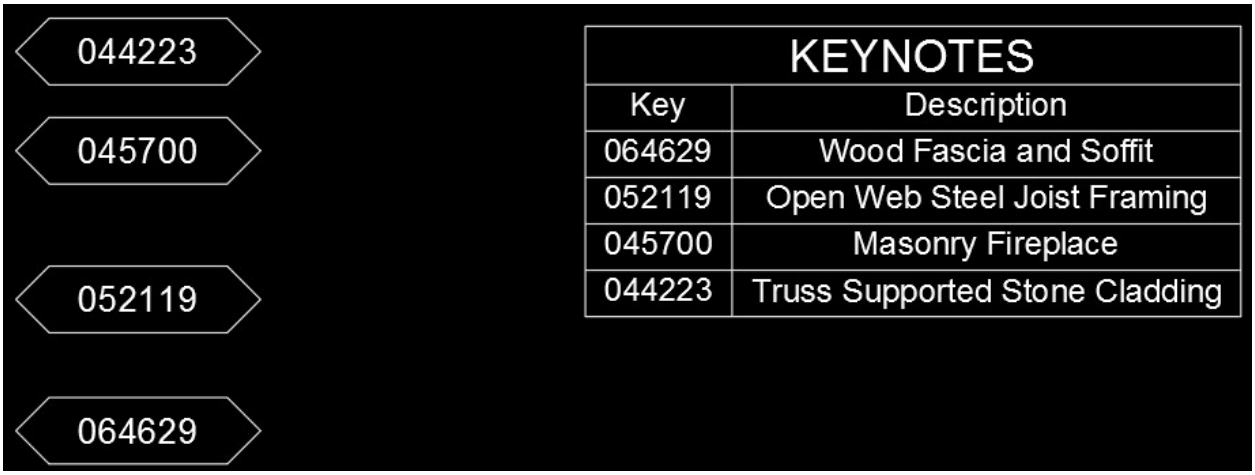


FIGURE 73 FINISHED KEYNOTE LEGEND