Autodesk University 2012

AC427-3: Excel-ing with AutoCAD®: No Programming Required

Donnie Gladfelter – CADD Microsystems, Inc.

AC2807 Learn to combine the power of Microsoft® Excel® with the power of AutoCAD software. This class will explore several ways you can use AutoCAD and Microsoft Excel in tandem without programming. You'll be able to apply everything learned in this class using an out-of-the-box installation of AutoCAD and Microsoft Excel. Conventional concepts will include working with Data Links to display, update, and manage Excel data from AutoCAD. Lesser-known concepts will include updating Update Block Attributes from Excel tables, combining Data Extraction tables with Excel (Data Link) tables, and writing AutoCAD script files using Excel.

About the Speaker:

Donnie Gladfelter (Richmond, VA) is a highly visible, and respected thought leader in the design community. He has authored multiple books including the book and Autodesk Official Training Guide *AutoCAD 2013 and AutoCAD LT 2013: No Experience Required.* Other publications include articles in the popular AUGIWorld magazine, and The CAD Geek blog (www.TheCADGeek.com) which welcomes more than 14,000 visitors each month.

A speaker at Autodesk University since 2007, Donnie is a proven communicator with experience speaking to audiences in excess of 60,000+ people. Through a long-standing peripatetic existence his portfolio of presentations includes serving as the host of Autodesk University Virtual 2010, local user-group presentations, and countless industry events.

Driven by a personal mantra to empower design professionals, he applies more than a decade of industry experience as a Business Development Manager at CADD Microsystems, an Autodesk Platinum Partner, as he helps professionals throughout the Mid-Atlantic leverage technology through his solutions-focused insights and expertise.

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Introduction

A long-time standard among both architects and engineers, Microsoft Excel has proven itself as an incredibly versatile tool for both creating and analyzing data. Over the years many third-party applications and homebrewed solutions have been created to bridge the gap between Autodesk AutoCAD and Microsoft Excel. Unfortunately, the programming knowledge required to create many of those solutions proved too great a hurdle for a large number of AutoCAD users.

Fortunately modern releases of AutoCAD have begun to bridge this gap with an ever growing collection of tools that can connect to Excel. In this class you will learn to maximize the potential of these tools without writing a single line of code. So sit back, relax, and get ready to Excel with AutoCAD: No Programming Required.

Objectives

- Create data links to display, manage, and update Excel tables from AutoCAD
- Update AutoCAD block attributes using data from an Excel spreadsheet
- Combine data from a data extraction table with data from an Excel spreadsheet
- Automate tasks with AutoCAD script files that are created with Excel

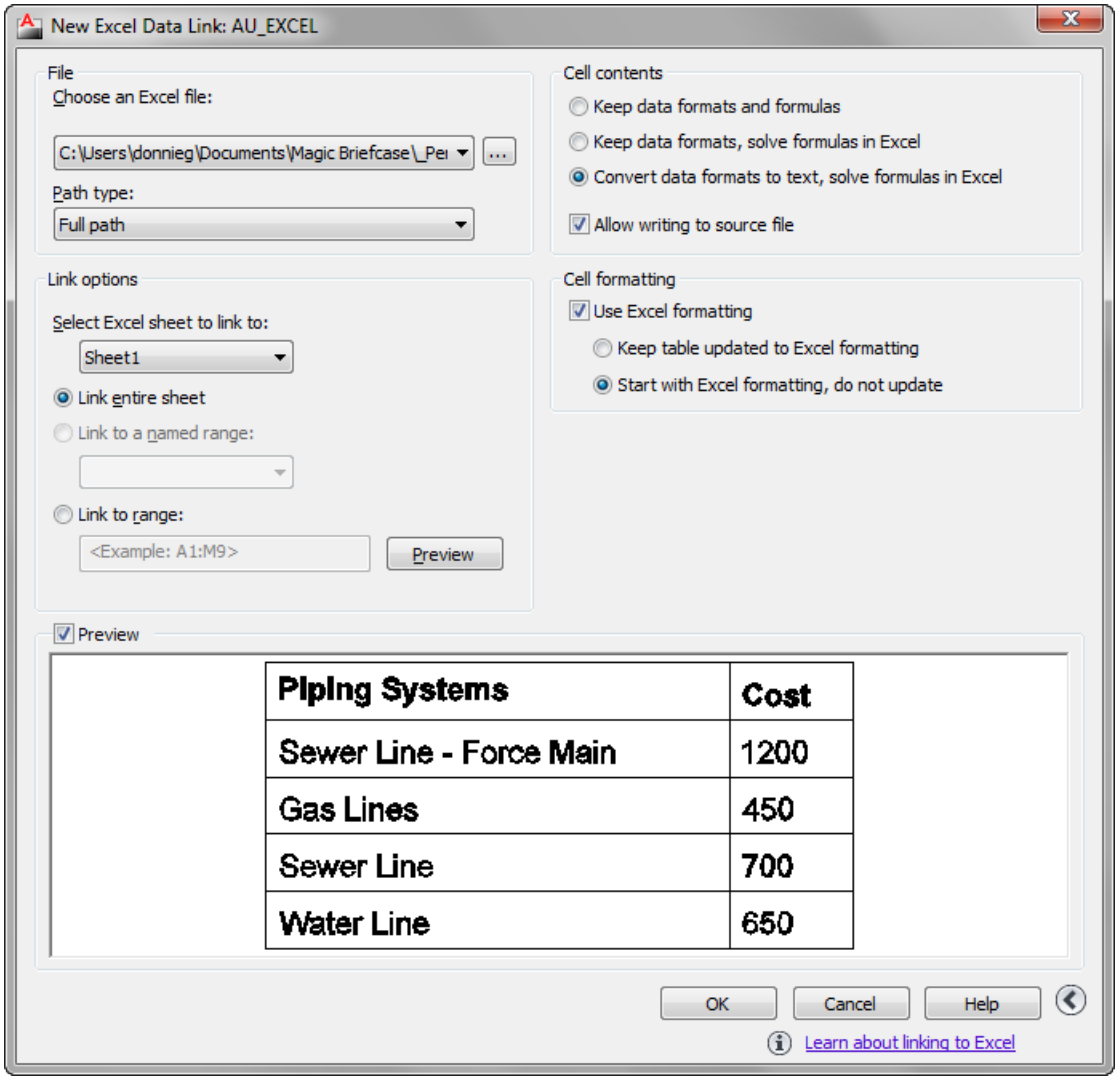
Contents

Linking Excel Tables with AutoCAD

External References allow us to link drawings, images, and several other files into our drawings, but what about tables? Although it has been possible to establish a link between AutoCAD and Excel using OLE (Object Linking and Embedding) objects for some time, it's only been since AutoCAD 2008 that a native AutoCAD solution has existed. Using Data Links, it's now possible to link an AutoCAD table with an .xls, .xlsx, or .csv file.

New Excel Data Link

Several options are available to you when linking an Excel spreadsheet into an AutoCAD drawing. The way you configure these options will largely depend on variables such as the complexity of your Excel spreadsheet, and how you prefer to display it within your drawing. This section will walk you through each of the options available to you from the Excel Data Link dialog.



File

- **Choose an Excel File:** Click the button to browse to and specify the location of an Excel XLS, XLSX, or CSV file on your computer or network.
- **Path Type:** Use the drop-down list to choose one of three options; Full Path; Relative Path; or No Path.
    - **Full Path:** Uses the complete path of the selected data link. This will include the drive letter/server name, root directory, and all subdirectories.
    - **Relative Path:** Typically the preferred option for keeping project data links functional after a project has been archived, and the drive letter/UNC path has changed. This method will only include the portion of the path AutoCAD needs to locate the data link; generally no higher than the project directory. You drawing must be saved for this method to work.
    - **No Path:** Requires both the Excel document and AutoCAD DWG to live in the same directory, and will only save the filename of the referenced Excel document.

Link Options

- **Select Excel Sheet to Link to:** Dropdown list displays each worksheet saved within the selected XLS or XLSX file. A data link can only connect to a single sheet, thus multiple data links would be required to display multiple worksheets from a single XLS or XLSX file.
- **Link Area:** Choose which portion of the worksheet displays in the AutoCAD DWG.
    - **Link Entire Sheet:** Creates a table including the whole worksheet (to include all rows and columns of the selected worksheet).
    - **Link to a Named Range:** Creates a table using a pre-named collection of cells from the selected Excel file.
    - **Link to Range:** A range of cells may be defined within the AutoCAD data link itself. Valid range definitions include; rectangular regions, A1:D10; entire columns, A:A; or sets of columns, A:D.

The essential link options such as the Excel file and Link Area are found in the standard Excel Data Link dialog. Additional parameters may be customized by clicking the More Options button found in the lower-right corner of the dialog. The expanded Excel Data Link dialog includes the following parameters:

Cell Contents

Controls how data is imported into your drawing, more specifically how formulas are handled.

- **Keep Data Formats and Formulas:** Imports Excel worksheet with formulas and data formats attached.
- **Keep Data Formats, Solve Formulas in Excel:** Preserves data formats (number, text, etc), but relies on Excel (not AutoCAD) to solve formulas. This is a good option for worksheets whose formulas and other components do not correctly solve within AutoCAD.
- **Convert Data Formats to Text, Solve Formulas in Excel:** Like the *Keep Data Formats, Solve Formulas in Excel* option, formulas will be solved within Excel (not AutoCAD), however all data will be formatted as text (stripping away data formatting such as number, date, etc).
- **Allow Writing to Source File:** When enabled changes made to a table inside AutoCAD may be written back to the source Excel table using the `DATALINKUPDATE` command.

Cell Formatting

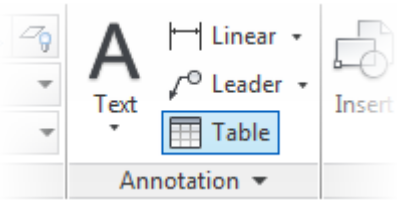
- **Use Excel Formatting:** Use to control whether AutoCAD uses formatting of AutoCAD Table Style (disabled/un-checked), or the Excel file (enabled/checked). When enabled you'll have the ability to further refine how AutoCAD uses the formatting stored within your Excel file. These settings include:
  - **Keep Table Updated to Excel Formatting:** When selected, AutoCAD will keep the AutoCAD Table formatting in sync with the Excel table formatting when the `DATALINKUPDATE` command is used.
  - **Start With Excel Formatting, Do Not Update:** Performs a one-time-import of formatting specified in the original Excel file. Subsequent formatting changes are not included when the `DATALINKUPDATE` command is used.

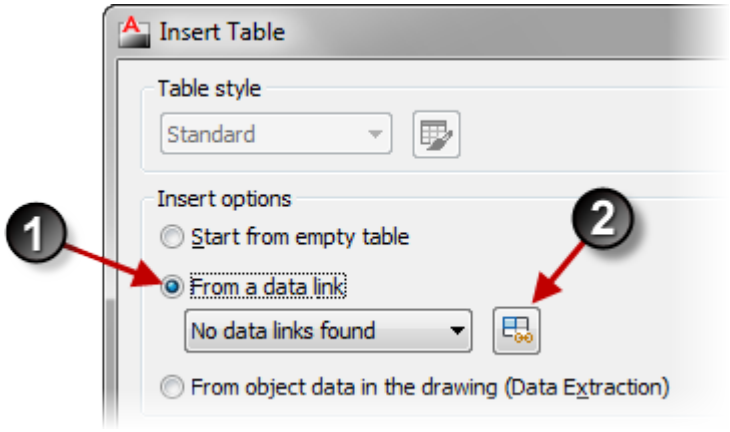
Note: *Cell Formatting options has no effect on how AutoCAD manages changes to data within a linked Excel document. These settings only control how AutoCAD manages a cells format changing from Bold to Italic.*

Process: Creating an Excel Data Link

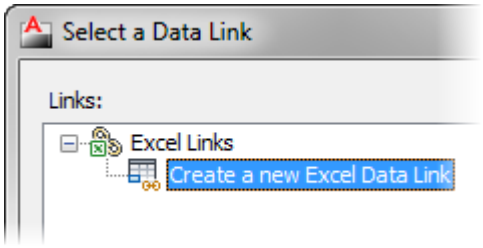
The following steps will show you how to create data links between an AutoCAD drawing and an Excel workbook, displaying a table linked from Excel within your AutoCAD drawing.

Step	Action	Result
1.	Start the TABLE command; On the Ribbon, choose Home tab ➔Annotation panel ➔Table.	The Insert Table dialog opens.

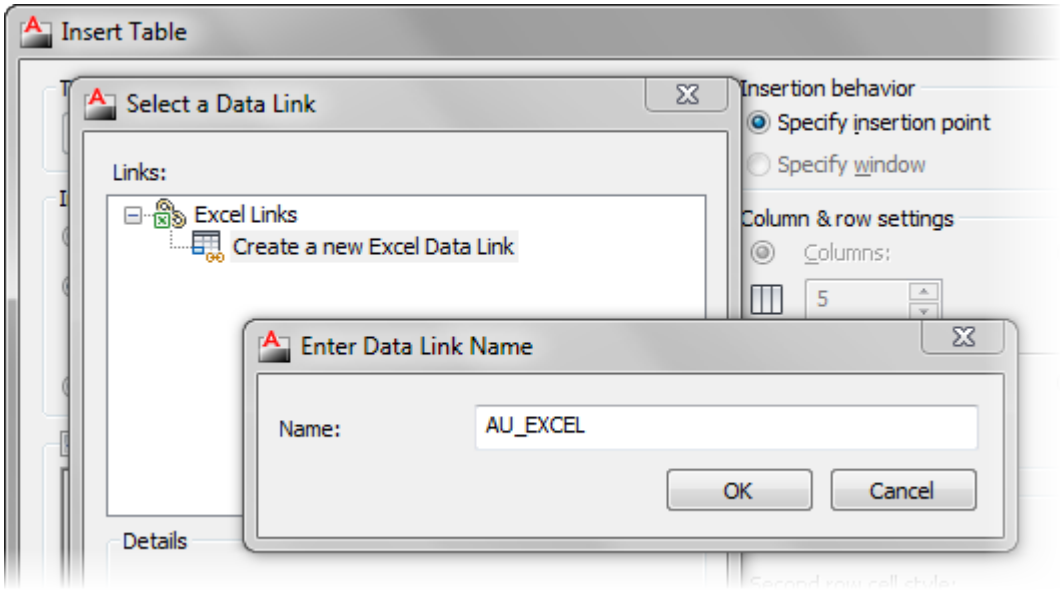




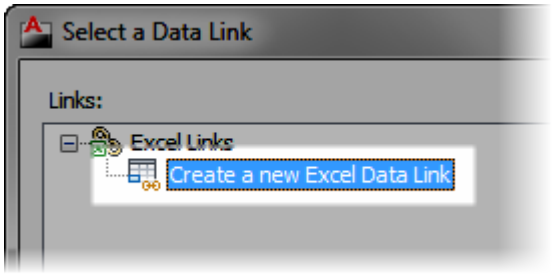
2.	From the Insert Table dialog; click From A Data Link [1] within the Insert Options area of the dialog.	The From a Data Link drop-down list is enabled, and displays No Data Links Found.
3.	With From A Data Link selected, click the Data Link Manager button [2] to the right of the Data Link drop-down list.	The Select A Data Link dialog opens.



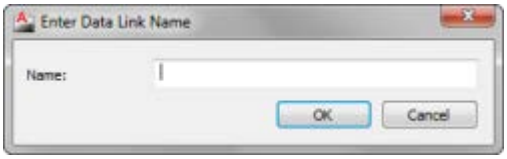
Step	Action	Result



4. From the Select A Data Link dialog; click Create A New Excel Data Link from the Links tree.

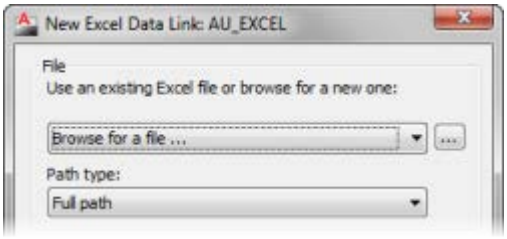


The Enter Data Link Name dialog opens.

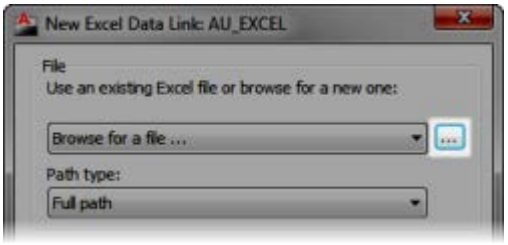


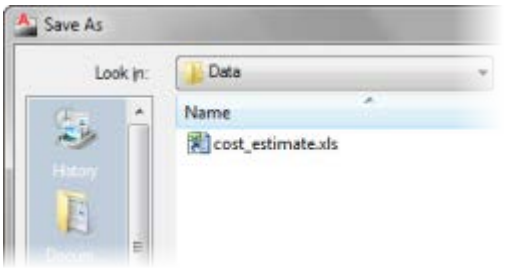
5. Enter a unique name for the Data Link within the Enter Data Link Name dialog; click OK.

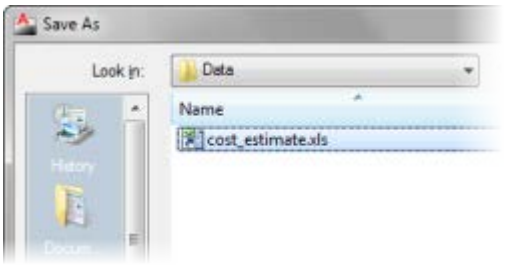
The New Excel Data Link dialog opens.

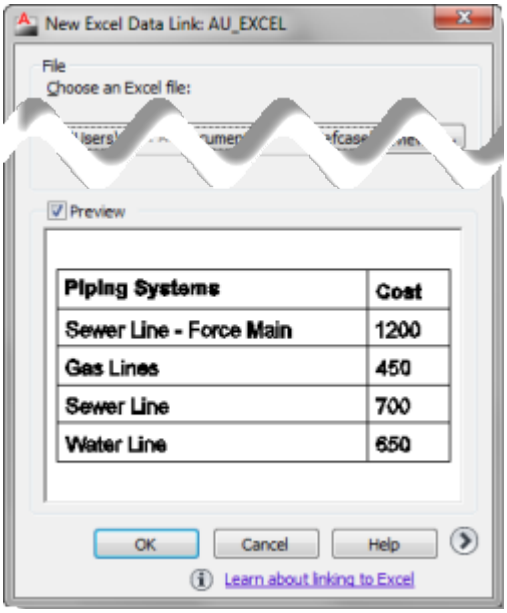


Step	Action	Result
6.	Click the … button to browse to an Excel file (.xls or .xlsx). After selecting an Excel workbook, the New Excel Data Link dialog displays additional information about how the link will be created.	The Save As dialog box opens, allowing you to browse for an Excel (.xls or .xlsx) file.
7.	Browse to and select an Excel file (.xls or .xlsx) from the Save As dialog box; click Open.	The Save As dialog closes and the New Excel Data Link dialog updates to display information about the selected Excel file.

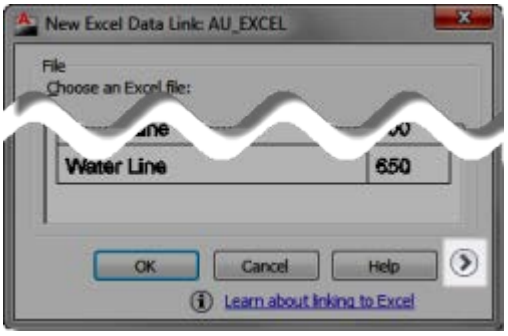




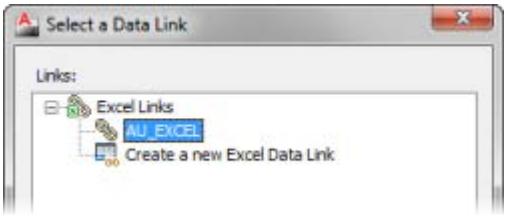


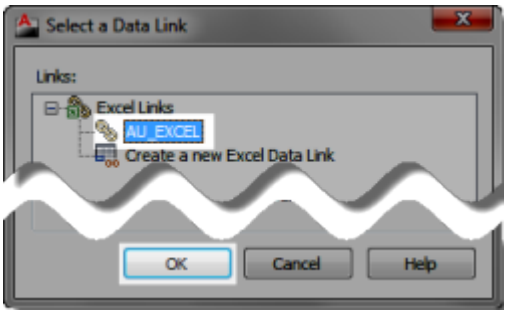


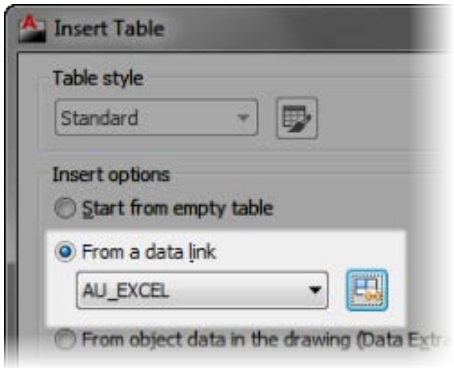
Step	Action	Result
8.	Using the ⊙ button, expand the New Excel Data Link dialog to configure the data link.	The New Excel Data Link dialog expands to display a complete list of data link configuration options.
9.	Using the instructions within the New Data Link section (above) as a guide, make the desired changes the Excel Data Link; click OK.	The New Excel Data Link dialog closes, and the Select a Data Link dialog reopens to display the newly created Excel Data Link.
10.	Choose the newly created Excel Data Link (AU_EXCEL in this example) within the Select a Data Link dialog; click OK.	The Select a Data Link dialog closes, and the Insert Table dialog reopens to display the selected Excel Data Link (AU_EXCEL in this example) under the From a Data Link option.

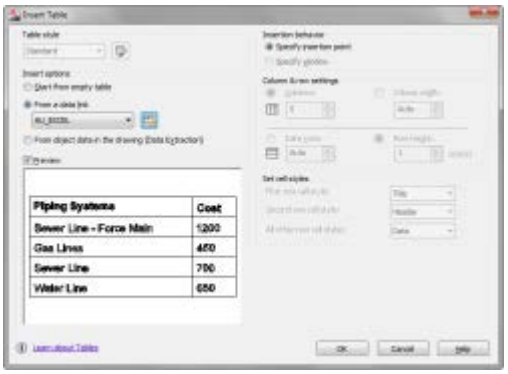
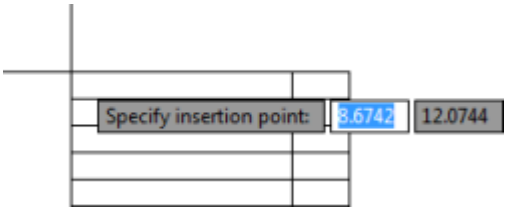


Piping Systems	Cost
Sewer Line - Force Main	1200
Gas Lines	450
Sewer Line	700
Water Line	650







Step	Action	Result
11.	Confirm each of the configuration choices within the Insert Table dialog, and click OK. 	Choose an insertion point for your table. 

Updating Linked Excel Tables

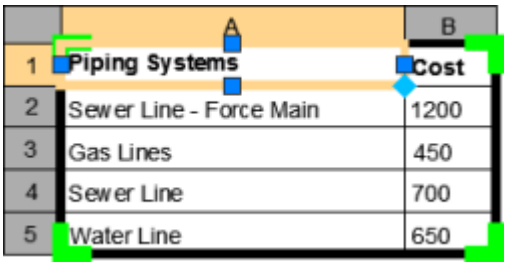
When flipping between AutoCAD and Microsoft Excel, it may be necessary to manually update one or more Data Extraction tables. Like most things in AutoCAD, this can be done in several different ways.

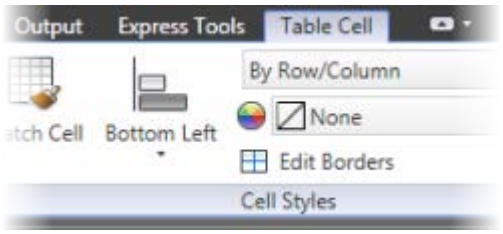
Process: Updating using Contextual Table Cell Ribbon

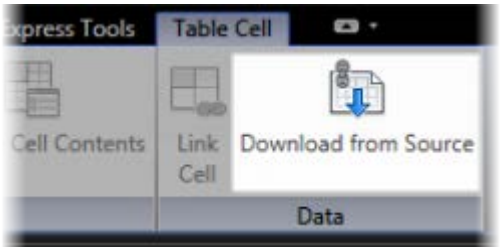
The AutoCAD Contextual Ribbon Tabs expand the reach of the AutoCAD Ribbon by providing quick access to tools related to, or in the context of, a given object. This functionality extends to Tables, and more specifically Table Cells. Selecting any cell within an AutoCAD table will open the Contextual Table Cell Ribbon tab. From this Contextual Ribbon tab several common tasks, including updating Data Links, can be performed.

To update Data Links using Contextual Ribbon tabs:

Step	Action	Result
1.	Select any cell of a linked AutoCAD table.	The contextual Table Cell Ribbon tab opens.
2.	On the contextual Table Cell Ribbon tab ➔ Data panel; click Download From Source.	The Excel Data Link updates to reflect changes made to the linked Excel file.





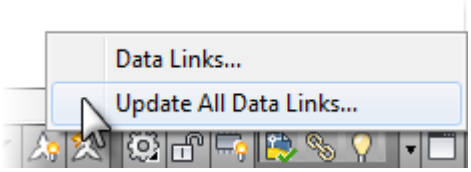


Piping Systems	Cost
Sewer Line - Force Main	1400
Gas Lines	450
Sewer Line	700
Water Line	650

Process: Updating using Status Bar

The AutoCAD status bar provides access to several application settings. An additional Data Link icon will display in the status bar whenever data links are present in a drawing. With this icon it is possible to update all data links in a given drawing at once.

Step	Action	Result
1.	Right-click the Data Link icon within the status bar; click Update All Data Links.	All data linked tables within the current drawing update to reflect the latest revisions to the source Excel files.



Piping Systems	Cost
Sewer Line - Force Main	1400
Gas Lines	450
Sewer Line	700
Water Line	650

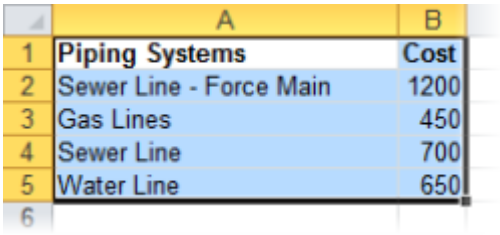
Quickly Link an Excel Table with AutoCAD

Manually creating Data Links as outlined earlier in this document will undoubtedly give you the most control over the way the link between Excel and AutoCAD is created. While this control is absolutely needed in many applications, a collection of "off-the-shelf" settings is oftentimes more than adequate. Assuming these default settings are adequate for your application, the quickest and easiest way to link Excel with AutoCAD is using the Windows Copy and Paste commands.

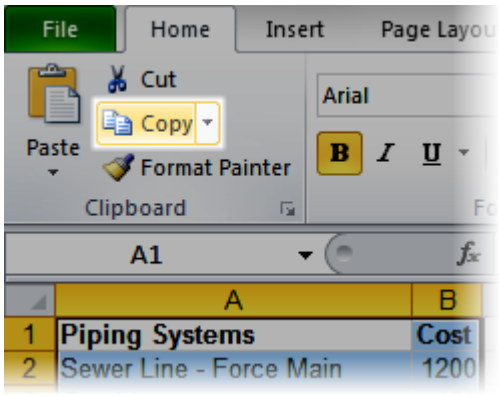
The following procedure outlines how to quickly link Excel with AutoCAD using these commands:

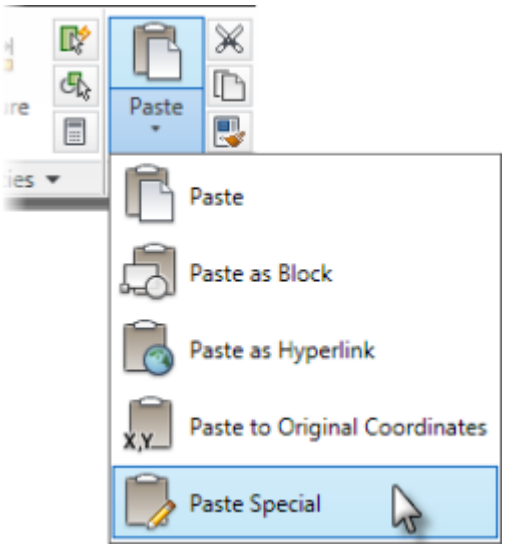
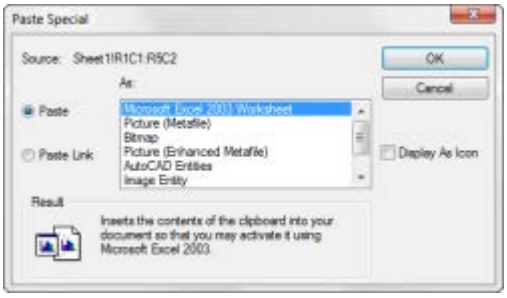
Process: Quickly Linking an Excel Table

Step	Action	Result
1.	From Microsoft Excel, select the cells to link to an AutoCAD drawing.	The selected cells highlight within Excel.

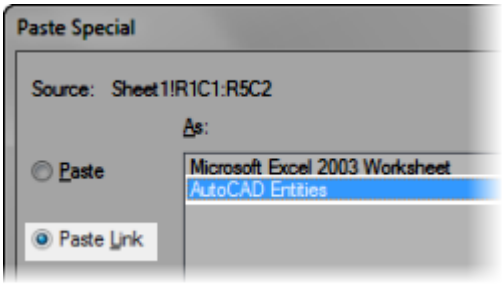


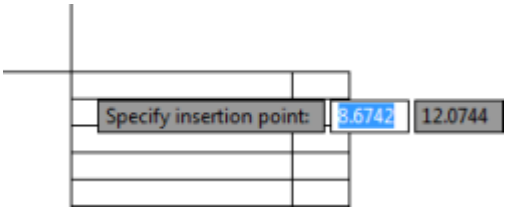
2.	Still within Microsoft Excel; click Copy from the Ribbon, or contextual right-click menu.	The selected cells are copied to the Microsoft Windows clipboard.



Step	Action	Result
3.	Switch to AutoCAD and open the drawing you wish to link to the Excel table you copied to the Windows Clipboard.	The AutoCAD Application Window is now the active application. 
4.	On the Home tab of the Ribbon ➔ Clipboard panel; expand the Paste tool by clicking the down arrow beneath it. With the Past tool expanded, click Paste Special. 	The Paste Special dialog opens. 

Step	Action	Result
5.	From the Paste Special dialog, click the Paste Link radio button, and then select AutoCAD Entities. Click OK.	Choose an insertion point for your table.

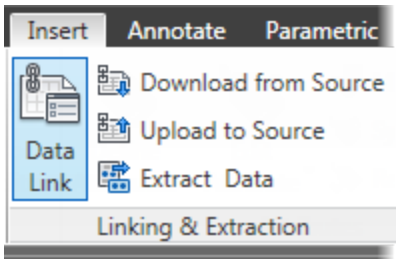




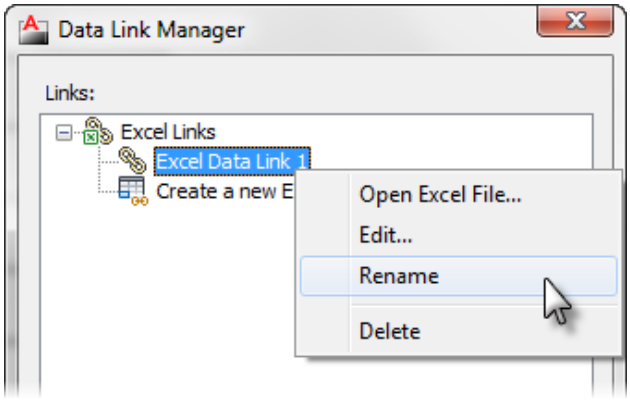
The Excel table is linked into your drawing.

Piping Systems	Cost
Sewer Line - Force Main	1200
Gas Lines	450
Sewer Line	700
Water Line	650

Process: Editing Existing Data Links



AutoCAD automatically creates a Data Link in the background when using the Paste Special command to quickly link Excel with AutoCAD. These data links are given an arbitrary "Excel Data Link #" name where the # is a sequential number; 1, 2, 3, and so on. Since this arbitrary naming convention has little context with the table, many prefer renaming these automatically created Data Links to something more descriptive. This can be done after the Paste Special command is used to link a table by using the Data Link tool on the Insert Ribbon tab ➔Linking & Extraction panel.



The Data Link command will open the Data Link Manager, where you can both create new and modify existing Data Links in the current drawing. To rename an existing Data Link, highlight its name in the Links tree, right-click, and choose Rename.

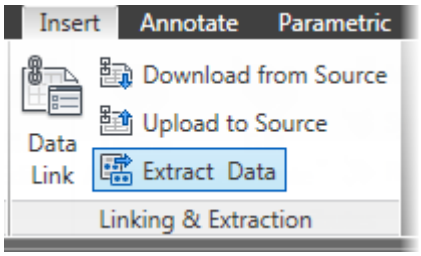
Enter a new name for your Data Link, and press Enter. You can also modify the individual parameters of an existing Data Link by double-clicking its name. This will open a dialog similar to the New Excel Data Link dialog discussed earlier in this handout, where you can tweak a Data Link to your liking.

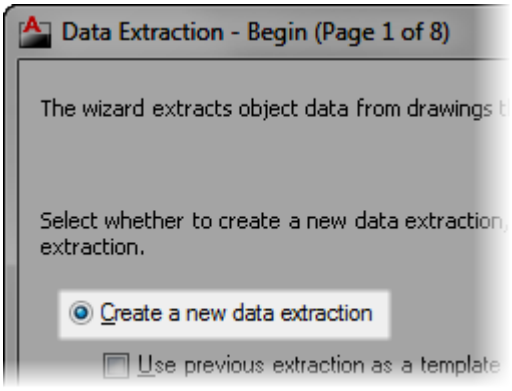
Build Dynamic Tables from Drawing Attributes

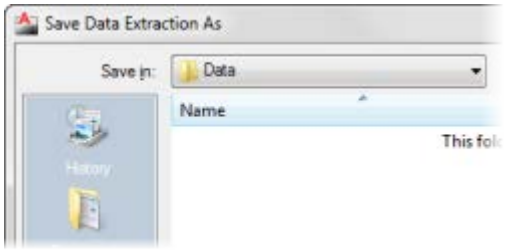
Attributes are most commonly thought of in the context of user-defined block attributes, however these are just one of several different attributes any AutoCAD object may have. Other attributes may include the length of a line, drawing coordinates, layer, scale, even dynamic block parameters. Using the Extract Data (DATAEXTRACTION or EATTEXT) command it's possible to quickly compile any combination of these attributes into a table. This table could help facilitate quantity takeoffs, or even as a way to create a dynamic schedule within your drawing.

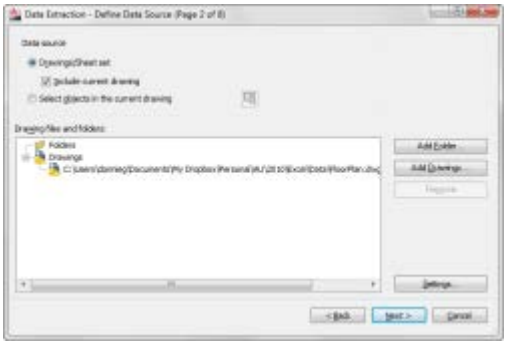
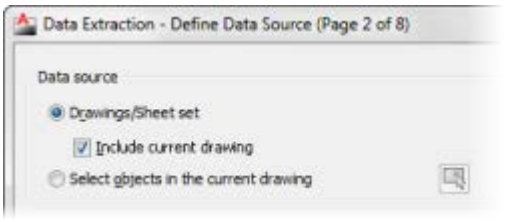
Process: Creating Dynamic Data Extraction Tables

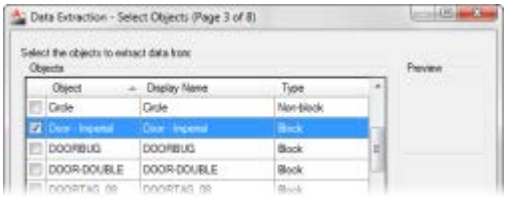
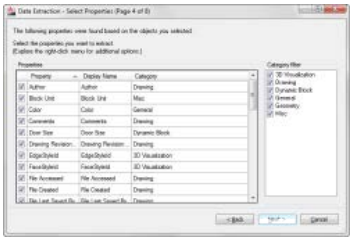
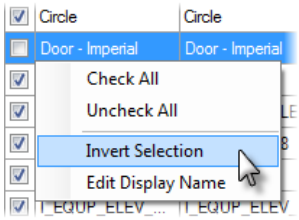
Step	Action	Result
1.	On the Ribbon, Insert tab ➔ Linking & Extraction panel; click Extract Data.	The Data Extraction wizard opens.
2.	On Page 1 of the Data Extraction wizard; choose the Create a New Data Extraction radio button. Click Next.	The Save Data Extraction As dialog opens.

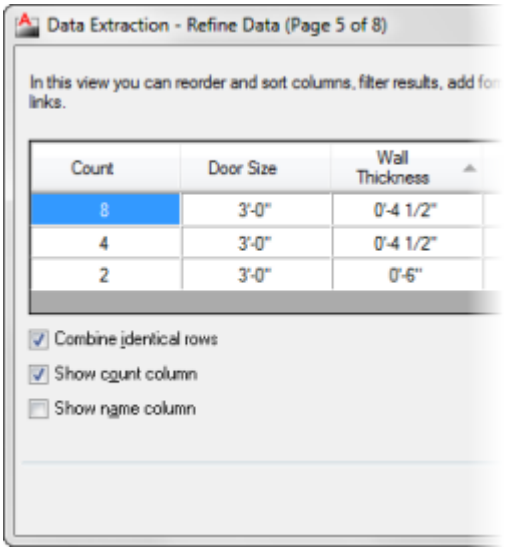
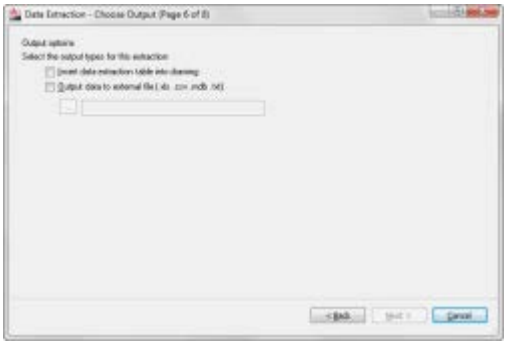
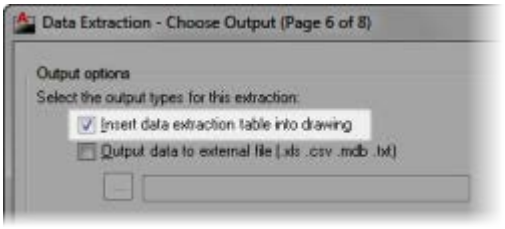
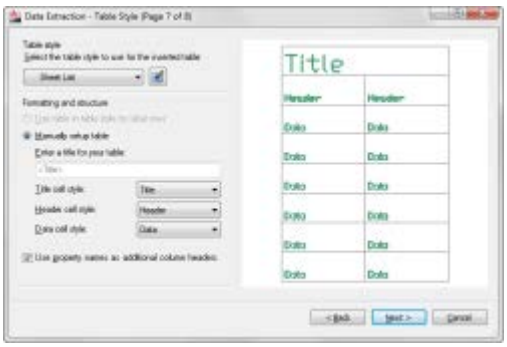


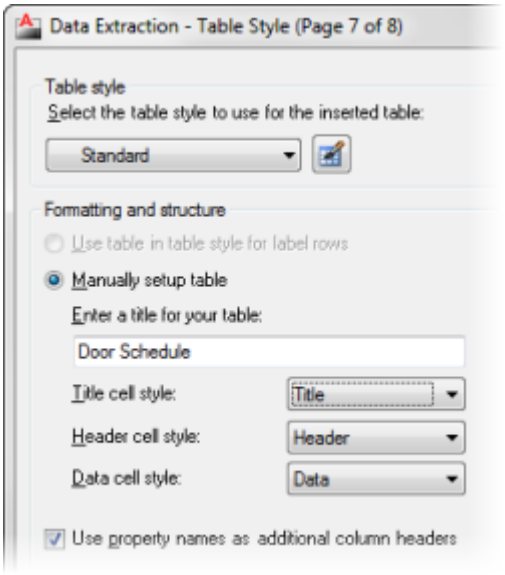
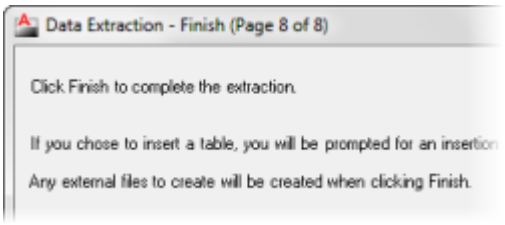
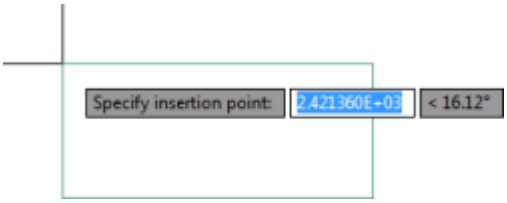




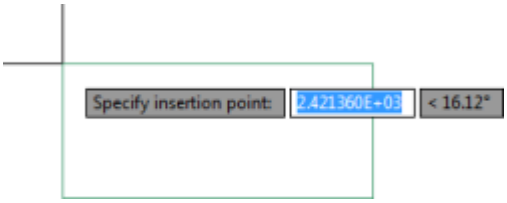
Step	Action	Result
3.	From the Save Data Extraction As dialog, enter a name for your Data Extraction; click Save. 	Page 2 of the Data Extraction wizard opens. 
4.	Page 2 of the Data Extraction wizard prompts for the data source to be defined. By default this is the current drawing, however any number of drawings may be added to the list, and the data included within them extracted into a single table. Specify the drawing to extract data from; click Next. 	Page 3 of the Data Extraction wizard opens. 

Step	Action	Result
5.	Page 3 of the Data Extraction wizard prompts you to select the objects whose attributes you would like to extract. This example will extract a single object; the Door – Imperial dynamic block. Click Next after selecting objects to extract.  	Page 4 of the Data Extraction Wizard opens.  *Tip: Uncheck the objects you want to extract, right-click, and select Invert Selection to quickly choose the objects to extract.* 
6.	Page 4 of the Data Extraction wizard prompts you to select the properties or attributes you wish to extract. Choose the properties you wish to extract, click Next.  *Tip: Customize column header names by modifying the Display Name cell of an extraction property.*	Page 5 of the Data Extraction wizard opens. 

Step	Action	Result
7.	Page 5 of the Data Extraction Wizard allows you Refine Data, or otherwise customize the overall organization of data within your table. In this example, identical rows are combined, a Count column is included (for quantities), and the Name column is omitted, and data has been sorted based on the Wall Thickness column. When finished click Next. 	Page 6 of the Data Extraction wizard opens. 
8.	Choose where to place the Data Extraction table from the Choose Output (Page 6) dialog. This example will insert a table into the current .dwg. Click Next to continue the wizard. 	Page 7 of the Data Extraction wizard opens. 

Step	Action	Result
9.	Page 7 of the Data Extraction wizard provides several options to customize how a Data Extraction Table displays in a drawing. This includes options to adjust the Table Style, and assign individual styles to elements such as the table Title, Header, and Data. Verify settings using the preview on the right siade of the dialog and click Next. 	Page 8 of the Data Extraction wizard opens. 
10.	Completing the Data Extraction wizard, Page 8 allows for the Data Etraction table configured in the preceeding steps to be inserted into the current drawing. Click Finish to insert the table. 	AutoCAD prompts for an insertion point. 

Step	Action	Result
11.	Click a location in the curent drawing to place the Data Extraction table.	The Data Extraction table is placed into the current drawing.



Door Schedule

Count	Door Size	Wall Thickness	Hinge	Swing
8	3'-0"	0'-4 1/2"	0	0
4	3'-0"	0'-4 1/2"	1	0
1	3'-0"	0'-4 1/2"	0	1
5	3'-0"	0'-5"	0	0
3	3'-0"	0'-5"	1	0
2	3'-0"	0'-6"	0	0
2	3'-0"	0'-6"	1	0

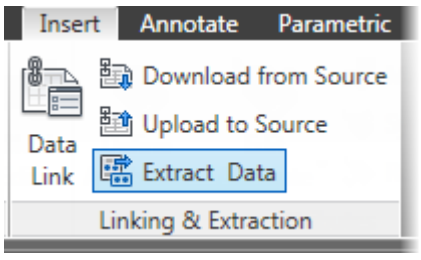
Dynamically Link Excel Tables with Data Extraction Tables

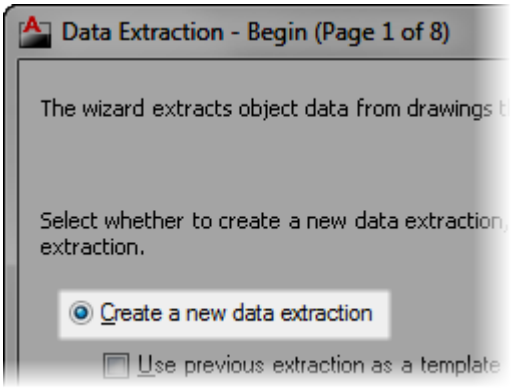
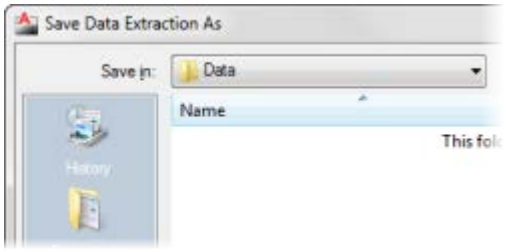
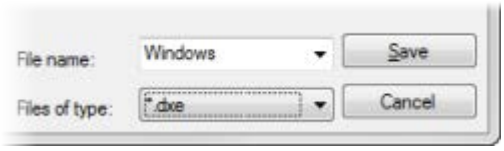
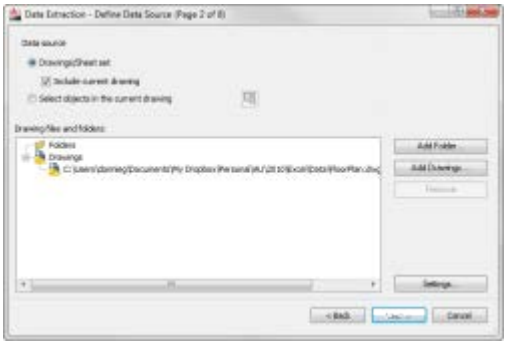
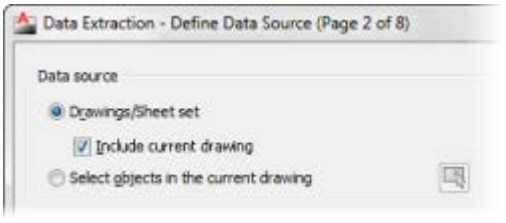
Data Extraction tables provide an incredibly powerful way to summarize data from the attributes of objects stored inside one or more AutoCAD drawings. While it's certainly possible to add any amount of metadata to an object inside AutoCAD using tools such as Block Attributes, inputting this data can be a time consuming endeavor. For this reason, detailed metadata is oftentimes contained outside the AutoCAD .dwg file, and instead stored in something like an Excel table.

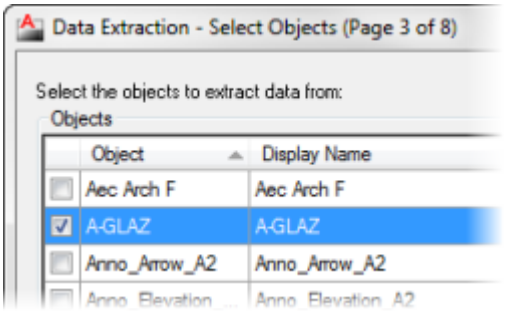
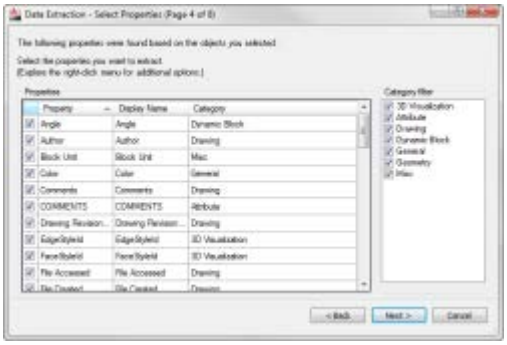
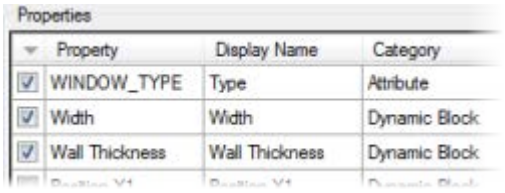
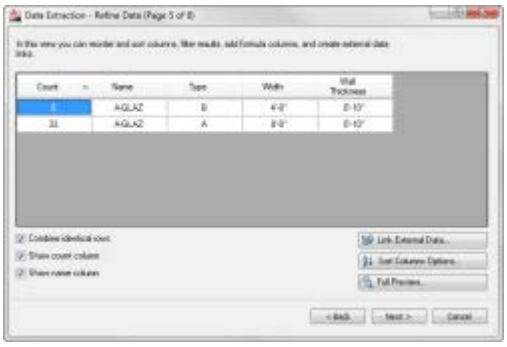
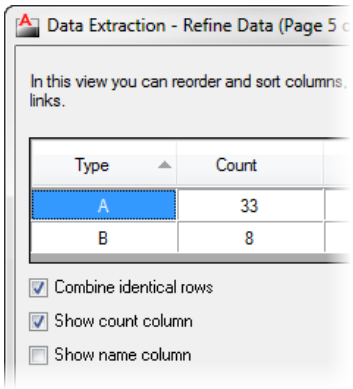
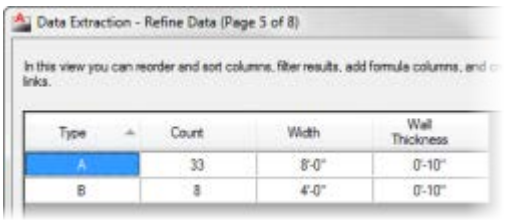
Process: Combine Excel Data Links with Data Extraction Tables

In this example a single dynamic window block represents both the A and B window types; the A type being 8' in length, and the B type being 4' in length. Additional information including the manufacturer and model is stored in an Excel spreadsheet, whereas the .dwg only contains the window type (A or B).

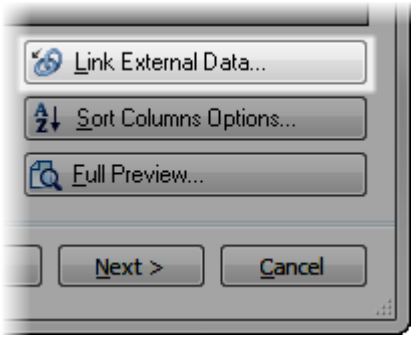
Step	Action	Result
1.	On the Ribbon, Insert tab ➔ Linking & Extraction panel; click Extract Data.	The Data Extraction wizard opens.

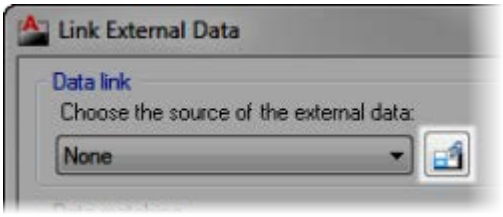


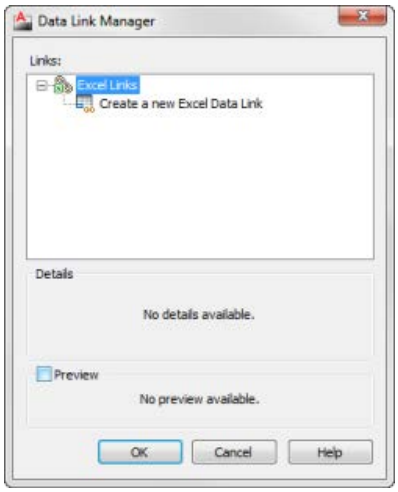
Step	Action	Result
2.	On Page 1 of the Data Extraction wizard; choose the Create a New Data Extraction radio button. Click Next. 	The Save Data Extraction As dialog opens. 
3.	From the Save Data Extraction As dialog, enter a name for your Data Extraction; click Save. 	Page 2 of the Data Extraction wizard opens. 
4.	Specify the drawing to extract data from; click Next. 	Page 3 of the Data Extraction wizard opens. 

Step	Action	Result
5.	Select the object or objects whose data should be extracted. This example will use a single object; the Window (A-GLAZ) block. 	Page 4 of the Data Extraction Wizard opens. 
6.	Choose the properties you wish to extract. Be sure to include one unique property that's included in both the AutoCAD drawing and the Excel spreadsheet. In this example, that property is the Window Type block attribute. 	Page 5 of the Data Extraction wizard opens. 
7.	Choose how drawing data should be summarized. In this example, identical rows are combined, a Count column is included, and the Name column is omitted, and data has been sorted based on the Type column. 	The preview inside the Refine Data Page 5 updates to reflect summary options. 

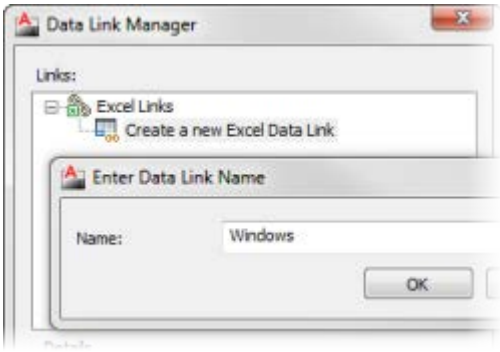
Step	Action	Result
8.	Still on the Refine Data (Page 5) dialog, click Link External Data.	The Link External Data dialog opens.
9.	From the Link External Data dialog, click the Launch Data Link Manager button.	The Data Link Manager dialog opens.

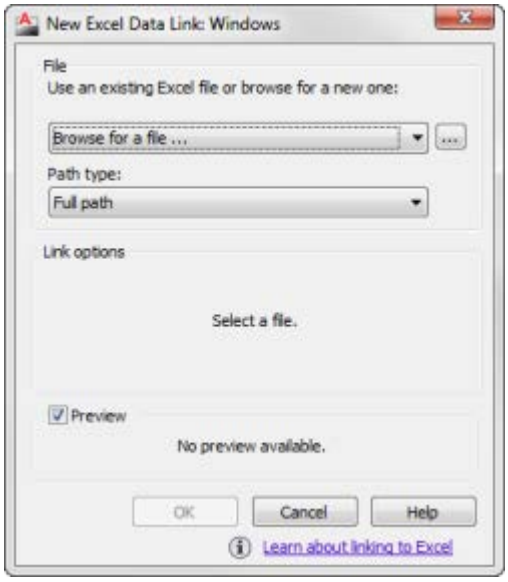


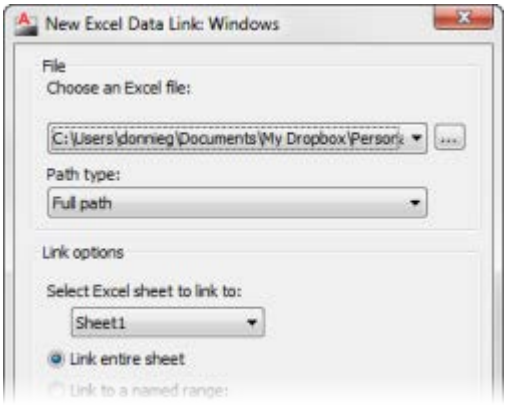


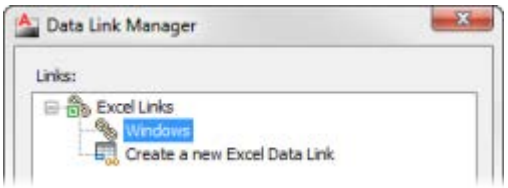
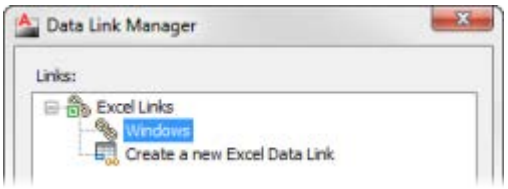
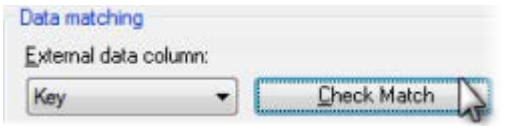
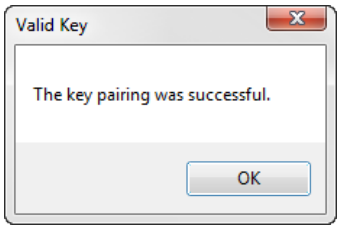


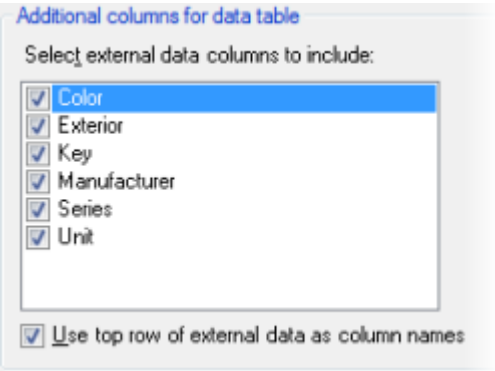
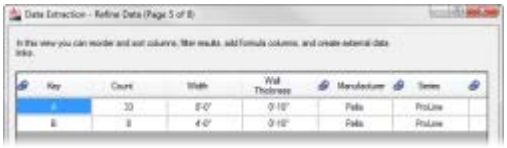
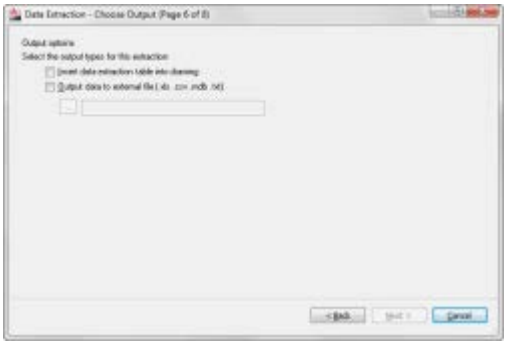
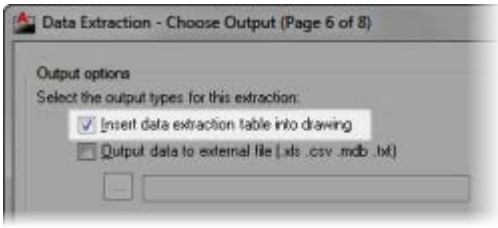
Step	Action	Result
10.	Click Create A New Excel Data Link from the Links tree, and then enter a unique name for the new Data Link. Click OK.	The New Excel Data Link Windows dialog opens.
11.	From the New Excel Data Link dialog, click the ... button.	The Save As dialog opens.
12.	From the Save As dialog, browse to and select an Excel document. Click Open.	The New Excel Data Link dialog expands to display information related to the selected Excel document.



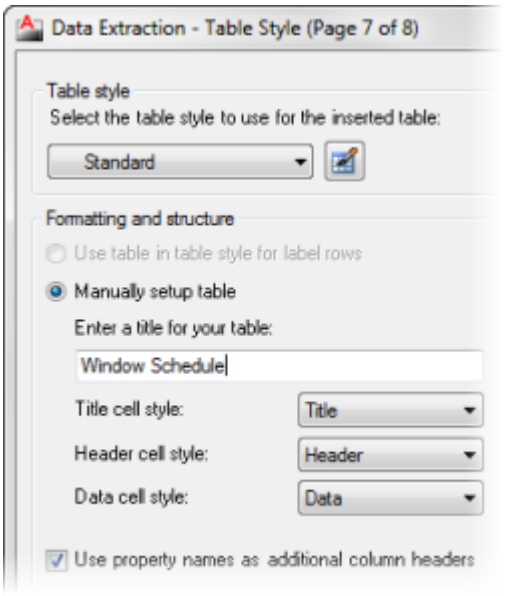




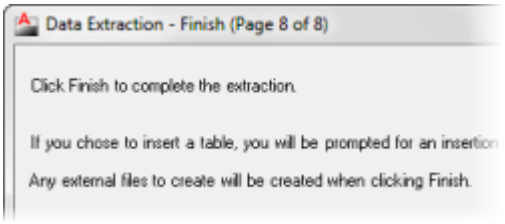
Step	Action	Result
13.	Configure the Excel Data Link using the options within the New Excel Data Link dialog. See the *New Excel Data Link* section of this handout for more information. Click OK	The Excel Data Link is created and listed inside the Data Link Manager dialog.
		
14.	Select the newly created Data Link from the Data Link Manager dialog; click OK.	Information related to the selected Data Link displays inside the Ink External Data dialog.
		
15.	Use the drop-down lists within the Data Matching group of the Link External Data dialog to match the Data Extraction and Excel tables.	The matching data columns are reflected in the Drawing Data Column and External Data Column drop-down lists.
		
	In this example Type represents the Data Extraction column containing the A or B window type designation, and Key is the matching column in the Excel document.	
16.	Verify the specified data columns are valid by clicking the Check Match button.	The Valid Key dialog opens to confirm a successful key pairing.
		

Step	Action	Result
17.	Use the Additional Columns For Data Table group to configure which columns from the Excel document are included in the Data Extraction table. Click OK. 	Information from the Excel spreadsheet is appended to the Data Extraction table preview. Linked columns are designated with a icon. 
18.	Preview the combined Data Extraction and Data Link table; click Next.	Page 6 of the Data Extraction wizard opens. 
19.	Choose where to place the Data Extraction table from the Choose Output (Page 6) dialog. Click Next. 	Page 7 of the Data Extraction wizard opens. 

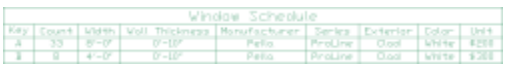
Step	Action	Result
20.	Specify the desired Table Style, table Title, and cell styles from the Table Style (Page 7) dialog.	Page 8 of the Data Extraction wizard opens.



21.	Completing the Data Extraction wizard, Page 8 allows for the Data Etraction table configured in the preceeding steps to be inserted into the current drawing. Click Finish to insert the table.	AutoCAD prompts for an insertion point.



22.	Click a location in the curent drawing to place the Data Extraction table.	The Data Extraction table is placed into the current drawing.



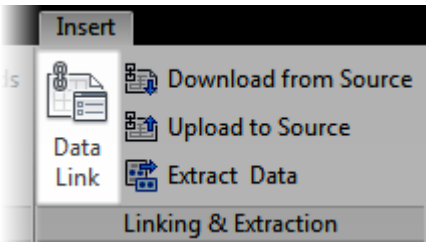
Generate Quantity-Based Cost Estimates

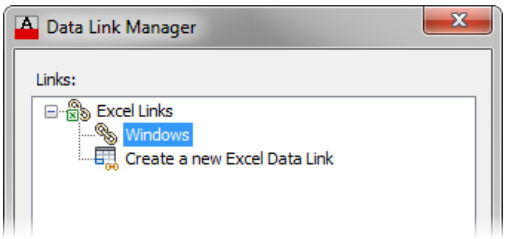
Data Extraction tables are commonly used to as a way to quantify pieces of equipment, generally represented as block insertions, for the purposes of cost estimating. The net cost for a given line item is typically expressed as *Block Count* × *Unit Cost* = *Net Cost*. This type of calculation can be accomplished within the Data Extraction function of AutoCAD by inserting a *Formula Column*. A Formula Column will allow you to do several things. First you will be able to calculate net item costs based on any column within your Data Extraction table; this could be block/drawing attribute information, or data linked from an Excel table.

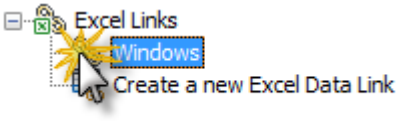
Process: Edit Excel Data Link

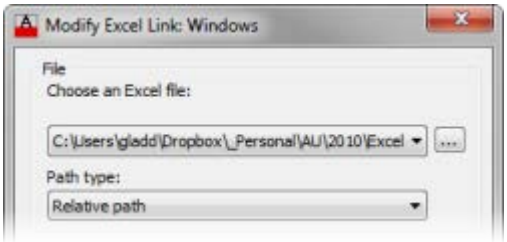
Formula Columns within a Data Extraction Table will only solve formulas between numerical values. Although this requirement may seem obvious, Excel Data Links are oftentimes configured to convert data formats to text as a way of maintaining visual fidelity of a table between AutoCAD and Microsoft Excel. As a result of this setting, cells that appear to have numerical values, may in fact be treated as non-numerical text in the eyes of AutoCAD. To ensure your table is composed of numerical values:

Step	Action	Result
1.	On the Ribbon, Insert tab ➔ Linking & Extraction panel; click Data Link.	The Data Link Manager dialog opens.
2.	Double-click the Excel Link (*Windows*) from the Data Link Manager dialog.	The Modify Excel Link dialog opens.

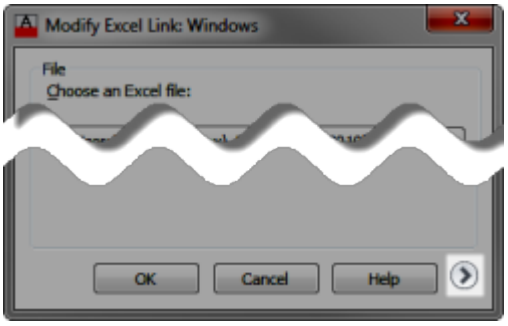




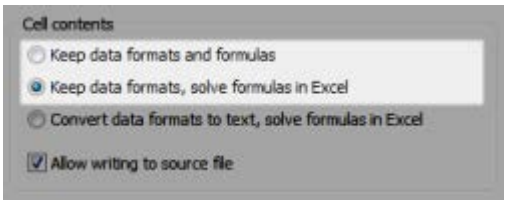


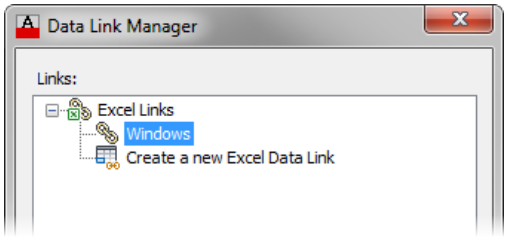


Step	Action	Result
3.	Click the More Options disclosure triangle in the lower-right corner of the Modify Excel Link dialog.	The Modify Excel Link dialog expands to display the Cell Contents and Cell Formatting groups.

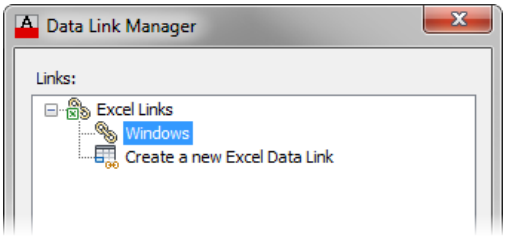


4.	Select the 'Keep Data Formats And Formulas', or 'Keep Data Formats, Solve Formulas in Excel' radio button within the Cell Contents group of the Modify Excel Link dialog. Click OK.	A Data Format which will retain numerical values from Excel is specified, and you're returned to the Data Link Manager dialog.



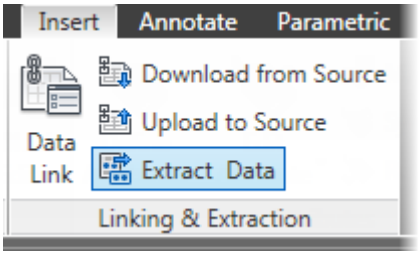
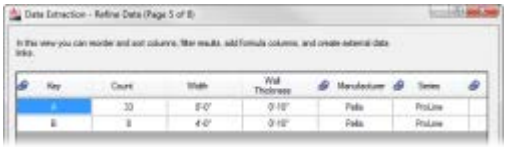
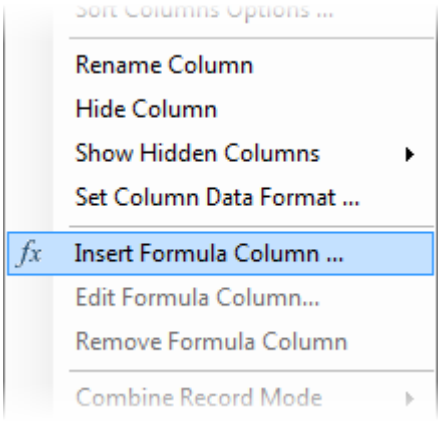
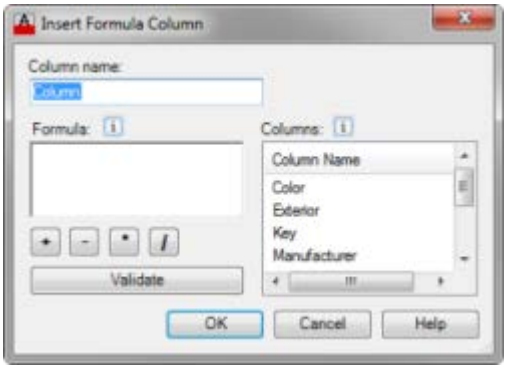


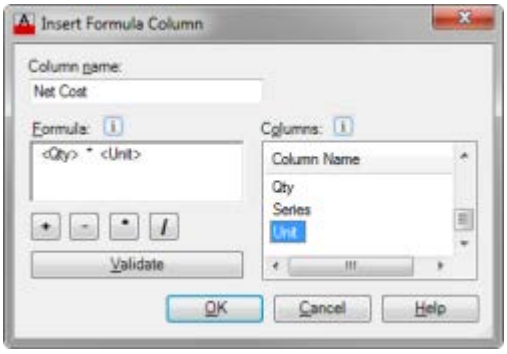
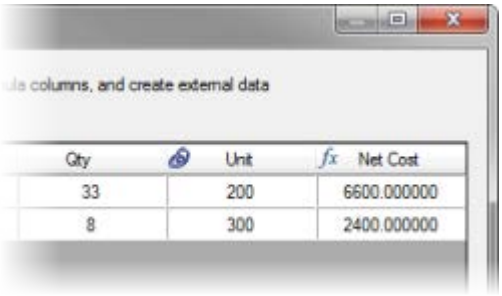
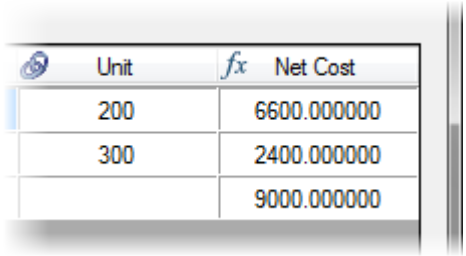
5.	Click OK to dismiss the Data Link Manager dialog.	The Data Link command completes, and you're returned to the AutoCAD drawing area.

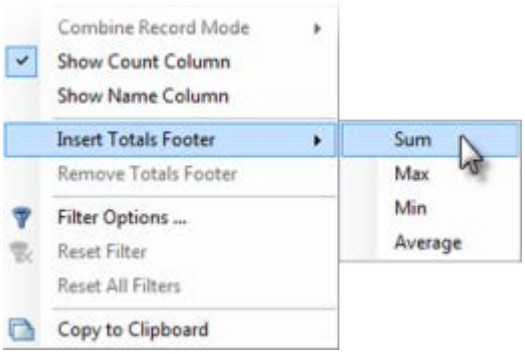


Process: Create a Data Extraction Formula

After verifying whether AutoCAD is retaining the numerical formatting of your Excel data, you can begin building a Data Extraction table to include a Formula Column for calculations such as Net Unit Costs. To do this, you will need to go through the process of creating a Data Extraction table by following these steps:

Step	Action	Result
1.	Create a new Data Extraction table by following steps 1-17 in the ***'Combine Excel Data Links with Data Extraction Tables'*** process outlined above. 	The Data Extraction Wizard is completed through the fifth page. 
2.	Choose Insert Formula Column by right-clicking on any of the column headers within Page 5 of the Data Extraction dialog. 	The Insert Formula Column dialog opens. 

Step	Action	Result
3.	Define a formula within the Insert Formula Column dialog by doing the following: a. Enter *Net Cost* for the Column Name. b. Double-click the *Quantity* column from the Columns list (right). c. Click the multiplication button from the Formula group (left). d. Double-click the *Unit Cost* column from the Columns list (right)	The mathematical formula for your Data Extraction table is defined. 
4.	Click OK to complete your formula.	A new, formula based, Net Cost column is added to Page 5 of the Data Extraction dialog. 
5.	Choose Insert Totals Footer ➔Sum by right-clicking on the Net Cost Formula Column.	A Totals Footer adding each of the net unit costs is added to your Data Extraction table. 



Step	Action	Result
6.	Specify your Output options (insert into drawing, or external file), and if applicible - table style information. Click Next.	Page 7 of the Data Extraction dialog opens, prompting you to finish the extraction. 
7.	Click Finish from Page 7 of the Data Extraction dialog.	Depending on your Output options, a table is inserted into your drawing, or created as an external file.

Author Script Files Using Excel

Script files provide a quick and easy way to automate many tasks inside AutoCAD. Although limited to commands you can enter at the command line, the versatility they provide is endless. Common uses for script files might include changing layer properties, adjusting plotter configurations, or perhaps even performing basic drawing maintenance like running PURGE and/or AUDIT. Whatever the case, chances are an application such as Notepad would serve as the authoring tool in each of these examples. But what if you need to incorporate data that will likely change several times, into a script file?

By combining the exceptional data parsing tools with the versatility of formulas, Microsoft Excel can, with a little creativity, serve as an equally exceptional authoring tool. The following example demonstrates how this concept may be applied to create a script file that will draw a series of lines from a list of coordinates.

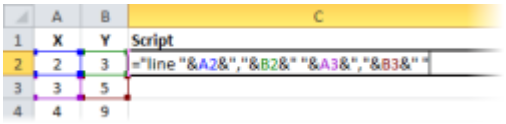
Process: Authoring Script Files with Excel

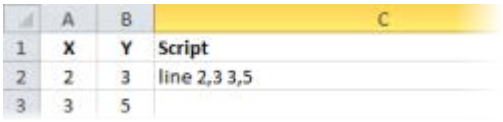
While the exact formula you create may vary, the following procedure outlines the critical components to creating a script file using Microsoft Excel as an authoring tool:

Step	Action	Result

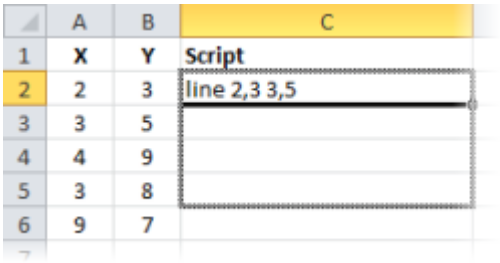
1.	Start the LINE command, noting each prompt.
	
	`LINE Specify first point: 1,1`
	
	`Specify next point or [Undo]: 2,2`
		Command sequence noted as:
		
		LINE <Enter>
		Specify first point: <x, y, z coordinate> <Enter>
		Specify next point: <x, y, z coordinate> <Enter>

2.	Examine command sequence to establish structure of script.	Script structure established as: LINE 1,1 2,2
3.	Write an Excel formula around established script structure.	Using the formula, Excel generates the Script syntax from the tables' data.



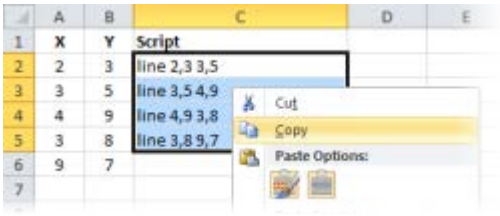


Step	Action	Result
4.	Assuming the Excel formula functions as designed; copy the formula to include the remaining data.	Remaining data is “scripted”.
5.	Copy Script column in Excel file to the AutoCAD command line.	AutoCAD executes the script authored using Excel.

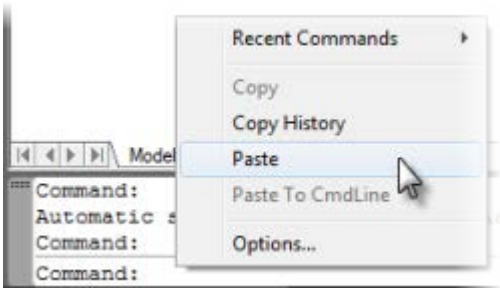


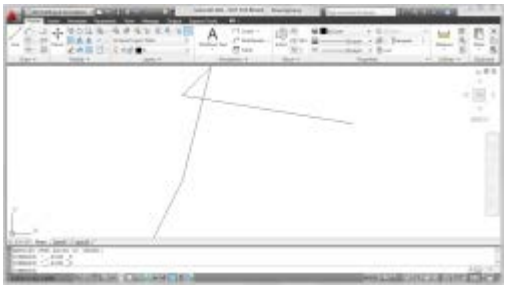
	A	B	C
1	X	Y	Script
2	2	3	line 2,3 3,5
3	3	5	line 3,5 4,9
4	4	9	line 4,9 3,8
5	3	8	line 3,8 9,7
6	9	7	

Excel



AutoCAD

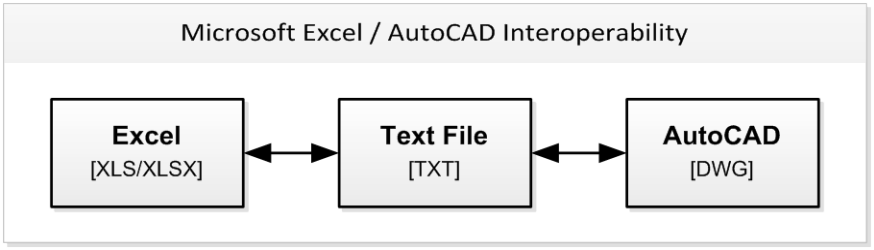




Populate Block Attributes with Excel Data

To this point our discussion related to the interoperability between AutoCAD and Microsoft Excel has revolved around the use of AutoCAD tables. These concepts are each powerful in their own way, however they force our data into structured tables, and do not allow for that data to be harnessed throughout the drawing itself. Unfortunately, there is no way for AutoCAD to automatically populate data from an Excel workbook to attributed blocks inserted into your drawing.

Using the Import and Export Attributes tools found within the Express Tools arsenal, it is however possible to exchange data between AutoCAD and Excel using tab-delimited .txt files. In lieu of a direct connection between AutoCAD and Excel, the .txt file will serve as the "connector" between these two platforms.



Guidelines for Importing and Exporting Attributes

The following guidelines will help you achieve the best results when using this method to import and export Block Attributes.

- As not to change the unique handle of block insertions, avoid erasing block insertions.
- Perform calculations and other data manipulations by using formulas to retain the original formatting and rebuild the export table in a black spreadsheet.

Understanding the Disconnect

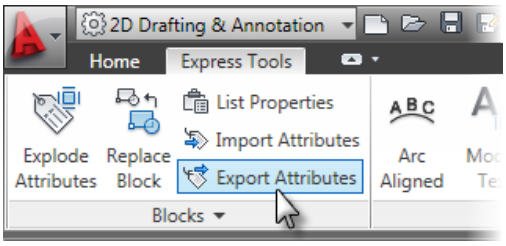
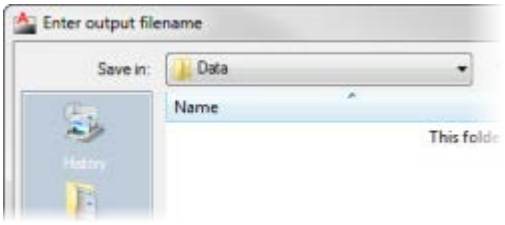
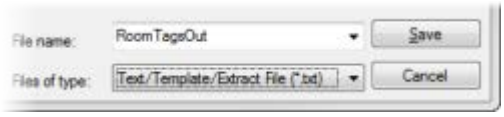
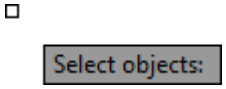
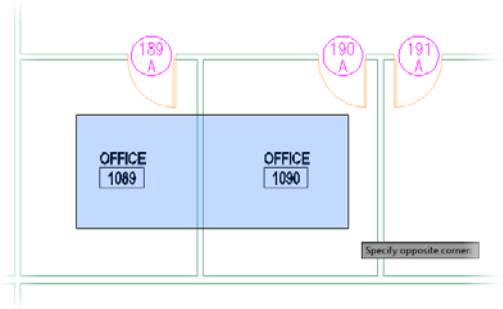
Although most users seldom think of it as such, an AutoCAD .dwg file is really nothing more than a glorified database containing a single record for every line, every drawing setting, every everything. By contrast, an Excel workbook is an unstructured collection of data. So why should you care that an Excel spreadsheet is considered an unstructured collection of data, and what does that mean to you?

Think for a moment what happens when someone calls your phone number. No matter the location of the person on the other end of the line, when they call your phone number, they don't get your neighbor or someone across town – they get you. While the technical reason for this isn't necessarily simple, the fundamental reason is. That's to say the reason it's your phone that rings is because your phone number is unique to you.

Databases operate in a strikingly similar way; the way record 1 is kept separate from record 10,000 is through a unique identifier known as a key. Within AutoCAD this unique key is known as a Handle. So while you can obviously create more than one line in an AutoCAD drawing, no two lines in an AutoCAD drawing will have the same handle (or database key). Knowing no two objects in a given AutoCAD drawing will share the same handle, we can use the handle to locate a specific block insertion within a drawing.

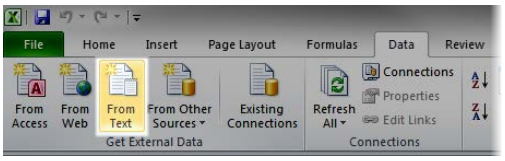
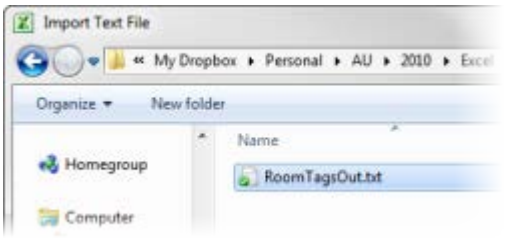
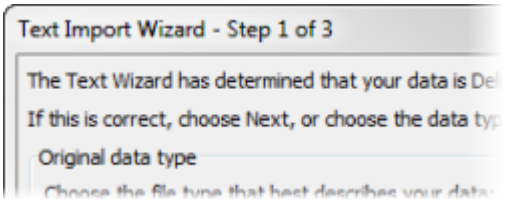
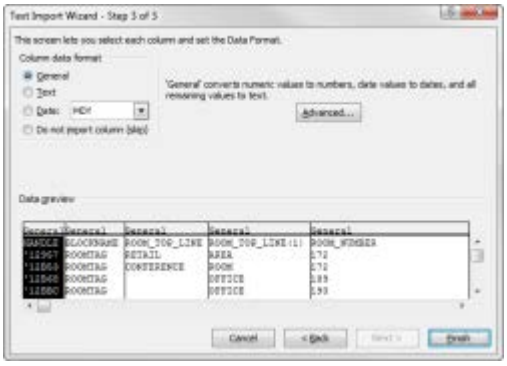
Process: Exporting Attributes

A tab-delimited text (.txt) file will serve as the transfer format for getting AutoCAD data into Excel, and Excel data into AutoCAD. To begin this process, the Export Attributes (ATTOUT) command will be used to collect the necessary information pertaining to each block insertion, and structure that data in a way Microsoft Excel can understand.

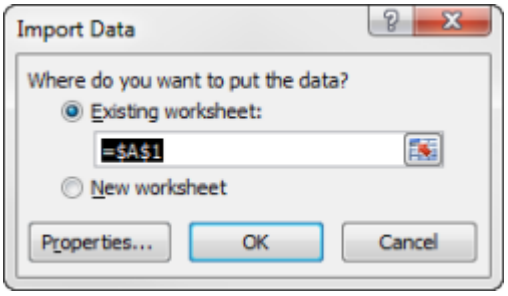
Step	Action	Result
1.	On the Ribbon, Express Tools tab ➔Blocks panel; click Export Attributes (ATTOUT). 	The Enter Output Filename dialog opens. 
2.	Provide a name for your Attribute Extract file. Click Save. 	The command line prompts Select Objects. 
3.	Select the Attributes to export from the Drawing Area. 	The selected attributes are selected. 
4.	Press Enter to accept the selection set.	Each of the selected block attributes are exported to the designated text file.

Process: Importing Attributes into Excel

WRITE A DESCRIPTION.

Step	Action	Result
1.	Launch Microsoft Excel. 	Microsoft Excel opens. 
2.	Import TXT file into Microsoft Excel using the Data ➔ Get External Data ➔ From Text command. 	The Import Text File dialog opens. 
3.	Browse to and select the .txt file created using the Export Attributes tool inside AutoCAD. Click Open.	The Text Import Wizard opens. 
4.	Follow the prompts of the Text Import Wizard making sure to choose the following: • Page 1: Delimited • Page 2: Delimiters, Tab.	The Text Import Wizard displays a preview of the data to be imported. 

Step	Action	Result
5.	Click Finish to complete the import.	The Import Data dialog opens.



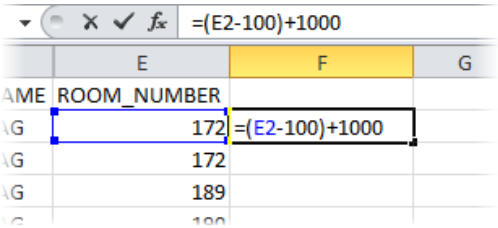
6.	Choose a location for the attribute data exported from AutoCAD. Click OK.	The AutoCAD attribute data imports into the specified Excel worksheet.

	A	B	C
1	HANDLE	BLOCKNAME	ROOM_TOP_LINE
2	'12957	ROOMTAG	RETAIL
3	'12B53	ROOMTAG	CONFERENCE
4	'12B68	ROOMTAG	
5	'12BBC	ROOMTAG	

Process: Modifying Attribute Data with Excel

After the attribute data imports into Excel, you can use any combination of Excel formulas to manipulate the raw data. These modifications can be as simple as changing a single column, or as complex as using a series of formulas to build a new worksheet based on the raw import data. Whichever method chosen, the table that will be used to export back to AutoCAD must keep the relationship of the Handle column intact. In the context of blocks, this Object Handle is what AutoCAD uses to distinguish each insertion of a block apart, and is critical for this process to work.

Step	Action	Result
1.	Modify the Excel spreadsheet as desired.	Spreadsheet is modified to reflect desired block attribute updates.

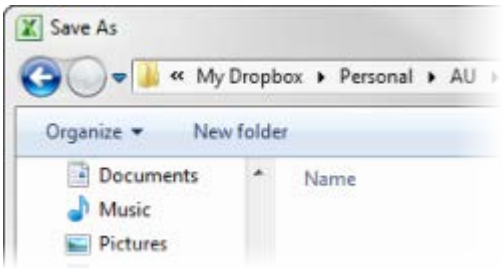
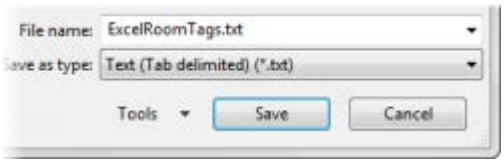


	D	F
E	ROOM_TOP_LINE(1)	ROOM_NUMBER
	AREA	1072
	ROOM	1072
	OFFICE	1089
	OFFICE	1090
	OFFICE	1091

Note: This example changes the room numbering format, and doesn't necessarily require a new table be created. Instead, the original ROOM_NUMBER column (E) was hidden, allowing a new column (F) to take its place.

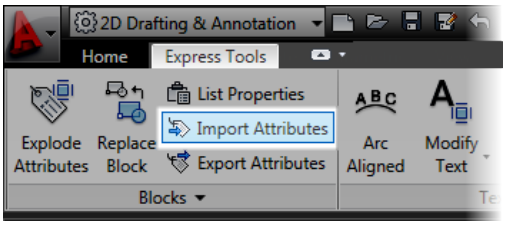
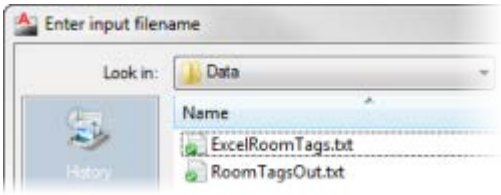
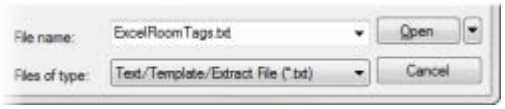
Process: Exporting Excel Attribute Table to AutoCAD

Microsoft Excel can both read and write to a long list of data formats. Despite being able to write to a wide variety of formats, only the .xls/.xlsx formats support all of the features and functions found inside Microsoft Excel. To preserve this functionality the recommended workflow is to save two versions of your Excel Export file; an Excel .xls/.xlsx file, and an AutoCAD readable tab-delimited .txt file. The following process assumes you have already created either a .xls or .xlsx version of your worksheet, and demonstrates how to export this file to a tab-delimited .txt file.

Step	Action	Result
1.	With the Excel table to be imported back into AutoCAD open, start the Save As command inside Excel. 	The Save As dialog opens. 
2.	Change Save As Type to Text (Tab Delimited) (*.txt), and provide a name for your new Block Attribute .txt file. 	A dialog displays warning some features may not be supported in the selected file format. Click Yes.  The Excel document is saved to a tab delimited .txt file.

Process: Importing Excel Block Attribute Table into AutoCAD

Bringing the process full circle, the following will outline the process for importing the data just exported from Microsoft Excel into AutoCAD. Assuming the Object Handle relationship was retained, this process will update each of the block insertions originally exported to reflect the updates made using Microsoft Excel.

Step	Action	Result
1.	On the AutoCAD Ribbon, Express Tools tab ➔Blocks panel; click Import Attributes (ATTIN). 	The Enter Input Filename dialog opens. 
2.	Browse to and select the Tab Delimited .txt file created with Excel. Click Open. 	AutoCAD imports the Tab Delimited .txt file created with Excel into the current drawing.