Autodesk University 2007

Opening the Door to Curtain Walls in AutoCAD® Architecture, Part II

David Driver, President 4D Architects, Ltd.

AB214-3 This class builds on Part I. In this session, you'll learn the appropriate use of overrides and how to add custom blocks to any portion of the Curtain Wall. We'll also build a custom door/window assembly to illustrate the extreme flexibility of this object. A tips-and-tricks section will cover how to use the Curtain Wall objects to create entirely new types of objects such as casework and parking stalls.

About the Speaker:

David is a registered architect, and has worked in architectural firms since 1984. He has experience on a range of projects including civic, commercial, and single and multifamily housing. In addition to ongoing production work, David is a consultant on CAD standards and the implementation of Autodesk Building Information Modeling products. An Autodesk Certified Instructor since 1997, David teaches intensive short courses at several Autodesk Authorized Training Centers throughout the U.S. His continuing practice of architecture guarantees his class will target the common tasks and problems encountered in daily office routines.
david@davidddriver.com

Autodesk®

Introduction and Outline

The Curtain Wall object has been around for years in AutoCAD Architecture (ACA) (Ahhh yes, the software formerly known as Architectural Desktop (ADT)). As with most objects in ACA, the more complex the style the more powerful the object. Last Year, I taught this class as one session. In response to various feedback items, I have split this year's class into two parts. Part 1 (AB210-3 if you missed it and want to download the Lecture notes and dataset) covered the kit of parts and set of rules basics ideas and terminology of a curtain wall. Part II (this class) will add to that information /set of rules methodology to create a door/window assembly from linework that utilizes overrides directly for the definition of the finished product. A brief outline for this class is:

5 minutes	Quick review of kit of parts, set of rules Kit of Parts: Frames, Mullions, Infills, Divisions Set of Rules: Grids and Nested Grids	Curtain Walls and Door/Window Assemblies are the third most complex thing in ACA following the display system and schedules. As such they are extremely customizable. They are a very efficient way to get your design intent into 3D, but are frustrating if you do not understand the basic parts and rules that control them.
10 minutes	Review of creating a curtain Wall from Scratch	Brother/Sister objects to the Curtain Wall Style
15 minutes	Overrides Happen	Different overrides and how to use them effectively including; A Brief development of overrides (why so many ways?). Overrides as part of adding to face of mass object. Direct Overrides by using door/window tool. Right click overrides Vs "do something more grip" (infills, divisions, mullions/frames) overrides.
10 minutes	Customizing Parts	Profiles and custom blocks
15 minutes	Creating a Door/Window Assembly from line work	This exercise leads you through creating a door/window assembly from some linework. While the example is residential in nature, the idea can be applied to curtain walls, or curtain Wall Units as well. This exercise also covers the ever mysterious "Design Rules>transfer to object" function.
10 minutes	Common Curtain Wall Blues	Corners, Schedules, Display and best use issues
15 minutes	Beyond the Storefront: Examples that push the envelope	Glass Block Walls, Stained Glass, Shelving Units, Parking Spaces

Please feel free to ask questions during class. I do have a plan of attack and may ask to defer the question if I think I will cover it later on. Of course if I do not answer a question in class feel free to email me: david@davidddriver.com

Quick review of kit of parts, set of rules

Kit of Parts = Frames, Mullions, Infills, Divisions Set of Rules = Grids and Nested Grids. For basic terminology as well as an exercise that leads you though creating a curtain wall style from scratch, refer to the handout for AB210.

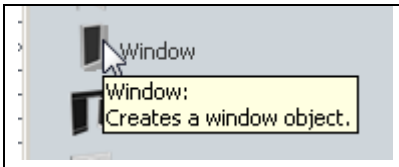
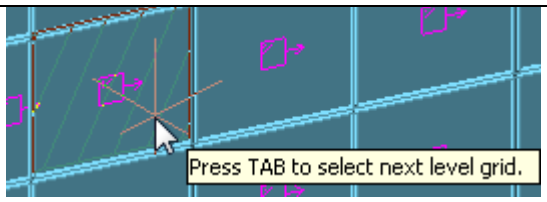
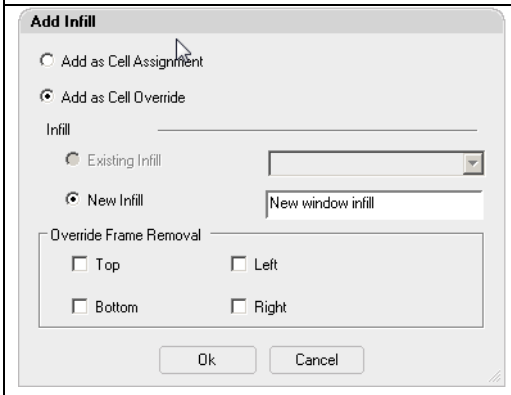
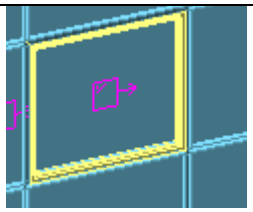
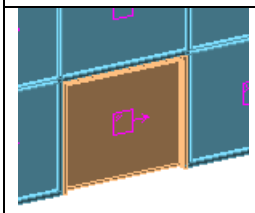
Overrides Happen

A discussion of curtain walls cannot be complete without overrides. There are many ways to override portions of the curtain wall. The reason for the many ways is that the curtain wall object has been around for a long time. As ACA developed, the ways you available to interact and override the curtain wall object developed as well. In more or less historical order:

- Right click overrides
- Direct Overrides by using door/window tool.
- "Do something more grip" (infills, divisions, mullions/frames) overrides.
- Overrides as part of assigning curtain wall to face of mass object.

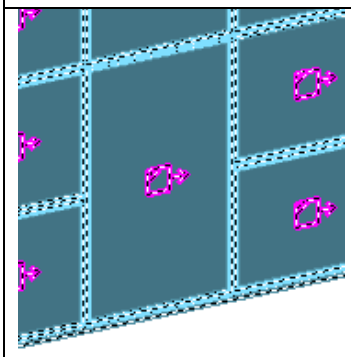
Direct Overrides:

Direct Overrides allow you to add a Window, Door, Door/Window Assembly just use the tool, and then select the curtain wall

<table>
<tr>
<td> 
</td>
<td> 
</td>
</tr>
<tr>
<td> 
</td>
<td> 
Note when you use the tool to add another object into the curtain wall, it creates the infill definition needed for the override.</td>
</tr>
<tr>
<td>  </td>
<td>A door added by the same method will only fill in the available space and will not let you add into 2 cells, the cell must be merged first which brings us to: Right click overrides</td>
</tr>
</table>

Of note, although you can apply a window, door or door/window assembly in this manner, you cannot add in a curtain wall unit like this using a tool palette tool directly.

Right Click Overrides



Utilizing the curtain wall context sensitive right click:

Infill > Show Markers

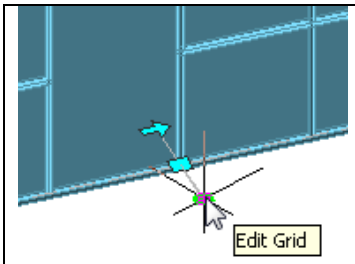
Then

Infill > Merge

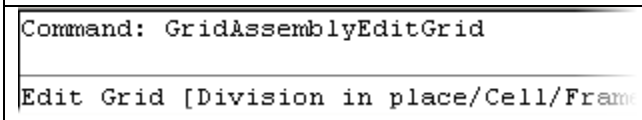
Allows you to create a space within the grid for a door or storefront (Door/Window Assembly)

Combined, the right click infill tools along with the tool palette actions will get the job done many times.

"Do Something More" Grip



Somewhere around about version 2006, the "do something else" grip showed up. While not the official name, this grip appears as a round circle on many of the ACA objects. For a curtain wall, this is the "Edit Grid" grip and will start a session not unlike an edit in place mode (but not really like any other edit in place mode of ACA).



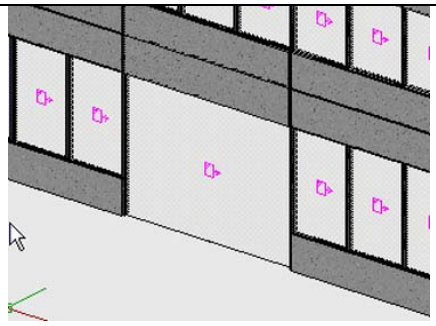
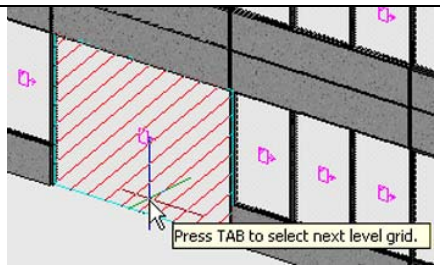
The key is to understand that this is as much a command line session as a graphic one

The Edit Grid mode was one of the last tools developed and has many more options than are available with a right click override. This tool allows you to manipulate the Divisions of the curtain wall in addition to the standard cell and frame/mullion tools available from the right click menu. BE CAREFUL! It is very easy to do a lot of damage to your curtain wall in a short amount of time with this command.

Overrides on Curtain Walls Applied to Mass Elements

Just a note here if you add curtain walls by face to mass elements the entire curtain wall is composed of overrides. Be careful with the "add selected" feature if you are working with this type of curtain wall.

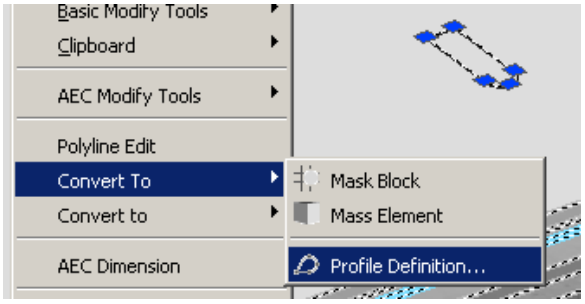
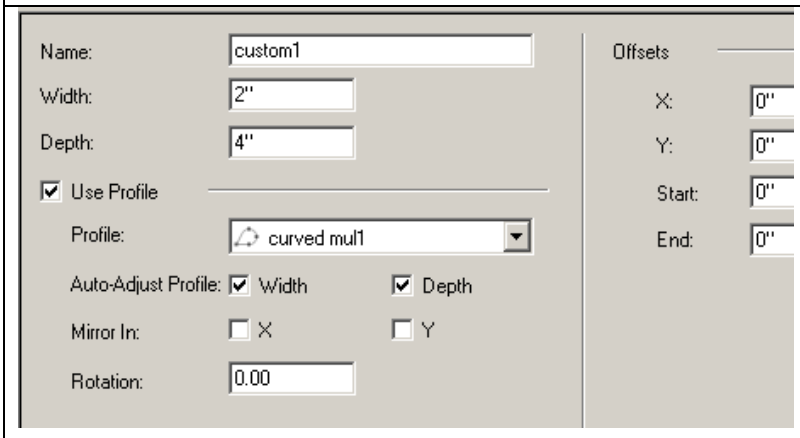
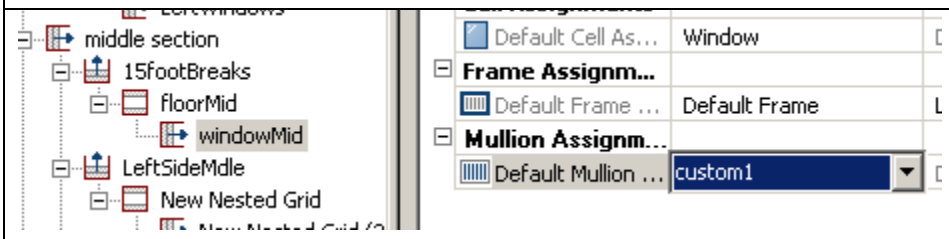
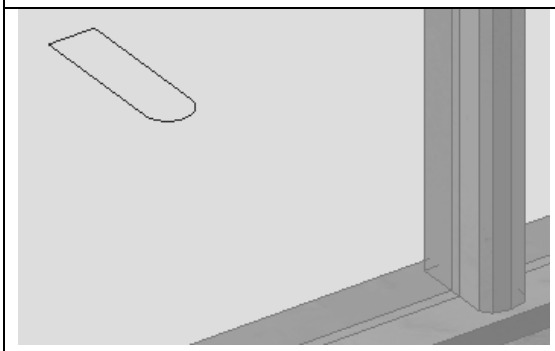
Overrides Exercise: Edit In Place and Overrides on curtain walls:

	Select the curtain wall, right click > Infills > show markers
	Select the curtain wall, right click > Infills > merge
	This may take several merges. Enter thankfully will repeat this command so you don't have to right click many times.
	Using the Door/ Window assembly tool you can now just select this merged cell
	

Custom Curtain Wall Parts

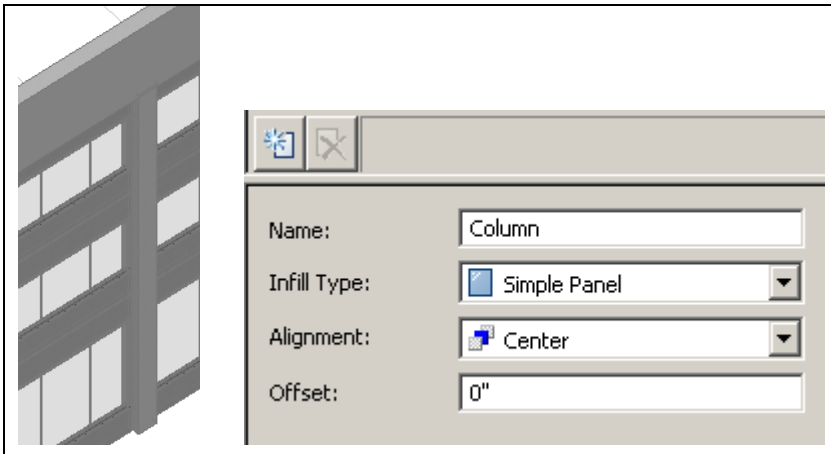
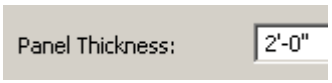
With Profiles and Custom Blocks you can create almost anything with a curtain wall.

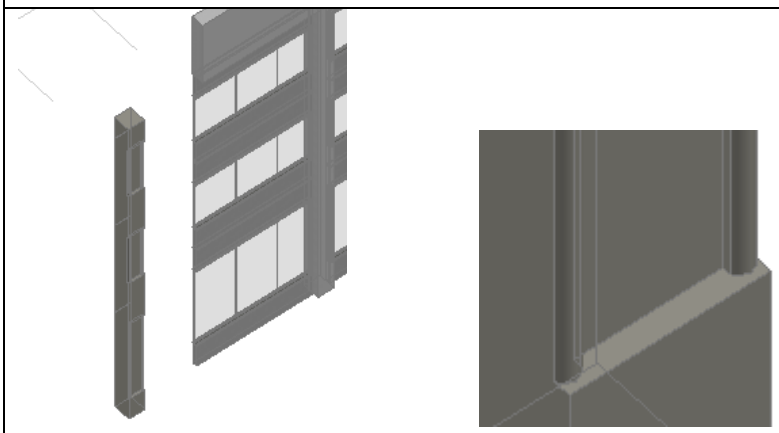
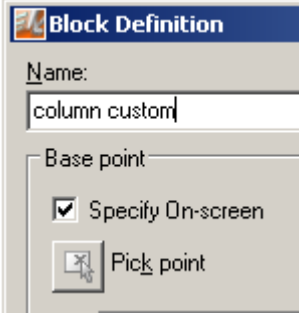
Profiles for mullions and frames

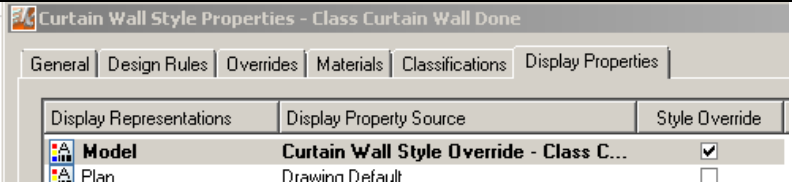
	Draw a polyline and convert it to a profile using the right click menu
	Edit the Curtain Wall Style to define a new mullion or frame
	Assign the mullion to the style or use override.
	

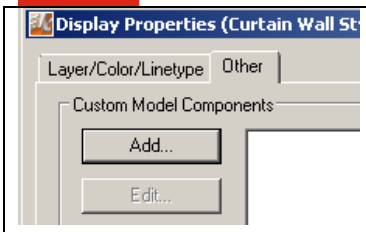
Adding Custom Blocks to a Curtain Wall

Custom Blocks can be used to replace any portion of a curtain wall.

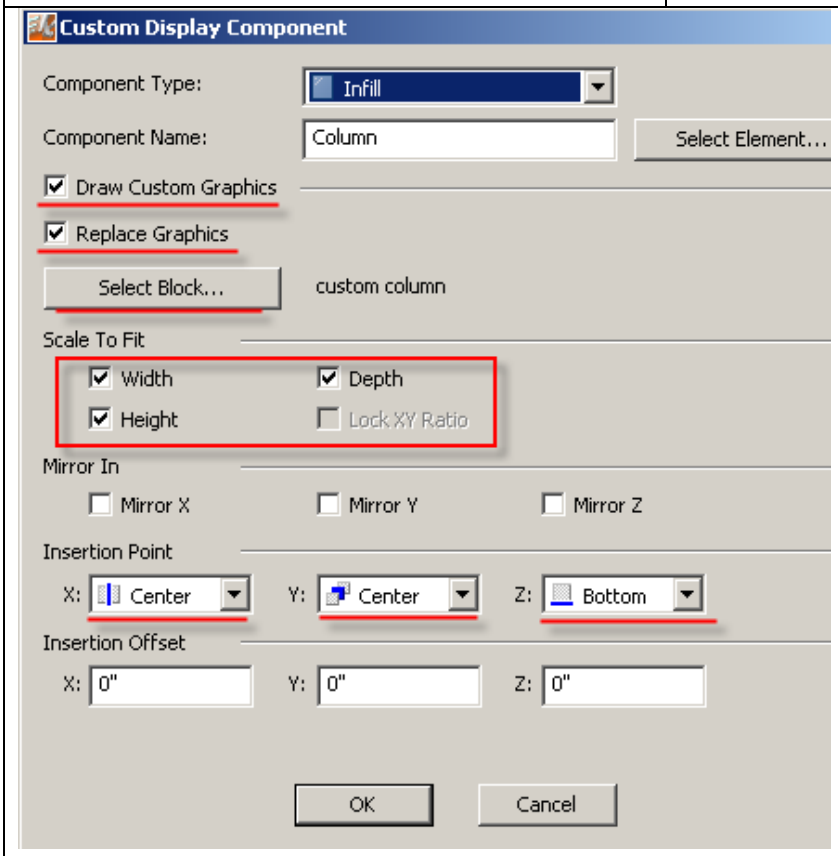
<table>
<tr>
<td> 
</td>
<td> 

In the example here, the columns were originally laid out as an infill called Column.</td>
</tr>
<tr>
<td>  </td>
<td>A single booleaned mass element was created to replace the infill simple panel</td>
</tr>
<tr>
<td> 
</td>
<td>Create a block out of the column

I use the very bottom and center of the column as the insertion point. This makes it easier for me to place the column. Also, I make the column as close to the real size as possible.</td>
</tr>
<tr>
<td> 
</td>
<td>Edit the curtain Wall style and assign a style override to the model representation.</td>
</tr>
</table>

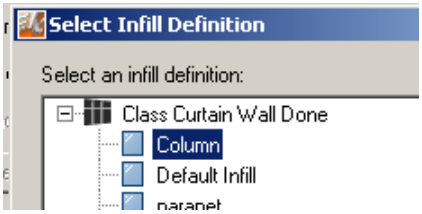


Click the Add Button on the Other tab of the model Display properties



Set the component type to the definition type you wish to replace. (frame, mullion or **infill**)

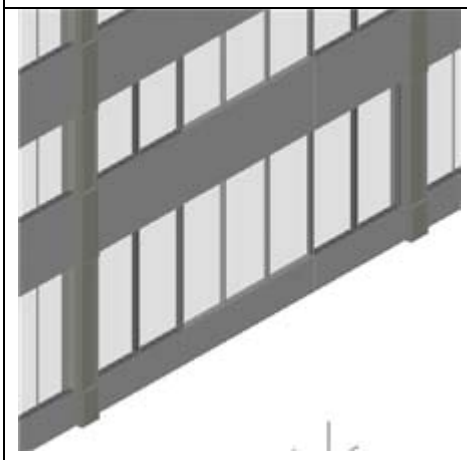
Click the Select Element button and pick the infill definition to replace



Check draw custom graphics to enable you to replace graphics (checkbox) and select the block you just created.

Because I have drawn the column to size I will scale it to fit

The insertion point is all about matching the insertion point of the block you created. Center bottom is how I made my block



The columns are now part of the definition of the curtain wall style

Creating a Custom Window Assembly From Lines with Overrides

This exercise will create a Door Window Assembly as shown in the illustration below.

The finished product of this exercise will look something like this		

I was on the team that produced the Autodesk Architectural Learning Assistant that was part of ACA's release 3.3 cycle. I believe that a similar exercise was published on that CD as part of the ALA, but I do not have a copy any more to confirm this. It is an exercise I work through in my intermediate classes and have been updating it each year a new release comes out. With the added functionality of the last several releases, this has changed substantially from the original 3.3 exercise.

There are 5 general tasks in this exercise.

1) Create the window assembly from the lines

2) Save as a style

3) Create the style's element definitions.

Establish all the different definitions within the style that we need to complete the window assembly. This will entail creating definitions for infills, mullions and frames.

4) Override the parts of the Custom Door/Window Assembly style.

This is the area that has changed most in the last 3 releases. There are now 3 distinct ways to override assignments of a Curtain Wall or Door/Window Assembly Style.

In practice with a small custom assembly like this I will usually just use the right click overrides. However as a teaching tool I will add the steps to utilize the edit in place functions as well as the adding elements directly from the toolbar.

5) Save and write the overrides into the assembly style.

Terminology

Frame (the outer component of the window assembly)

Mullion – Any of the internal divisions

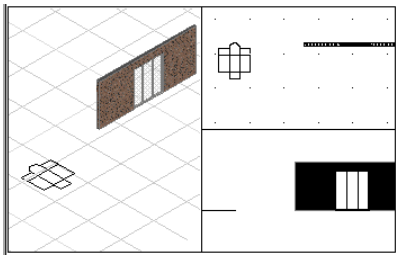
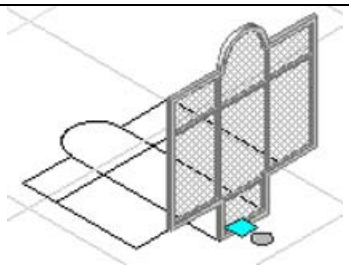
Infill – what happens inside each of the areas formed by the mullions and frames.

RC indicates Right Click access to shortcut menu

[Enter] indicates press the enter key or right click and select enter from the right click menu.

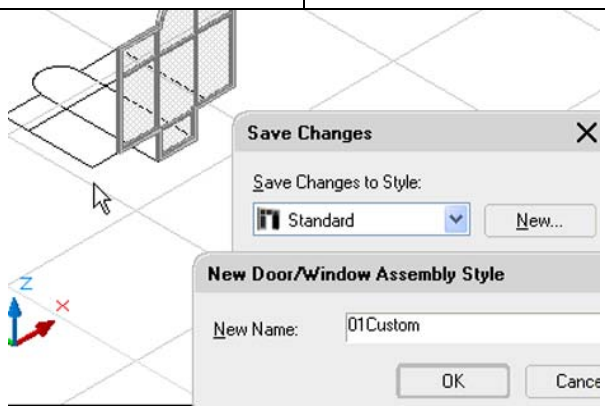
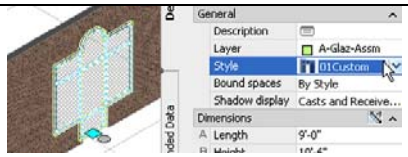
Assembly – Door/Window Assembly

Exercise: Custom Assembly Task 1) Create Window Assembly From Lines:

Step	Image / comments	Comments
Open …\ BD32-2 Curtains Part 2.dwg	This is part of the dataset you can download from www.autodesk.com/auonline Or my own site www.davidddriver.com	This drawing was created with the Aec Model (Imperial Ctb).dwt
This drawing has some elements already within it: Linework from which you will create the assembly style A wall with a standard assembly placed in it with the same dimensions as the Linework (10'-6" high x 9'-0" wide) Some material definitions to use on the style		This drawing also contains the final product of the exercise as a style with the name CustomDone
This drawing has some styles already defined that will be used with the exercise. These Styles will be used as infills overrides for the window assembly.	Windows: WindAssmbly_DBLHung window style with the frame turned off WindAssmbly_Arched window style with the frame turned off	Door: WindAssmbly_SingleFullLight Single Hinged door style with frame turned off
Verify the left viewport of the Exercise Layout tab is current		
On the Design palette, Right click on the door/window assembly tool and select Apply tool properties to>Elevation sketch		
Select the linework in the lower left of the drawing, [Enter] [Enter] [Enter] The assembly is placed in the drawing.		You should now have an assembly in the drawing that looks like this.

YOU ARE IN EDIT IN PLACE MODE! The first thing we need to do is to save this as a new style.

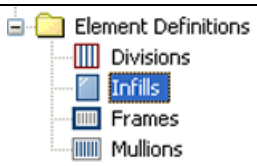
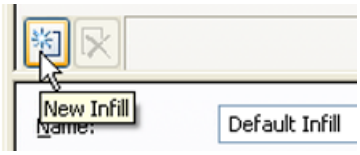
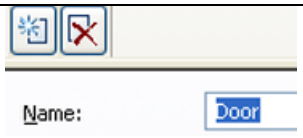
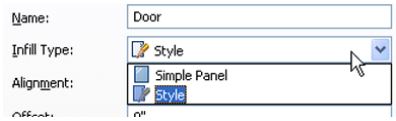
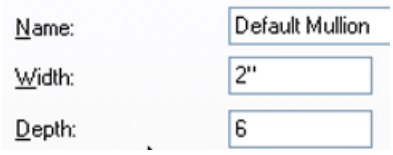
Exercise: Custom Assembly Continued, Task 2) Save as a new style:

Step	Image / comments	Comments
Select the window assembly, RC > Design Rules> Save to style. Pick the new button Give it the name **01Custom** Pick the OK button		
Pick the OK button again.		You should be back in the drawing The window assembly is now a style we can use.
Select the Assembly that is in place in the wall and use the properties to change it to this new Assembly style		

Exercise: Custom Assembly Continued, Task 3) Create the style's element definitions:

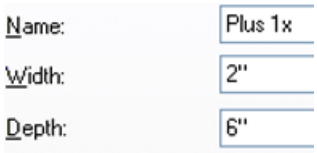
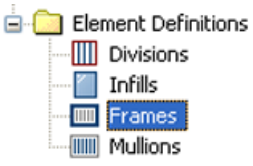
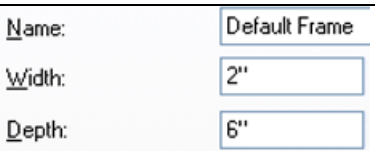
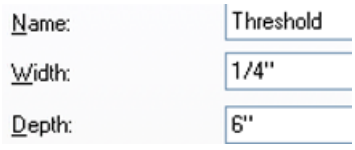
Just as it is when you create a curtain wall style, you create the kit of parts first. It is easiest to do this here also. For this Assembly will need the following for which the steps are provided on the next page:

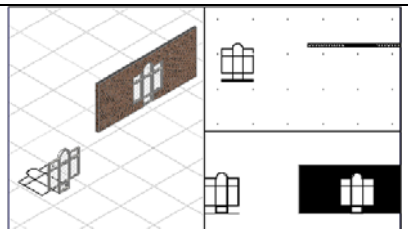
Infills	Mullions	Frames
"Door" based on the door style WindAssmbly_SingleFullLight "SideWindow" based on the window style WindAssmbly_DBLHung If you are ahead of the game, go ahead and create another infill called 'top window' based on the window style WindAssmbly_Arched	A mullion that has a width of 2 and a depth of 6 A Mullion called "Plus1x" with an offset of you guessed it 1" A mullion called "Less1x" with an offset of you guessed it -1" These two last mullions will be used to align the mullions with the frames	A frame called 'threshold' that has a width of .25 and a depth of 6 A frame W=2, Depth=6

Step	Image / comments	Comments
Establish Infill styles		
Select the Assembly, RC > Edit Style		
Pick the design rules tab		
On the left, select the element definition **Infills** on the left		
Pick the new infill icon (midway down below where it says 'default infill') This creates a new infill, give it the name **Door**		
Change infill type to **Style** On the lower right, expand door styles and highlight **WindAssmbly_SingleHung**		
Repeat this creating infill SideWindow based on the window style WindAssmbly_DBLHung		
Establish Mullions		
Select the element definition **Mullions** on the left Change the default mullion settings to: Width = 2 Depth = 6		

Create a new mullion with an offset	The mullions created in this next step will be assigned as an override to the interior mullions to get them to align with the frame.	By default the mullions are center justified and the frame is justified to the outside of the lines used to generate the Assembly.

Note. In general the offsets will work as follows; positive x offset will move the mullion in the positive X direction. If the window assembly is placed backwards in the wall, then these directions will reverse themselves. I know that in previous releases (it may have been a while) the direction of the original line work for assembly would affect this also. I have just become so accustom to drawing vertical lines from bottom to top and horizontal lines from left to right.

Pick the new Mullion icon This creates a new mullion, give it the name **Plus 1x** Set: Width = 2, Depth = 6 and over on the right side, enter 1 for the x offset		
Repeat, creating a mullion Less 1x with a negative x offset of 1" (-1")		
Establish Frame Styles		
Select the element definition **Frames** on the left Change the default mullion settings to: Width = 2 Depth = 6		
Pick the new Frame icon		
Name the new frame **Threshold** and give it a width of .25 and a depth of 6		Note if you wanted to create a threshold that was sloped, you could draw a closed polylines, create a profile and assign the profile to the 'threshold' frame

		definition here
Click OK button to return to the drawing. Save your work.		The frames and mullions changes we made to defaults are reflected in the drawing

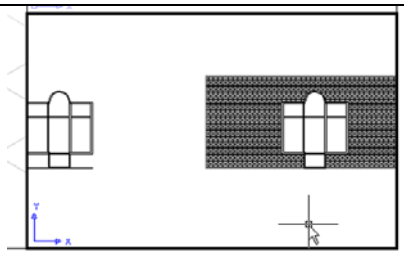
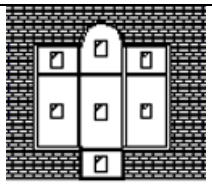
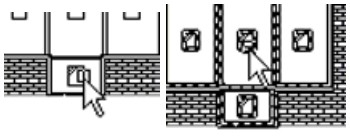
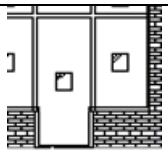
Exercise: Custom Assembly Continued, Task 4) Overriding the parts of the Custom Door/Window Assembly style:

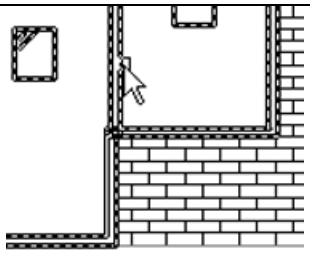
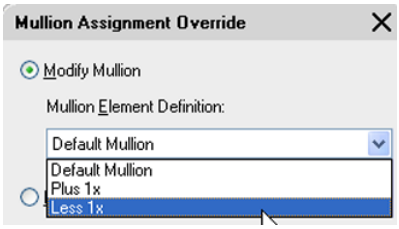
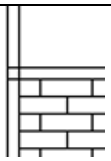
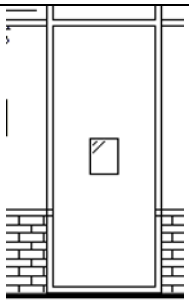
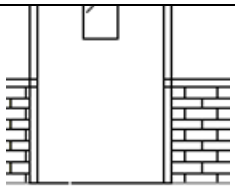
This section is broken down into 3 sub sections to illustrate the different ways of overriding a curtain wall or as in this case a door/window assembly style. These three methods are:

- Using the right click overrides
- Adding styles directly from the tools on the toolbar
- Using the edit in place grip function on these objects

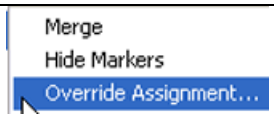
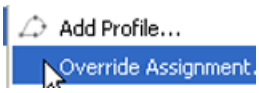
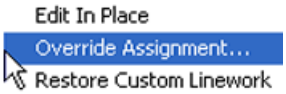
Important! In all of these cases if you are working on a style you will want to transfer the design rules onto the object so that your modifications can be pushed back into the style.

Sub Section 1) Using the right click override to merge cells and change the mullion assignments

Step	Image / comments	Comments
Merge the cells for the door		
Make the right lower viewport active Select the assembly RC > Design Rules > Transfer to Object		
In the right side viewport Select the window assembly RC>Infill>Show Markers		Markers will appear in the cells of the assembly to aid you in selecting a cell to merge or override
Again from the assemblies right click menu select Infill > Merge Click the lowest cell (Cell A) Click the cell in the center (Cell B)		 The two cells are now merged, creating a space to put the door
Change the mullion assignments		

Again from the assembly's right click menu select Frame/Mullion> Override Assignement Click the right inner lower mullion		
Select the Less 1x definition from the drop down		 The mullion definition is replaced with the definition you created in the first part of this exercise.
Repeat for the left side using the Plus 1x mullion Repeat the process for the two vertical mullions above the door		The frames and mullions on each side of the door are now aligned
Repeat this process one more time and replace the bottom frame with the threshold definition		

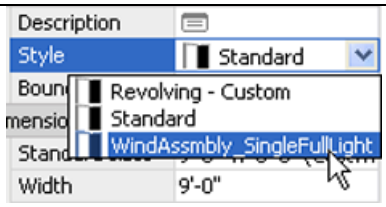
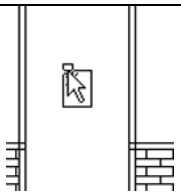
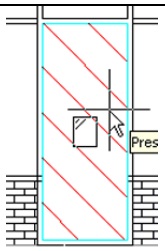
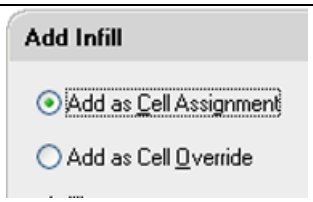
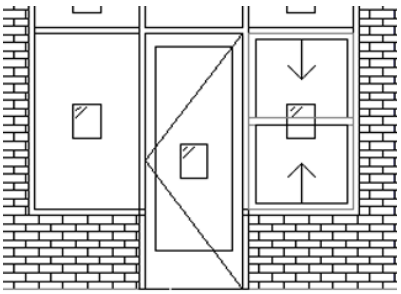
The right click menu of a curtain wall, unit or door/window assembly allows you to directly override definitions of these objects in the drawing. You could complete this exercise using only the Right click override functions:

Right Click>Infill>	Right Click>Frame/Mullion>	Right Click>Division>
		

However, because this is a learning experience we will add the door by using the door tool instead.

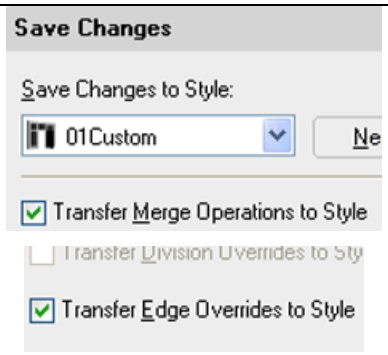
Sub Section 2) Adding a door with the door tool.

Step	Image / comments	Comments

Click the standard door tool on the design palette		
In the properties change the door style to WindAssmbly_SingleFullLight		
Click the window assembly		
Click the cell marker in elevation where the door is to be placed		
Click Add as Cell Assignment.		Note that this bypasses our definition defined in the style. We could override that existing definition if we wished.
Repeat this process and add a window of the style WindAssmbly_DBLHung to the right side of the assembly		 The object we have been working on has all the overrides. Any other objects of the same style will NOT have these overrides in place.

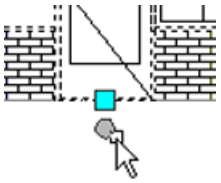
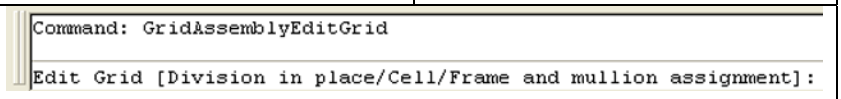
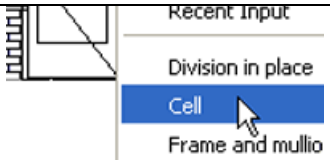
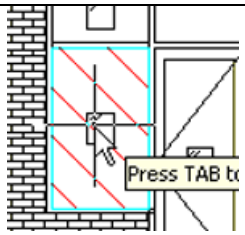
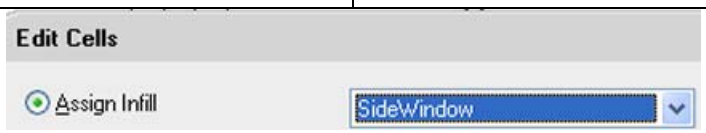
TIP: The dialog box that appears when you add a style based tool also is a handy frame removal tool when used for placing Assemblies in curtain walls (storefront in a curtain wall).

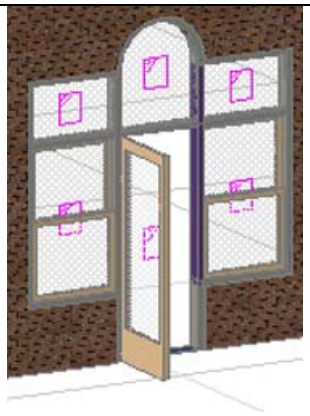
Before move on to using the edit in place grip, it is important to now transfer these overrides back into the style.

Select the Assembly RC > Design Rules > Transfer to style Check all available check boxes Click OK		

Sub Section 3) Edit In Place.

The last section looks adds the remaining window using the Edit in Place grip

Step	Image / comments	Comments
Select the assembly in the right lower viewport		Do NOT pick on the door or the window, pick on a frame or cell marker of the assembly.
Click the round grey grip that appears at the bottom of the assembly.		You are now in the Curtain Wall-DoorWindowAssembly edit in place mode. Unlike many of ACA's edit in place mode this is very command line or right click driven.
Note the command line options		
Right click and click Cell		
Click the window area on the left		
Click Assign Infill and use the drop down to select SideWindow		

Click OK		
Done!		

The downloadable dataset has a drawing with the completed style in it.

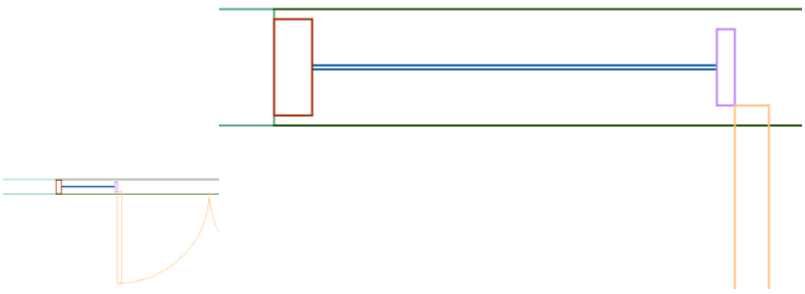
Etcetera:

After you add doors and windows, the door and window will be accessible directly in the drawing. When you right click on a door, you will not get the window assembly shortcut menu. Make sure you select the window assembly not a door or a window after they are added.

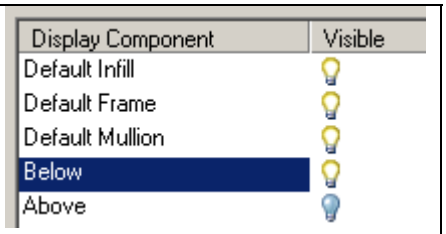
Do not mix and match editing in place (grip) with overriding. Remember to save your changes back to the style before you edit in place

Common Curtain Wall Blues

The sill plan does not look right (door/window Assembly)

	By default, the sill representation is turned on. The cut plane will only show at cut height default of the display configuration

Turning off the Sill display in the style's display properties

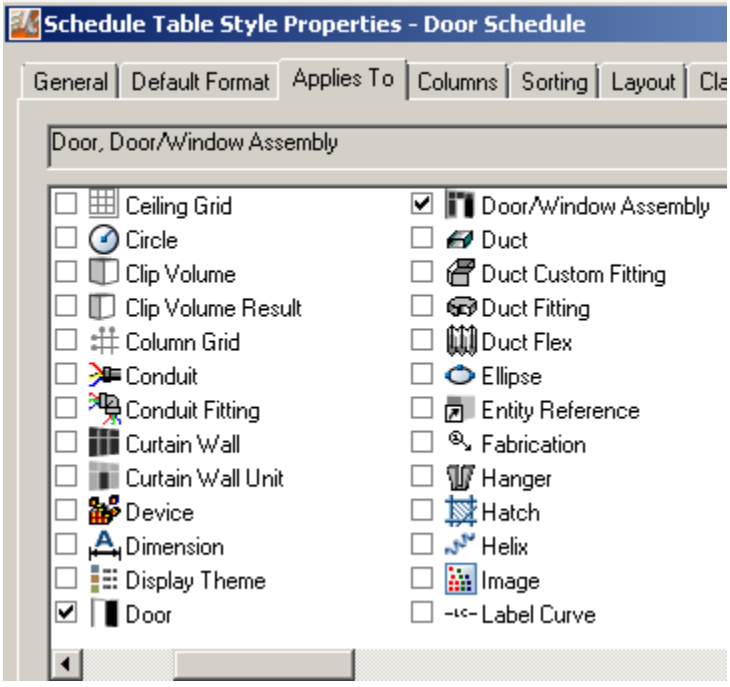


In the Plan representation, turn on the "Below component

Finished representation (OK this is one of the out of the box so no comments on the frame and mullion widths pleas)

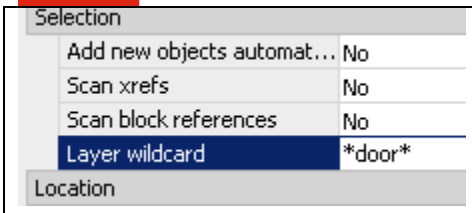
My schedule shows not only the doors, but all the door/window assemblies as well.

The default door schedule will find both doors as well as door/window assemblies. Either:



1) duplicate the door schedule style and tell it not to do that (uncheck door/window assembly in the style).

Or

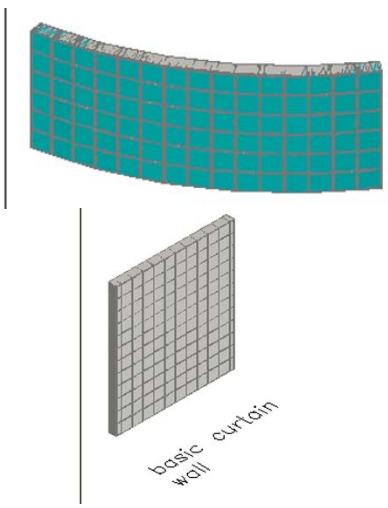
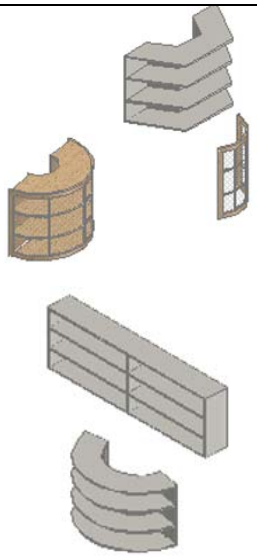
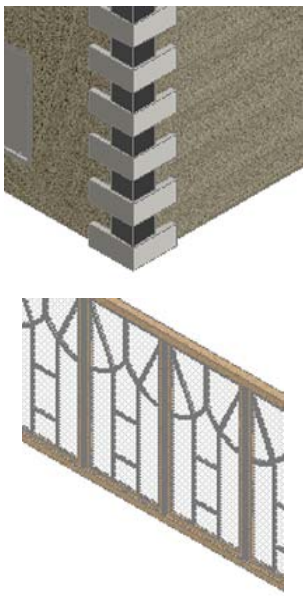
	2) Filter the schedule in the properties to only show *door*. Door/window assemblies by default are placed on layer A-Glaz-Std-Assm. And will not be shown in the schedule.

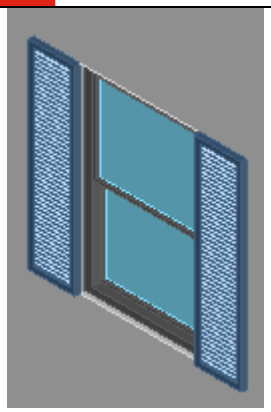
My Curtain walls do not miter.

The right click tool set miter angle not miter the vertical components. Instead create a new frame on one (either square, or a mitred one using a profile). Override both edges as needed.

Beyond the Storefront: Examples that push the envelope

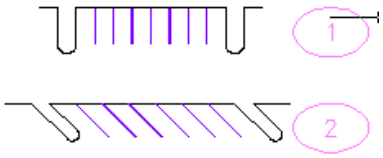
Most of the examples here were gleaned from other sources including the newsgroup and Autodesk's Style downloads.

		
Glass block curtain walls	Shelving units Downloaded from newsgroup, I forget who posted these, if it was you, email me and I will put your name here!	Chad Ames' quoins and stained glass window



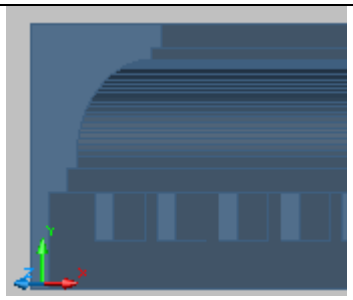
Window Shutter: John Herridge

Parking Count Schedule	
RowNumber	No. of Spaces
1	8
2	7
	15

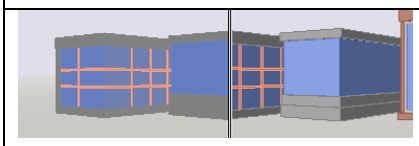


Parking Stalls:

John Herridge, AIA



Cornice: John Herridge, AIA



Corner Condition: Chad Ames

Remember to Think outside the box, and thanks for attending my class!!!

This document and dataset will be available from

www.autodesk.com/auonline or my own site www.davidddriver.com

If you have questions or comments, feel free to email me david@davidddriver.com