Architectural Desktop 4 - **Development** Guide

PART 5
CURTAIN WALLS

Contents:

---

1 Curtain Walls Access

Curtain Walls Toolbar
How do I get this toolbar?
You can also acquire access to these commands from the Alternate Design pull-down menu. From the **Design** pull-down menu, pick **Curtain Walls >** and cascade to the right for commands.

Curtain Walls pull-down menu

Alt.Menu **Design> Curtain Walls>**
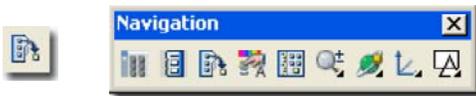
Keyboard **CurtainWallAdd**

Mouse

Links **Adjusting to the New Interface for AutoCAD and ADT Users**- for how to activate the Design pull-down menu
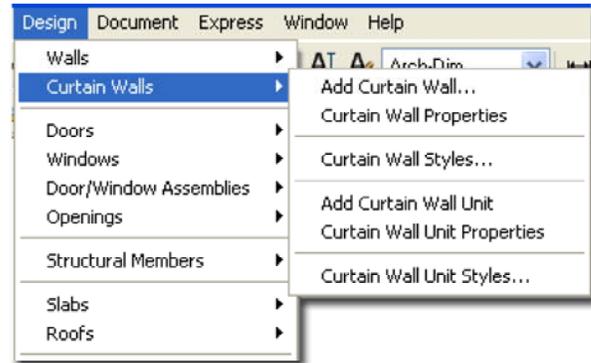
The mother of all Grids in ADT is the Curtain Wall Object. Users all over the world are finding new ways to employ this tool for things I am sure the programmers never dreamed of. I have even attempted to produce a suite of parametric furniture but due to display limitations for this Object Type, these currently only work in 3D Views.

The Curtain Wall Object is a sophisticated grid tool designed to work much like a Wall Object and thus does not support horizontal grids. Though you can rotate a Curtain Wall so that it matches any plane in space, such as Roof Planes, getting it to display correctly in Plan is rather difficult and sometimes impossible - but don't let that stop you from trying. Within the **Grid** you have a spaces called **Infills** (Cells) that can in turn hold other Objects such as **Curtain Wall Units**, **Door/Window Assemblies**, **Doors** and **Windows**.

Illustrated to the above I show the alternate Design pull-down menu for Curtain Walls and to the left I show the Content Browser to remind you of where to look for predefined Curtain Wall Styles. Since there really aren't very many predefines styles and since it is highly unlikely that your design criteria has been configured, just dive in and learn how to create your own Styles.

You can convert a Wall object into a Curtain Wall object.

Below is the main command line read-out for this tool:

Command: **CurtainWall**
Curtain Wall [Add/Convert/Reference/Modify/Properties/Styles/Interference]:

You can also specify the option that you want; such as **CurtainWallAdd** or **CurtainWallStyles**

---

2 Loading Curtain Wall and Curtain Wall Unit Styles

Opening Curtain Wall Styles in the Style Manager

Menu   **Design> Curtain Walls> Curtain Wall Styles...**

Keyboard   **CurtainWallStyle**

Links   **Copying Wall Styles in the Style Manager** - for information on how to drag-n-drop styles

Curtain Wall Styles - for how to create and work with.

Curtain Wall Unit Styles - for how to create and work with.

The first subject we will cover is how to get other ADT Curtain Wall Styles than "Standard". On a local installation of ADT you should find, within the ADT folder, the following sub-folder structure (see image below left).
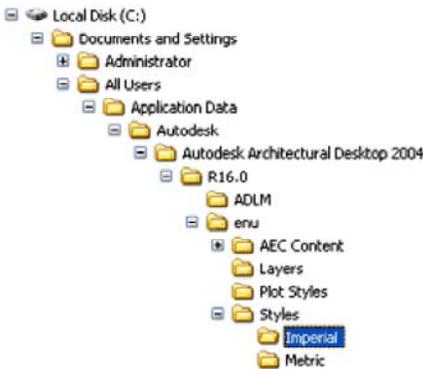
Both the **Imperial** and **Metric** folders contain similar **Styles** folders within which you will find one Curtain Wall Style drawing file.

On a Network based installation of ADT, these Curtain Wall Styles should be on a captured drive (like "G:\offices standards") or similar location with a similar folder structure to that illustrated left (Content >> Imperial >> Styles >> **Curtain Wall & Curtain Wall Unit Styles (Imperial).dwg** or **Curtain Wall & Curtain Wall Unit Styles (Metric).dwg**). In a very customized office scenario, this file may not even be present and others may have been designed for the wall styles your office prefers (in this case, see your CAD manager).
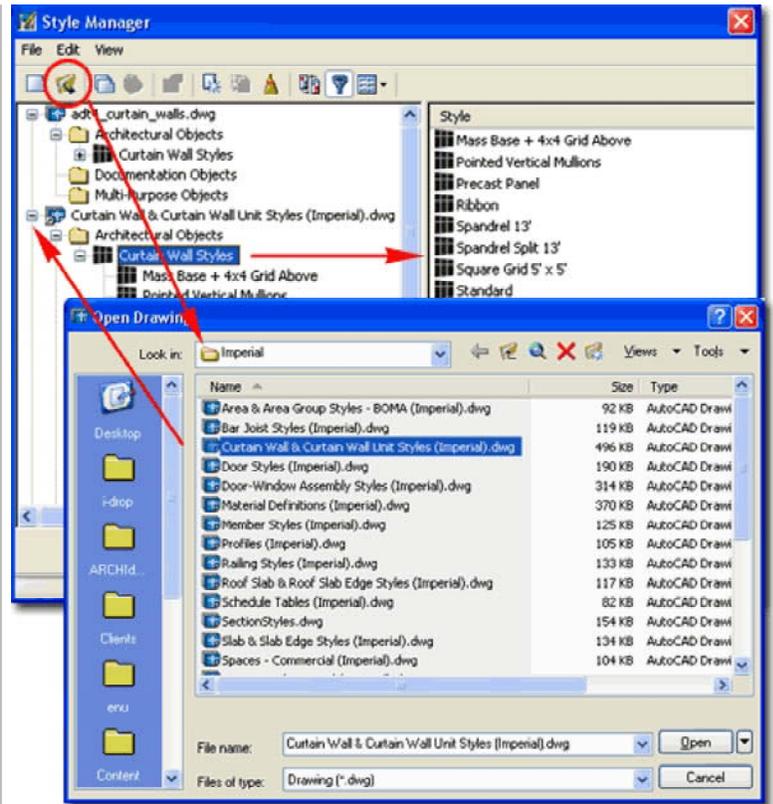
Illustrated above, I show how you use the **Style Manager**, filtered for **Curtain Wall Styles**, to **Open** one of the Curtain Wall Style files from ADT's **Styles folder**. The process is much like Opening a drawing for editing.

Curtain Walls - Overview of Structure

The **Curtain Wall** object is arguably the most complicated object in ADT. One of the reasons I feel that I can safely state this is that a Curtain Wall can incorporate nearly every aspect of Architectural Desktop. It employs everything from Automatic Layer Keying, unique Display Representations and a complex Style Structure to an open door for customization that allows you to associate nearly every other form of ADT object within it. It is, in the simplest terms, a Matrix.

To begin understanding this object, my advice is to first visualize it as a **2 dimensional grid in 3D space**; in other words, a grid standing up in the Z-axis instead of lying in the XY plane. In its most simple form, it can be a single **Frame** with one **Cell** inside. The complexity comes from adding more Cells, altering those Cells and nesting other objects within those Cells as Infill, but at all times, the Curtain Wall is still a single Frame. If you draw a Curtain Wall one unit long or 100 units long, there is still only one Frame there.

CURTAIN WALL MATRIX

TOP

INFILL

MULLIONS

FRAME

RIGHT

LEFT

CELLS

BOTTOM
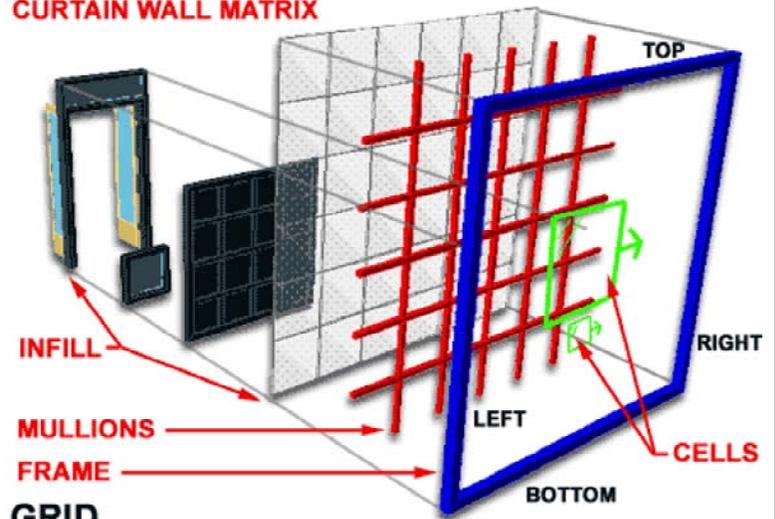
GRID

PRIMARY	DIVISIONS	HORIZONTAL #
	CELLS	SECONDARY GRID
	FRAMES	SIZE / POSITION
	MULLIONS	SIZE
SECONDARY	DIVISIONS	VERTICAL #
	CELLS	INFILL
	FRAMES	SIZE / POSITION
	MULLIONS	SIZE
TERTIARY ...		

3 Adding Curtain Walls

Add Curtain Walls Properties Palette

Alt.Menu **Design> Curtain Walls> Add Curtain Wall...**

Keyboard **CurtainWallAdd**

Links

STANDARD CURTAIN WALL
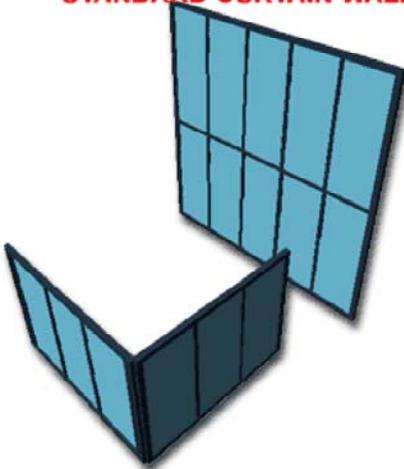
The **Add Curtain Walls** dialogue box is such a deceptively simple interface that you may think that the controversy over them is without warrant. In fact, it appears easier to use and comprehend than the Add Walls dialogue box but that is because the majority of the complexity and work lies behind the scenes; within **Curtain Wall Properties** and **Curtain Wall Styles**.

Once you have loaded your Curtain Wall Styles, you can begin to **Add** them. On the **Add Curtain Walls** dialogue box, use the **Style** drop-down list to pick your style.

Height - total height for your Curtain Wall. This is an interesting topic that I have to work with for some time before providing more advice.

Currently, if you decide to build an entire face of a high-rise with one Curtain Wall, you will be encounter problems if you intend to break that Curtain Wall up for each floor. I have decided to see it two ways: one is a Curtain Wall for Design Study and the other is one that is used for each floor and each file with a height equal to each floor. I use Xref's to bring all of the floors together. If **Height** is red then your typed in value is higher or lower than what has been set by the style; if **Height** is blue, then the typed in value is equal to the value set by the style and if **Height** is black, then the Style has no preset value.

Straight - pick points just as you would with a line or a regular Wall object. If you Start and Stop in a linear path, the Curtain Wall does not glue together as one so you will end up with a series of Curtain Walls. This may or may not be desirable.

Curved - pick a base point, a second point where you want to "pull" the curved Curtain Wall through (like the midpoint of an Arc) and then pick the last endpoint. This can be tricky to control and it is often easier to use an Arc that you Convert into a Curtain Wall.

Adding Curtain Walls - Examples

ADT CURTAIN WALL STYLES
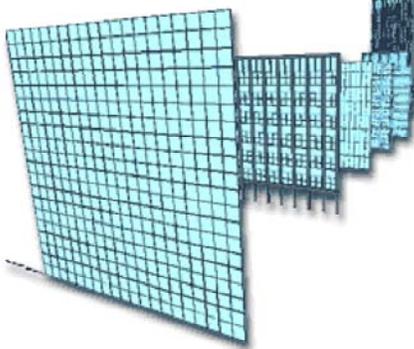
You can open the **Curtain Wall & Curtain Wall Unit Styles (Imperial).dwg** or **Curtain Wall & Curtain Wall Unit Styles (Metric) .dwg** to see ADT's full set of Curtain Wall Styles as illustrated left. Opening this file and using the 3D Orbit tool to view it in Shaded mode will be a good test to see how your machine and graphics card will handle working with Curtain Walls.

Though ADT's Curtain Wall Style have been designed to span several floors at one time, this is not how we have been using them; primarily because we work with floors as separate files and Xref them together to create the full model (when needed). If you attempt to create a full high-rise model with one curtain wall, there is no way to break it up automatically for each floor. Therefore, you can think about Curtain Walls as serving two primary functions: as a full height massing study element and as a highly detailed floor height (one floor at-a-time) element.

DRAWING CURTAIN WALLS
...IT'S MUCH LIKE DRAWING WALLS BUT WITH ADDED COMPLEXITY

Since Curtain Walls can prove to be rather complex and difficult for people to get going with, we have found that allowing users to simply create a regular Wall object first and then converting it later, keeps a job going without early interruptions. As you can see from the illustration above, even the "**Standard**" Curtain Wall Style can cause project delays due to simple, but complex, matters of mullion spacing and corner cleanup issues.

4 Converting to Curtain Walls

Converting Walls to Curtain Walls

Menu   **Design> Curtain Walls> Convert Wall to Curtain Wall**

Keyboard	**CurtainWallConvertWall**
Palette	Select Curtain Wall on Palette, right-click to Select [Apply Tool Properties To](#) and cascade over to Layout Grid.
Links	[Wall Styles](#) - for information on how to create a wall style.

CONVERTING WALLS TO CURTAIN WALLS
ONCE A CURTAIN WALL STYLE IS DEVELOPED, CONVERSION IS EASY

UNIQUE WALL STYLE CREATED TO CONVEY CURTAIN WALL CONCEPT FOR DEVELOPMENT LATER ON IN PROJECT.
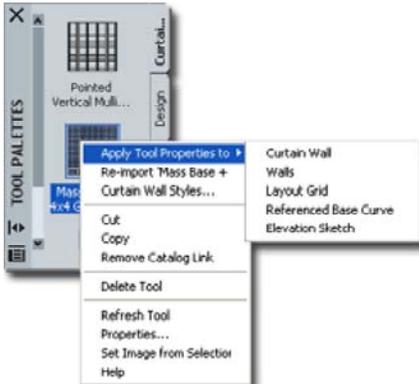
Converting Walls to Curtain Walls is so painless a process that I highly recommend this approach during project development. Since Curtain Wall Style design can be such a time consuming process a designer can often get caught up in something that isn't as important as it appears. For some drawings, a slightly modified Wall Style could probably serve as a curtain wall (especially if elevations are not going to be derived automatically).

Illustrated to the right, I show a single floor of a high-rise in early development phase. The core and some offices have been roughed out but now tests need to be done on a true Curtain Wall System. Originally, a simple **Wall Style** had been used to create the Curtain Wall but now refinement can take place by using the Convert Wall to Curtain Wall routine. When you convert Walls, you will be asked two important questions: **baseline alignment** and "**erase layout geometry**". You will also, of course, be asked which Curtain Wall Style you want to use.

Curtain wall baseline alignment [Left/Right/Center] <Baseline>: - it is obvious from these four options that you can justify according to one of them, but the question is which one. My tests, though inconclusive, show that it doesn't matter because the conversion process reads the original justification of the Wall being converted.

Erase layout geometry? [Yes/No] <N>: - this seems like a simple enough option but if you do Erase your geometry and you want it back for future conversions when testing other Curtain Wall Styles, you will have to create these walls again. My suggestion is that if you anticipate lots of curtain wall testing, keep this set of walls on another layer and simply turn them off.

Note:
On this particular exercise we discovered two major problems that you may want to know about.

1) In working with curved **Walls**, Doors and Windows will have significant problems justifying correctly if they happen to land right where curved wall segments join. You can try the [**WallJoin**](#) command but we still have not found an adequate solution for this problem.

2) In working with curved **Walls** and **converting** them to **Curtain Walls**, you may find that Mullions and Frames do not line up correctly despite any efforts made to correct this problem in the Curtain Wall Styles. We have yet to find an adequate solution for this problem.

Converting Linework to Curtain Walls

Menu	**N.A.**
Keyboard	**CurtainWallConvert**
Palette	Select Curtain Wall on Palette, right-click to Select [Apply Tool Properties To](#) and cascade over to Layout Grid.
Links	[Convert Linework to Window Assembly](#) - Part 6, Section 7 - for an example of how this method works with Window Assemblies.

To convert Linework into a Curtain Wall, all you have to do is draw the elevation lines for the **Frames** and **Mullions** using **Lines**, **Arcs**, **Plines** and even **Circles**. When drawing the frames, ADT will convert the lines for frames by interpreting them as the exterior edge (not as centerlines) When drawing the mullions, ADT will convert the lines for mullions by interpreting them as the centerlines. Though this may seem like one of the easiest and fastest methods for creating custom Curtain Wall Styles, it is actually a rather horrible offering because the end product is virtually unchangeable. As a Style, you will find the Primary Grid uses your linework as a "Custom Grid" that you cannot modify.

Note:

CONVERT TO CURTAIN WALL LINEWORK

CURTAIN WALL WILL BE CREATED DIRECTLY ON TOP OF LINEWORK SO ROTATING UP MAY BE REQ'D.

MULLIONS
FRAME
CENTER LINES
LINES, POLYLINES, ARCS AND CIRCLES
EXTERIOR EDGES

Though you can modify the Infill, Frames and Mullion sizes and even use Overrides for other types of modifications, I think it best to see this option as one you use when desperate for a solution.

When you have converted linework to a Curtain Wall, the **Design Rules** are automatically set to the **Object** instead of a Style. To Save the New Curtain Wall as a Style, use the **Save to Style...** context menu option and create a New Style Name.

Converting Layout Grids to Curtain Walls

Menu	**Design> Curtain Walls> Convert Layout Grid to Curtain Wall**
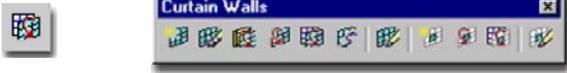
Keyboard	**CurtainWallConvertGrid**
Palette	Select Curtain Wall on Palette, right-click to Select Apply Tool Properties To and cascade over to Layout Grid.
Links	Convert Layout Grid to Window Assembly - Part 6, Section 7 - for an example of how this method works with Window Assemblies.

Links	Modifying a Layout Grid - to learn how to use the Manual option for setting the gridline spacing.

To convert a Layout Grid into a Curtain Wall, you simply need to create a Layout Grid and then use it as a guide to form how you want your Frames and Mullions with respect to dimensions and proportions. This is similar to the technique of using linework, as discussed above. See the discussion for **Converting Layout Grids to Window Assemblies** for more information.

Referencing Curtain Walls

Menu	**Design> Curtain Walls> Reference Curtain Wall**

Keyboard	**CurtainWallReference**
Links	

The Reference Curtain Wall tool provides you with a way to derive a Curtain Wall from a simple object like a Line, Pline, Arc or even a Spline. The term Reference can be misleading when in fact all you are doing is using the simple object shape as a path to form the Curtain Wall Style off of. This tool is similar to Converting Walls to Curtain Walls, discussed above.
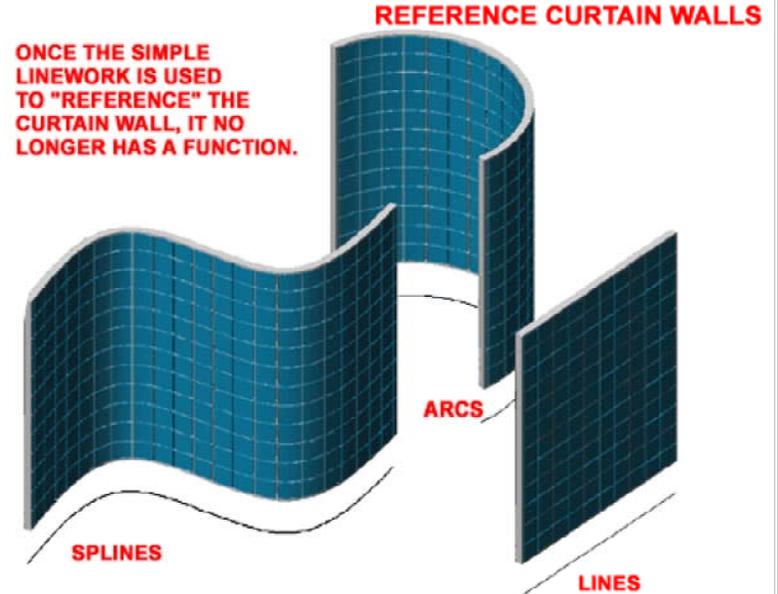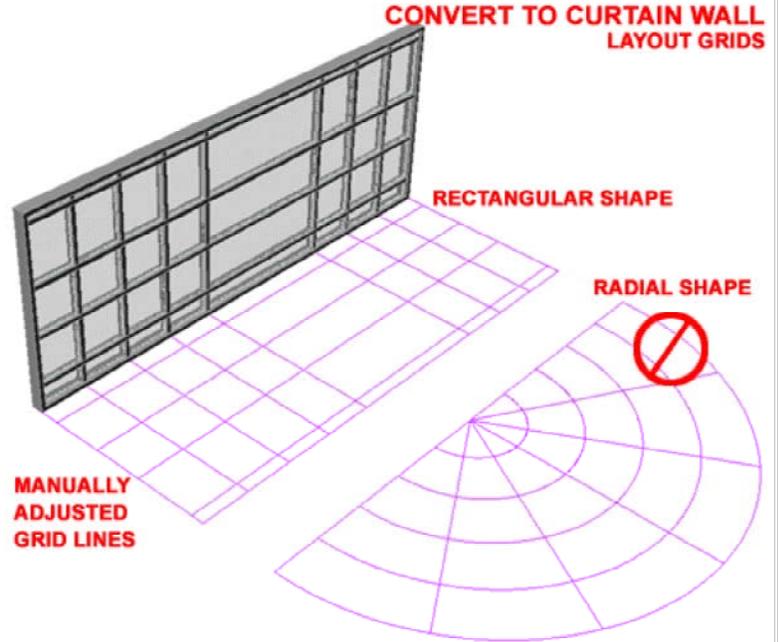
5-5 CURTAIN WALLS

5 Modifying Curtain Walls

Modify Curtain Walls Properties Palette

Alt.Menu **Design> Curtain Walls> Curtain Wall Properties**
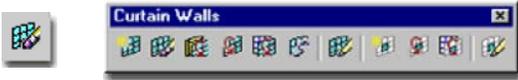
Keyboard **CurtainWallProps** or -CurtainWallModify

Links [Tools](#) - for how to set miter angles automatically by selecting two curtain walls.

The **Modify Curtain Walls** tool opens a dialogue box almost identical to the Add Curtain Wall dialogue box. You can change the **Style**, change the **Height** or use the Properties button to access more advanced options to change.

For more extensive editing options, use the **Properties** button on the Modify Curtain Walls dialogue box - see illustration, right.

DIMENSIONS

A - Base Height - this value can be very confusing if you look at the image on this dialogue box (**A**). In most cases, the measurement reflects the same height as you would expect from a Wall object; from base to top (bottom of frame to top of frame). There is an option on the **Defaults tab** of a **Curtain Wall Style** to create **Offsets** for a Curtain Wall where **A - Base Height** can then become a value between these Offsets - see Curtain Wall Styles - Defaults tab.

B - Length - this value represents the total length of a contiguous curtain wall segment and can just as easily be Stretched with Grips or the Stretch command.

C - Radius - this is the radius value for curtain walls that have been drawn with the Curved option. Unfortunately, once a segment has been drawn, you cannot change it to a curved segment and that is why you may find this value field unavailable.
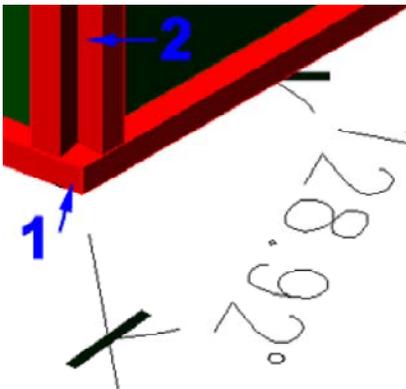
D - Start Miter Angle - the two miter angle options will accept both positive and negative values, so if you see your miter cut going in the wrong direction, try the opposite angle value. The miter angle only applies to the top and bottom Frame components and thus will not automatically cut the right or left Frame or any Mullions or other components within a curtain wall. To create mitered glass, you have to remove the right and/or left Frame component. To miter the right and/or left Frame component, you have to create a right and/or left Frame component that is already mitered (usually done with a **Profile** Style).

E - End Miter Angle - see comments for Start Miter Angle, above.

Curtain Wall Properties - Overrides tab

Links [Cell Overrides](#) - for how to make them manually

Depending on the type of Curtain Wall Style you are working with and the types, if any, of Overrides that may have been done to your Curtain Wall Style, you may or may not have any Overrides on the **Overrides tab** of the **Curtain Wall Properties** dialogue box.
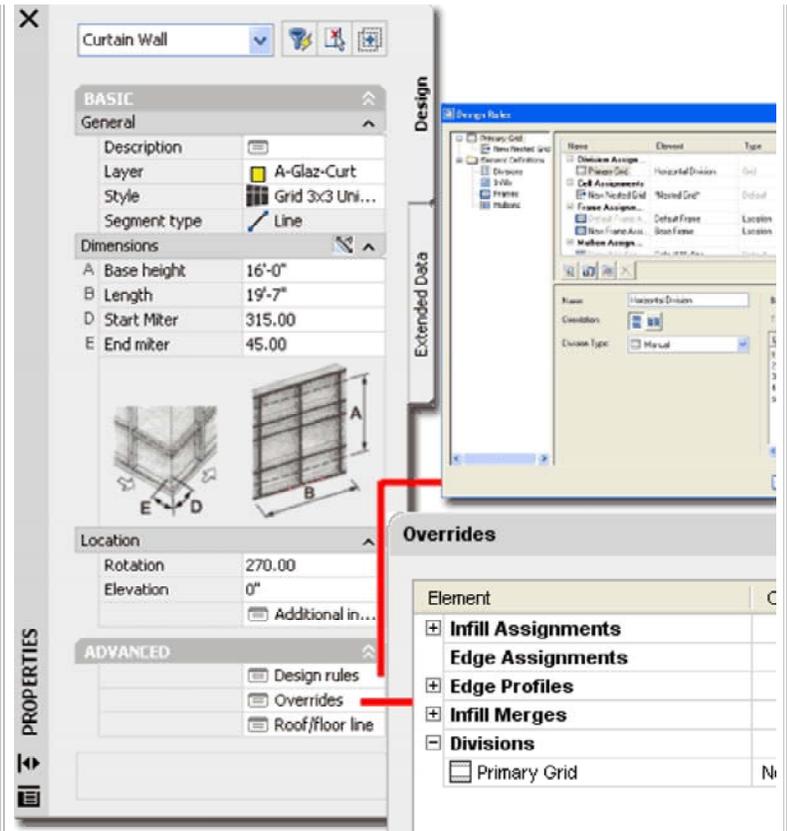
1. In the illustration to the left, I show that in complicated situations you will have to calculate the miter angles to make the top and bottom frame components meet correctly. If you don't calculate this value, you will either see a gap or overlap.   Also, remember that in a case as illustrated, one angle is positive and the other is negative (128.92 - 90 = 38.92 and -38.92 = 328.08) .

2. The really frustrating thing you may encounter is that this miter work does not affect the Vertical Frame components (those that you actually see in Plan view so you will have more work to do on them).

Hot Tip
Use the **"GridAssemblySetMiterAngles"** command to automatically calculate the miter angle between two adjacent Curtain Walls. You can also acquire access to this tool on the object specific pop-up menu.

OVERRIDES Illustrated to the right and left, I show a few simple **Overrides** and how they were created using the Overrides tools from the **object specific pop-up menu** (select and right click) . I also show that I prefer to work with **Cell Markers** turned on.
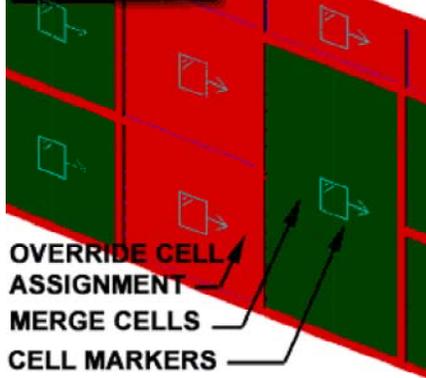
Once you have performed some simple Overrides, like **Merging** and changing **Cell Assignments**, you will see these changes on the Overrides tab, illustrated to the right. Some of these Overrides can not only be removed here with the **Remove** button, but you can actually make other changes to existing Overrides (see drop-down menu for Cell Assignments, right).
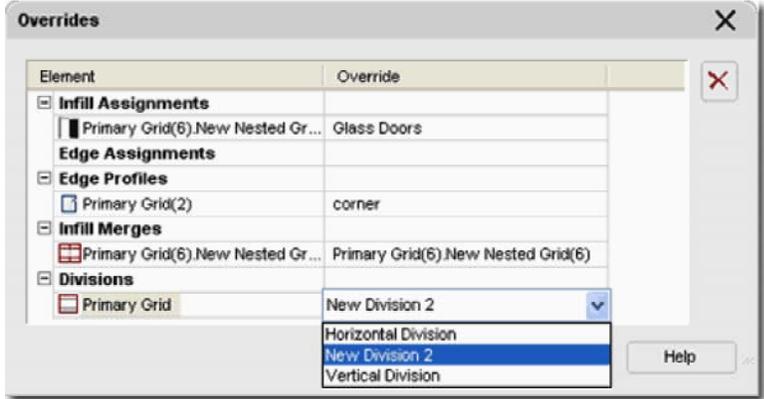
Curtain Wall Properties - Roof/Floor Line tab

Links   [Roof/Floor Line tab, Walls](#) - for more information how these options work.

On the Roof/Floor Line tab of the Curtain Wall Properties dialogue box, you will find the same set of tools and options offered on the same tab for Walls. Though it appears, at first glance, that you could easily vary and slope your Curtain Wall from this point, you may be surprised by the results. Frames, for example, do not necessarily pop up where you want them. For this reason, I have not used these options on Curtain Walls yet but that is not to say, you cannot find a good use for these options.

See also discussion for Walls.
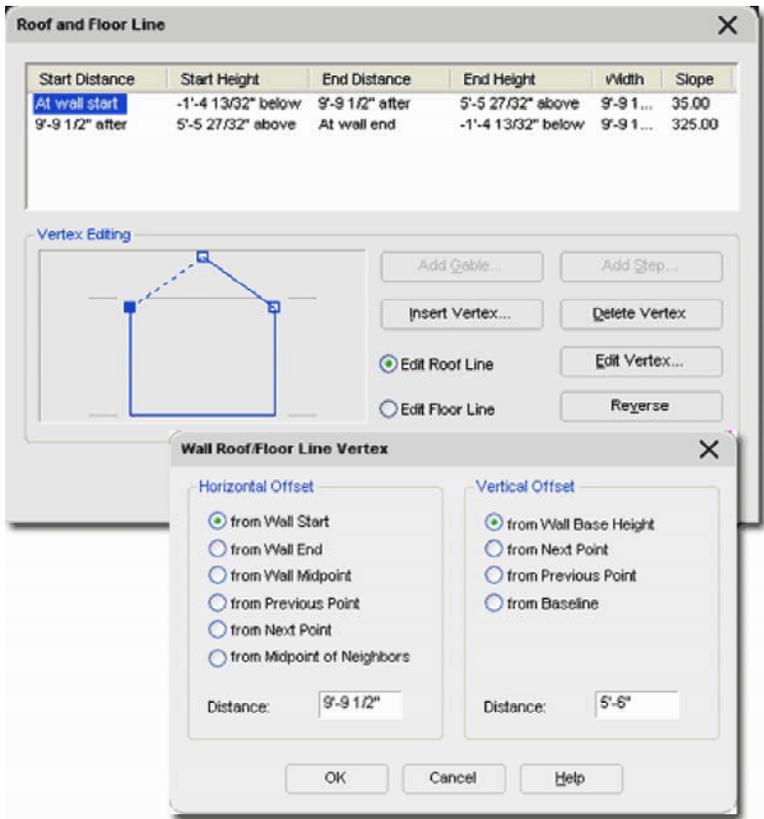
Curtain Wall Grip Points

Curtain Wall Objects have several Grip Points that work just like they do on regular Wall Objects such as Lengthen, Start, End and Location. You will also find that Curtain Walls have Base Height, Roof Line Start and End and Floor Line Start and End. The one Marker that is different from Walls is the Edit Grid option that allows you to work on the Curtain Wall Layout live in the Edit-in-Place mode. When you activate this Edit-in-Place mode, you will find a whole new set of Grip Point that you can work with - see discussion below for more on this subject.

USE TAB KEY → TO CYCLE THROUGH DIMENSIONS
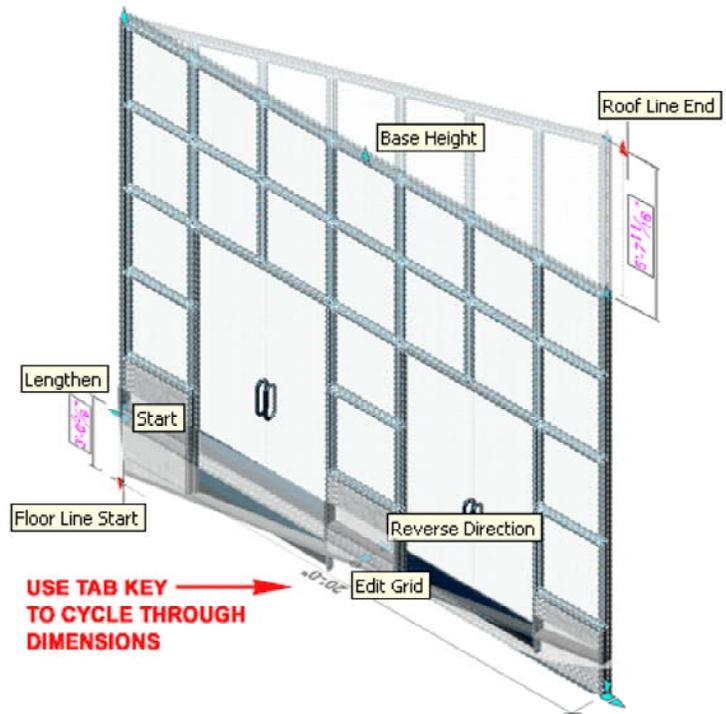
Curtain Walls - Editing via Object Specific Pop-up menu

Illustrated to the right is the object specific pop-up menu for a selected Curtain Wall. If you don't get the object specific pop-up menu when you select objects, check the **Options** dialogue box (Type "OP") and look for two possible causes:

1) **User Preferences tab**, Windows Standard Behavior, **Shortcut Menus in Drawing Area** should be **checked** on on the **Right-click customization** dialogue box, make sure that **Shortcut Menu** is checked for **Edit Mode**.

2) **Selection tab**, Selection Modes, make sure **Noun/Verb selection** is **checked**.

———————————

When you need to Modify a Curtain Wall in place, you actually have **two choices**. One approach has to do with using the **Edit in place** option and the other simply works on the principle of **Overrides**.

When you use **Edit in place**, you get more tools, including the Overrides and the option to **Discard changes** or **Save changes...** with a different Style name. This means that if you want the best of all in place editing options, use the Edit in place option.

I find that working directly with the **Overrides** often does the trick and thus I don't always go for the full set of **Edit in place** options. I also tend to forget that I have activated the Edit in place option and thus I keep getting the alert dialogue for Saving changes. If this stuff confuses you, you should consider beginning your Editing in place work by skipping down to the **Cell Makers** and **Overrides** topics below.

These tools are the best for visual minded designers who prefer to work right on a 3D view of a Curtain Wall. They cannot, however, solve every need and thus you will eventually have to go back and work with the Styles. I do find that you can do quite a bit of work with these tools and often take a basic grid and change it dramatically.
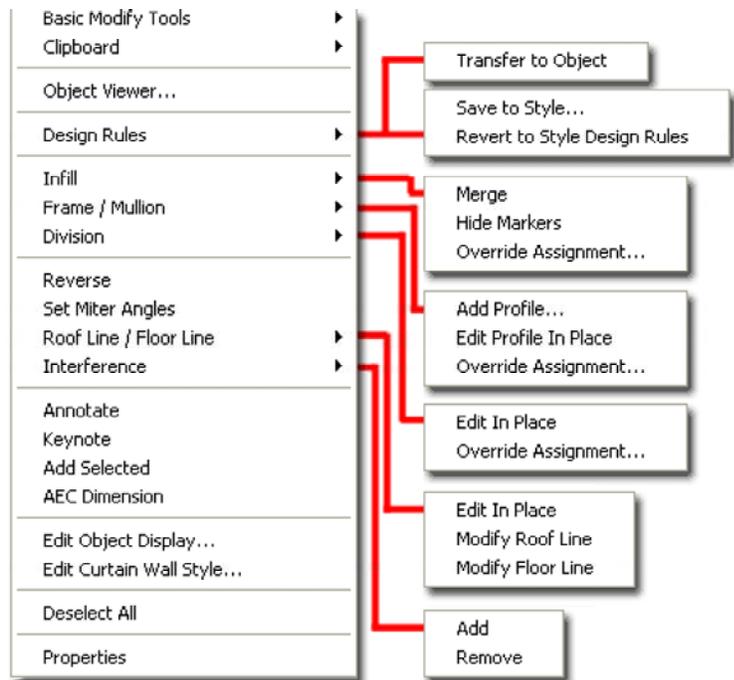
Edit in place

The first time you select **Edit in place** off the object specific pop-up menu, all you are doing it activating it; like an **ON** switch that is off by default. To turn it **OFF** after activation, you have to select either **Discard Changes** or **Save changes...** from the Edit in place fly-out or cascading menu (see illustration above, right).

When Edit in place has been activated, the object specific pop-up menu will change. The Edit in place menu option becomes a cascading menu with two options: **Discard changes** and **Save changes...** You should also find that the object specific pop-up menu gains two other editing options: **Element Definitions** and **Assignments**.

Discard changes - this should be an obvious option; it will allow you to go back to the original Curtain Wall Style before Edit in place was activated.

Save changes... - this option allows you to either save your changes back into the current style or into a new Curtain Wall Style.
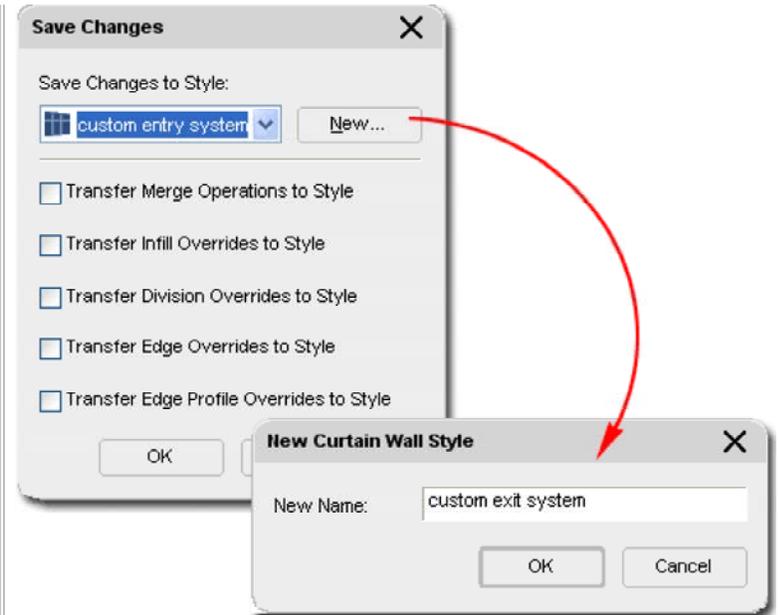
Cell Markers

Cell Markers are used to help work with **Overrides** for **Cells**, **Mullions** and **Frames**. Once on, they are physical objects that you can select for such Override tasks as Merging (in fact, oddly enough, you can even Snap to Cell Markers).

On the **Cell Marker** cascading menu off of the object specific pop-up menu, you should find six options: **Off**, **All Visible**, **1st Grid**, **2nd Grid**, **3rd Grid** and **Other...**

When you activate the **All Visible** Cell Markers, you get all of the deepest level markers for all cells in a Curtain Wall Style. This differs a bit from activating the deepest level markers within a Curtain Wall that has Nested Grids - see illustration right with a 5th Level Grid. If All Visible had been set on that Curtain Wall example, you would see the same markers plus markers for the surrounding Cells, much like the example with a 2nd Level Grid level.

1st - 3rd and **Other...** Grid Levels are for accessing specific levels of cells within a Curtain Wall Style. 1st Level will always provide you with an incomplete Cell Marker indicating the primary Frame and its primary divisions. This can be used to work with Frame Overrides but not Cell changes. The direction of the arrows indicate the direction of division numbering (as in horizontal, bottom to top).
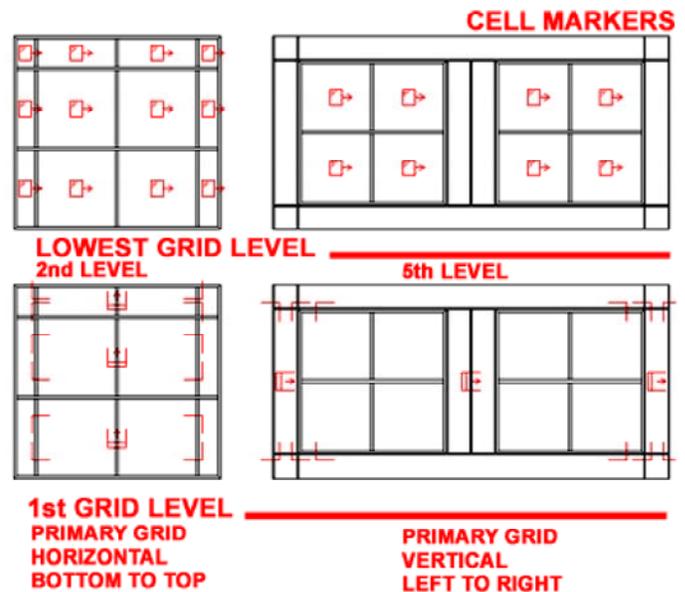
By using **Other...** you can access specific Cell Levels nested deeply within a Curtain Wall Style and thereby avoid the possible confusion cause by activating all cell markers.

My personal, "I don't have time for this", approach is to just use the **All Visible** option and see what I get. If there are too many cell markers to deal with I have solved that problem by Zooming in and reducing Cell Marker Size.

Cell Overrides

With the four **Cell Override** tools, you can achieve quite an impressive set of modifications to a Curtain Wall Style. In this set, you have **Merge Cells**, **Cell Assignment**, **Edge Assignment** and **Edge Profile**.

Illustrated to the right are some of the basic things you can do with Cell Overrides. The most powerful tool in the set is Cell Assignment Overrides because this is how you can control what goes inside a Cell Division. You can assign almost anything you want to a Cell; from simple Profiled shapes to something as complex as another Curtain Wall.

Merge Cells - this option allows you to select two cell markers at a time and remove any Mullions between them. These Cells must be adjacent to each other.

Override Cell Assignment - this option allows you to specify any **Infill element** currently listed in the Curtain Wall Style (this is done by specifying the **index number** on the command line). To Add new ones, use the Curtain Wall Style dialogue box and add a New Infill. Using the **None** option may produce some unexpected and undesirable results; such as the removal of Frame and Mullion components.

Override Edge Assignment - this option allows you to change or remove **Frames** or **Mullions** (this is done by specifying the **index number** on the command line). To change a Mullion or Frame, use the Curtain Wall Style dialogue box and add a New Frame or Mullion element. Using the **None** option may produce some unexpected and undesirable results; such as complete full length removal of a mullion.

CURTAIN WALL CELL OVERRIDES

Override Edge Profile - this option allows you to change a Frame or Mullion shape by either selecting a **Close Polyline** or by selecting a **Profile Definition** (this is done by selecting a closed Polyline or by specifying a Profile name on the Profile Definitions dialogue box that you get by hitting the Enter key).

Element Definitions

Links   Edit in Place - must be active for this option.

This set of options simply takes you directly to the specific tabs on the current Curtain Wall Styles dialogue box that control these settings. This option is only available when "**Edit in Place**" mode has been activated.

Divisions... number of rows and columns and how they are spaced apart.

Infil... type of object that resides between the rows and columns (the cells).

Frames... shape, form and dimensions of perimeter frame.

Mullions... shape, form and dimensions of internal divisionary elements (between the cells).

Assignments

Links   Edit in Place - must be active for this option.

This set of options is based on the basic Overrides but offers far more control over modifications and the number and location of these modifications. Assignments are only available for Window Assemblies that have "**Edit in Place**" active and thus assignments are not Overrides but actual changes to the Style (depending upon how you save the Edit in Place Assignments). Be aware that as with other forms of modifications to the Style, you will need to define the options first in order to be able to select them with any of these tools. For example, you cannot Add a Cell Assignment if it doesn't exist. You can, however, create new New Element Definitions while working in "Edit in Place" mode - > see comments for **Element Definitions** above.

Add Cell Assignment - this option allows you to change any or all Cell Infills to any other predefined Infill Definitions. This is very similar to the Override Cell Assignment option. If you are confused by the results of this tool, consider the original design of the Curtain Wall Style and its Grid system. Adding a Cell Assignment within a Grid usually affects a full Column but can appear to change only one Cell if the Grid only contains one Column of Cells.

Remove Cell Assignment - this option allows you to remove any non-default Cell Assignments that may have been Added at another time. Removal reverts to the default Cell Assignment.

Modify Cell Assignment - this option is similar to the Add Cell Assignment but changes all instances of the Cell Assignment, within the current Grid, to match the change selected. Add Cell Assignments introduces new Assignments by Column or for All Cells while Modify will change all Cells within the Grid that use the same Infill.

EDIT IN PLACE - ASSIGNMENTS

Remove Edge Assignment - this option allows you to remove any non-default Frame or Cell Edge Assignments that may have been Added at another time.

Add Edge Assignment - this option allows you to change any single or all Frame/Mullion Edges within a specific Grid.

Modify Edge Assignment - this option is similar to the Add Edge Assignment but changes all instances of the selected edge within the specific Grid.

Tools

Links   Curtain Wall Properties - Dimensions tab - for another place to edit the miter angles for Curtain Walls.

To access the tools listed below, **Select** a **Curtain Wall**, **right-click** on your mouse and look for the **Tools> cascading menu** option on the object-specific pop-up menu.

Reverse - this opinion flips a Curtain Wall around like a mirror image but does not flip inside to outside. This is useful when you have unique Offsets, for example, on one end but realize that you need them on the other end instead.

Floor Line - this option is the same as that for Wall objects and provides you with options for projecting your Curtain Wall down to a Floor Slab, Space object or other object representing a base.

Roof Line - this option is the same as that for Wall objects and provides you with options for projecting your Curtain Wall up to a Ceiling in the form of a Slab, Ceiling Grid, Roof or other objects representing a top.

Interference - this option allows you to add interference conditions much as you would with a Wall. In some cases Mass Elements are used but you can use many of ADT's objects as Interference objects, even a true Wall. Using this option will cut your Curtain Wall and wrap it around the interfering object.

Set Miter Angles [GridAssemblySetMiterAngles] - this option will automatically calculate the miter angle for Curtain Wall frames that meet at an angle. Unfortunately this option only affects the top and bottom frames and not the vertical frame elements.

CURTAIN WALL - TOOLS

ROOF SLAB

CURTAIN WALL WITH CUSTOM INFILLS

MASS ELEMENT

SLAB

PLINE

"ROOFLINE" "AUTOPROJECT" TO SELECTED ROOF SLAB. CUSTOM INFILL NOT AFFECTED.

"INTERFERENCE" (MASS ELEMENT LAYER TURNED OFF FOR CLARITY) DOES NOT AFFECT CUSTOM INFILL

"FLOORLINE" "PROJECT" TO SELECTED PLINE OBJECT

RESULTS WHEN DEFAULT INFILL IS USED

SET MITER ANGLE
BEFORE

AFTER

6Curtain Wall Styles

Style Manager - Curtain Walls

Alt.Menu **Design> Curtain Walls> Curtain Wall Styles...**

Keyboard **CurtainWallStyle**

Mouse Select a Curtain Wall Object, right-click and Select Edit Curtain Wall Style...

Links Loading Curtain Wall Styles - for information on how to load ADT Curtain Wall Styles.

For Curtain Wall objects, you can use the **Style Manager** to load, modify, delete and create new Curtain Wall Styles. If you have already worked with Door/Window Assembly Styles, you will not find this subject much different.

Though you can easily create New Curtain Wall Styles from Scratch using the New button, you may want to use the **Copy/Paste** technique instead because it is far easier to Modify Settings of an existing Object Style than it is to create one from Scratch. In some cases, you may even miss specific settings that can come back to haunt you much farther down the road on a project - things like Display Representations or Data for Schedules.

Illustrated to the right, I show the process of creating a **New** Curtain Wall Style that I have Named "**Custom Curtain Wall**". By **double-click**ing on this new style, you will invoke the **Curtain Wall Style Properties** dialog box - as illustrated.
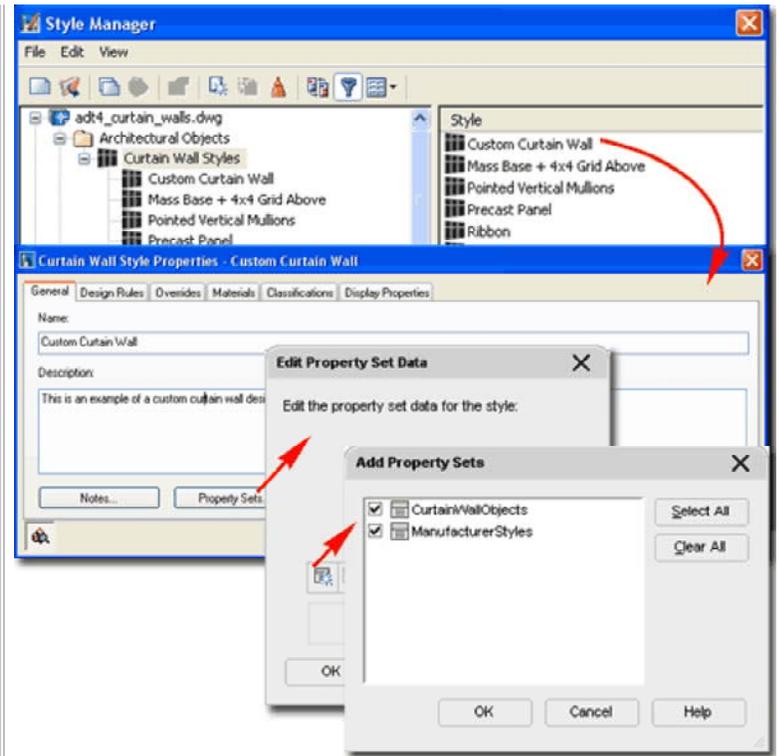
On the **General Tab** of the **Curtain Wall Style Properties dialog**, you will find a place to modify the **Name**, add a **Description**, add **Notes...** and **Property Sets...** If you intend to use the Schedule Tags and Schedule Objects in ADT, you must use the Property Sets... button to Add the appropriate Property Data. Data can be added for expanded Schedules or additional Schedule Styles and you can even create new Data Sets but let's put that topic off to **Part 18 - Schedules**.

Illustrated above, I show that ADT comes with one example Property Set for **CurtainWallObjects** that you may want to experiment with to see the type of data you can extract from one of these Object Types.

Curtain Wall Style Properties - Design Rules tab

Links **Assembly Style Properties - Design Rules tab** - for another example of similar information.

Illustrated to the right, I attempt to provide an understanding of the **Design Rules** tab interface. On the **left side** is a **Tree View** showing a **Grid** hierarchy, starting with a **Primary Grid** and a **folder** containing the **Element Definitions** that the Grids are comprised of. In the **upper right side**, is a **Table** (Column and Rows) of the current **Grid Assignments**. On the **lower right side**, is a **Properties** or Settings view for the specific configurations of the currently selected **Elements**.

DIVISIONS When you **select** an Assignment, such as **Primary Grid**, you should find numerous configuration options in the Properties View area. The Primary Grid, for example, provides options for unique **Name**s, **Orientation** of Cells, **Division Type**s and corresponding options for these Division Types (see **1**, **2**, and **3**).

To create the simple Curtain Wall Style illustrated to the left, set the **Horizontal** and **Vertical Divisions** to use a **Fixed Cell Dimension**, specify that dimension, set desirable **Widths** and **Depths** for the **Frames** and **Mullions** and then set desirable **Materials**.

By starting with a really simple example such as this one, you can work with different values and settings to see how they affect basic components. Once you start nesting layers of Grids, it gets a lot more difficult to visualize in your mind what you need to change in order to get desirable results.

See **Section 8 - Curtain Wall Styles - Design Rules** for a more in-depth discussion of this subject.

Curtain Wall Style Properties - Overrides tab

Links **Curtain Wall Pop-up menu options** - for information on how to add Overrides.

The **Overrides** tab will not offer anything other than the Override categories unless you have actually performed Override tasks and Saved them to the current Curtain Wall Style.

Once you have made Override changes and used the Save Changes dialog box via the **Edit in Place** object-specific pop-up menu, then you will see those changes reflected here as illustrated to the right. Not only can you make more changes to overrides here, you can **Remove** them.

To find out about creating overrides, read **Section 5 - Modifying Curtain Walls**

Curtain Wall Style Properties - Materials tab

Links [Object Style Properties - Materials Overview](#) - for an expanded step-by-step explanation of Materials

Illustrated to the right I show that all Curtain Wall Styles offer three Default Components under the **Material tab**: Default Infill, Default Frame and Default Mullion. If you create New Infill, Frame and/or Mullion Element Definitions they will automatically be listed as new Components under the Materials tab. This means that should you need unique Material characteristics such as different Frame Materials for example, you can define New Frames for each side of the Curtain Wall. You can also use this feature to create Infills that are Glazed, Metal, Wood or any other Material.

Since Materials can also be used to control line properties, you may want to use an existing Curtain Wall Style as the source for any new ones you create.

NEW INFILLS, FRAMES AND MULLIONS ARE LISTED AS NEW COMPONENTS THAT CAN RECEIVE NEW MATERIALS
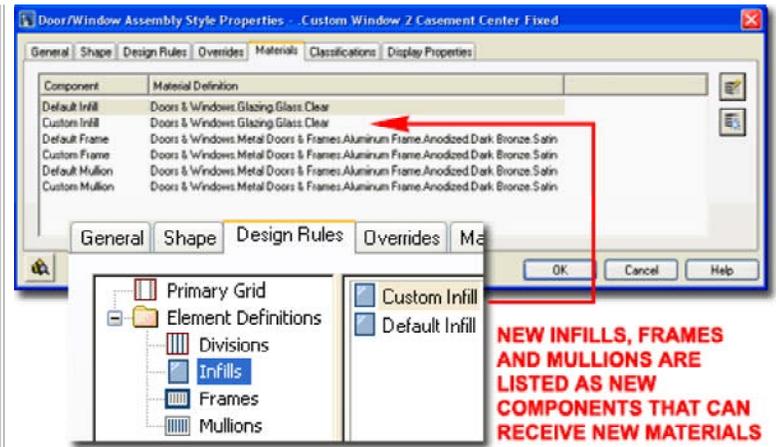
Curtain Wall Style Properties - Classifications tab

Links [Style Properties - Classifications](#) - for information on this subject and screen capture of dialog box tab.

[Object Style Properties - Classifications Overview](#) - for an expanded step-by-step explanation of Classifications

Curtain Wall Styles have a Classifications tab that is identical to that for most Object Styles. See discussion under Doors and Windows for more on this subject.

Curtain Wall Style Properties - Display Properties tab

Links [Object Style Display Properties Overview](#) - for the full story on Display Properties for Style

[Object Display Property Overrides - Object and Style Based](#) - for an explanation of the differences between using Display Properties via the Styles versus the Edit Object Display... option.

The **Display Properties** tab of the Curtain Wall Style Properties dialog box, illustrated right, provides access to a set of Display Representations similar to those found for Walls. Keep in mind that in addition to the Display Properties for the Curtain Wall you can also control the Display Properties of the Objects you use as Infills by working with their own Style Properties. In other words, the Curtain Wall only provides control over its short list of Display Components (Infills, Frames and Mullions) while Doors and Windows or other Inserted Objects are managed by their own Display Properties.
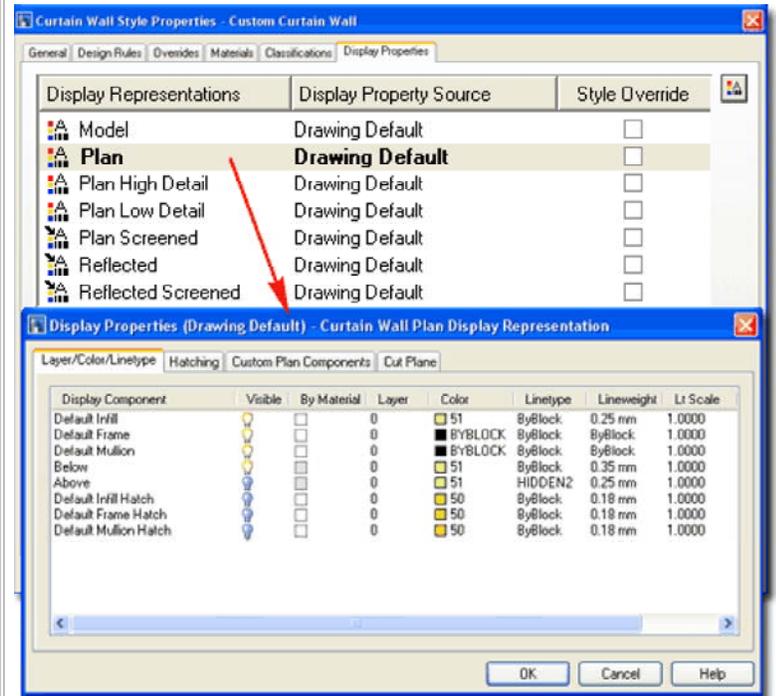
YOU CAN ALSO ACCESS DISPLAY PROPERTIES BY SELECTING AN OBJECT, RIGHT-CLICKING ON YOUR MOUSE AND USE THIS POP-UP MENU OPTION

Illustrated to the left, is another way to access the **Display Properties** tab; **select** the specific **object**, **right click** on your mouse to invoke the object-specific pop-up menu and select **Edit Object Display...** Just be aware that when you use this approach, you can actually set an Object Override as opposed to a Style Override. Object Overrides can be extremely useful because they allow you to add things like Sills or Thresholds to any object within a Style Family but they can also be problematic because they lock you out from more centralized, Style level, controls.

In **Plan** view, you have Layer controls for **Infill**, **Frame** and **Mullion**. You can also have these components filled with User Specified **Hatch** patterns controlled on the **Hatch** tab. The **Custom Plan Components** tab offers the ability to add custom features to the "generic" Assembly. The **Cut Plane** tab allows you to re-define where you want the cut made on your Door/Window Assemblies.   This can be a valuable option if you introduce Interferences within your Door/Window Assemblies and wish to have those displayed or not displayed in plan view.

---

7 **Curtain Walls - Display Properties**

Curtain Wall Display Property Overview

The **Display Properties** of Curtain Walls are actually quite simple since there are basically only three components to work with: **Frames**, **Mullions** and **Infills**. Curtain Walls can complete in themselves or you can think of them as the framework for inserting all sorts of other Objects. When using other Objects, such as Doors or Windows, as Infills those Objects must be controlled by their respective Display Properties.

Below I will discuss some of the basic concepts of working with Curtain Wall Styles and their Display Properties and then elaborate further for those who really need to dig in and create highly custom Styles.

Illustrated to the right I show three different Views an example Curtain Wall I used on a project for a college campus building. In **Plan View** I show that I I have custom Corner Frames to more accurately represent how the Curtain Wall will be constructed. In **Elevation View** I show, colored, the heirarchy of Mullions used to achieve a flexible Style design. In **Model View** I show a simple base panel and the insertion of Doors.
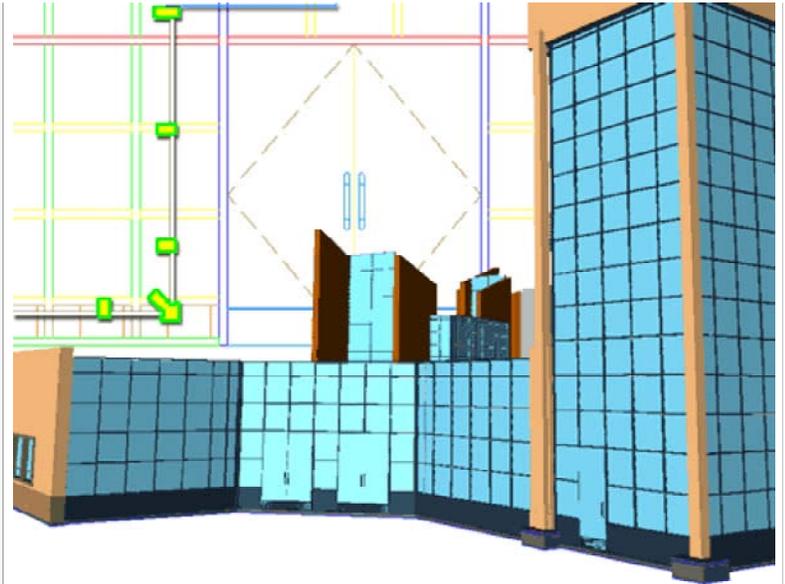
Curtain Walls in Plan

Links [Door/Window Assemblies in Plan](#) - for another example of similar information.

Depending on how many design features you have put into your custom Curtain Wall Styles, the task of producing the desired **Plan View** display could proved to be nearly as difficult as creating the Style to begin with. If you span multiple floor levels with one Curtain Wall Object, you may find that one Plan Display is only good for one floor.

Illustrated to the right I show a simple Curtain Wall Object for a single floor level with entry doors inserted as "Infill" and glazed panels in all of the adjacent "Cells". Since **Plan**, **Plan High Detail** and **Plan Low Detail** all offer the same set of **Display Components**, it will not matter for this discussion which one you are working with. In the example to the right I do not show the **Below Display Component** because it would prevent us from seeing the **Above Display Component**. Generally, I do not use the Hatch Patterns in my Curtain Walls but you may want to us them for Presentation drawings.

Notice that though I have Doors as an Infill, there is no control for the Display of the Door Style within the Curtain Wall Display Components list. For custom Objects, you must work directly with their own Style Properties.

As you can see, the list of Display Components and what they control is fairly simple to comprehend; it's the **Cutting Plane** subject that is the real key to controlling what you see in Plan.
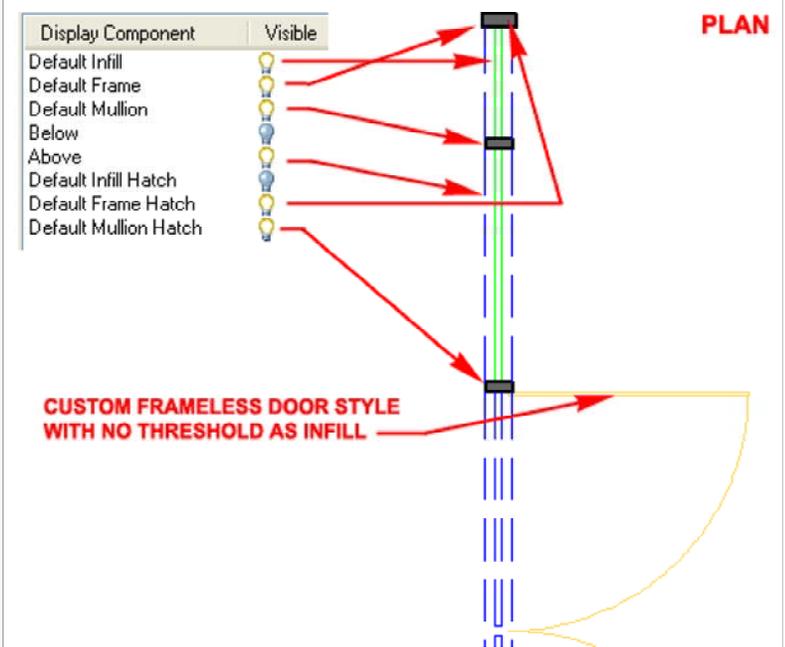
Curtain Walls Above or Below the Cutting Plane

Links [Door/Window Assemblies Above or Below the Cutting Plane](#) - for another example of similar information.

Generally, a Curtain Wall Object stands free much like a Wall Object and thus defers its default Cut Plane Height to the current Display Configuration (just like a Wall). The problem with this default setting is that a Curtain Wall usually has a lot more internal detail than a Wall and thus you are likely to want to set a more specific point through which you want the Cut Plane Height. In addition to this, the default Above and Below Cut Plane Heights typically reach well beyond the elevation heights of a Curtain Wall and thus prevent you from capturing and Above or Below linework. You may have notice this when turning on the Above and/or Below Display Components in Plan only discover no change at all.
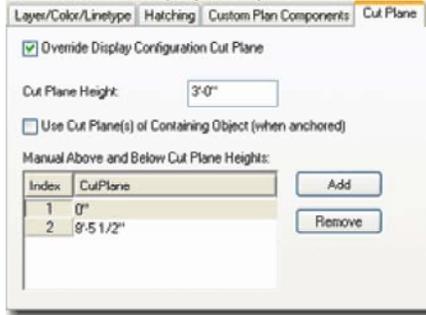
Illustrated to the right I show three different Plan Display results based on three different Cut Plane scenarios: the Default, a Custom Height and a Custom Height with Custom Above and Below Cut Plane Heights as illustrated on the Cut Plane tab, left. Of course the design of your custom Curtain Wall Style will affect the results and you may be lucky enough to use the Default Cut Plane Height as controlled by the current Display Configuration. If you want to take advantage of the Above and/or Below linework, you will need to set Manual Above and Below Cut Plane Heights that run through the Components that you want to Display in Plan.
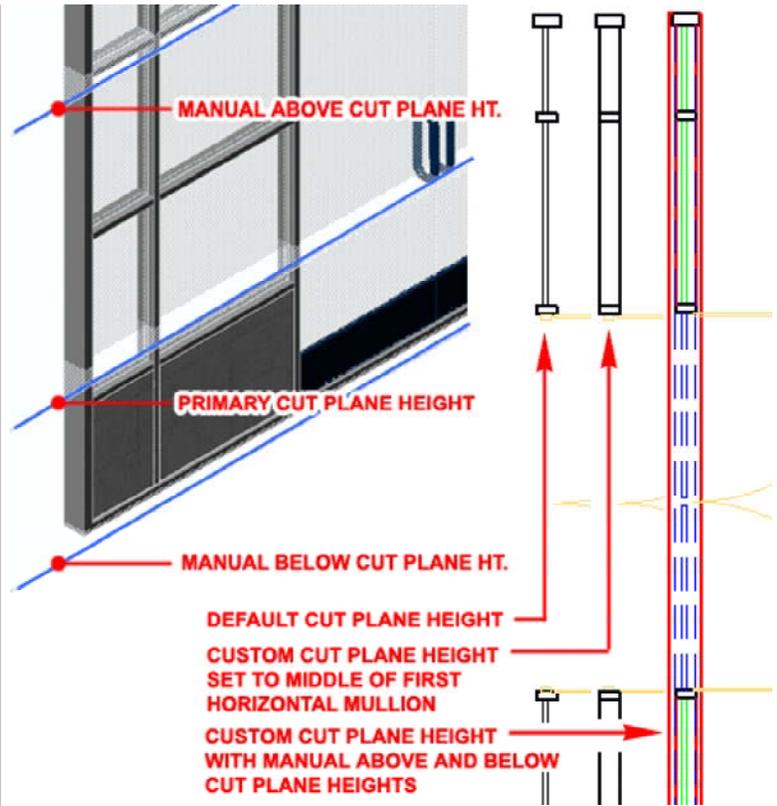
Curtain Walls Spanning Multiple Floors (Levels) - Elevation

From a designer's point of view, creating **one Curtain Wall Object** that is used for **many floors** is far easier to manage than replicating work on each floor as separate Curtain Wall Objects. From the view on a Construction Document, the important thing is that the correct linework is illustrated for the Curtain Wall at each floor. Attempting to get both is not always easy and at times I have used one Curtain Wall Object as a master for Elevations, Sections and so on while using special replicas on each floor drawing that produces the desired linework I must have on my CD's. This may seem ridiculous but it may also be necessary given the limitations of Cut Plane controls on Curtain Walls when spanning floors.

Assuming you are using one Curtain Wall Object and Xref'ing it into multiple floor plan drawing files, the worst setting you can tinker with is the "**Override Display Configuration Cut Plane**" because that will fix whatever "**Cut Plane Height**" you set in the source file for all of the other files you Xref the Curtain Wall into.

Unless you take the time to create unique Display Representations and unique Display Configurations that can then be used as Display Overrides on Xref'd Curtain Wall Objects, you have to work with the current **Display Configuration Cut Plane** Ranges and **Manual Above and Below Cut Plane Heights**.

Illustrated to the right I show an example Curtain Wall Object in Elevation and how two Manual Cut Plane Height Settings are read relative to the 2nd Floor. Keep in mind that when you use the Project Navigator tool, it automatically drops the Curtain Wall down relative to the Z-axis establishing a new Z=0 Cut Plane point (base of 2nd Floor Z-axis = 0). If you work with Xref's manually, make sure to Move your Curtain Wall down in the Z-axis to the appropriate Floor Line position.

The **current Display Configuration**, illustrated lower right, affects how your Curtain Wall is displayed relative to Z=0. This is an absolute World Coordinate System value that cannot be changed. You can, however, move the Object relative to this value in order to change how it is perceived or presented but that's yet another story. You may find, as illustrated to the right, that the default Above and Below Cut Plane Ranges exceed what you want to display. You can change them but be

aware that these ranges are Global for most Objects in the current drawing so setting the Display Below Range (labeled as "**C**") higher than zero may not be such a great idea. These Range values can be used to exclude or include Manual Cut Plane values set on Curtain Wall Objects - see discussion directly below.

In my example, I show that I have set two Manual Cut Plane Heights on the Curtain Wall Object itself. This is achieved by working through the Display Representation, such as Plan. These values are static and measured from the zero base of the Curtain Wall Object. This means that a Cut Plane Below Value for the 2nd Floor Point of View may also be the Above Cut Plane Value from the 1st Floor Point of View. If you follow that logic, conflicts can occur where you have just what you want on one floor but not on another and there may be little that you can do. If you are facing such a dilemma, consider assigning the Above and Below linework to fixed Layer Names so you can use yet another form of control in the Xref'd file.

Curtain Walls Spanning Multiple Floors (Levels) - Plan

Illustrated to the right I show how the "**Display Below Range**" of the current **Display Configuration** affects how the **Manual Below Cut Plane** value is displayed for a 2nd Floor Level Plan View of the same multi-level Curtain Wall example discussed above.

By setting the "Display Below Range" value to zero, the only components that are displayed as Below the Cut Plane are those that fall between the Cut Height and the Floor (assuming it is at Z=0).

By setting the "Display Below Range" value to a huge negative number (essentially negative infinity), the Manual Below Cut Plane value set on the Curtain Wall Object is now used to determine the components that are to be illustrated as Below the Cut Plane.

Obviously a similar result can be achieved for the "**Display Above Range**".

Note:
To include such items as Doors or Windows Anchored as Infills in Curtain Walls, you will need to change their **Display Representations to display Components that are Above and/or Below the Cut Plane**. Such changes must be done on the Object or Object Style in the source Curtain Wall file.
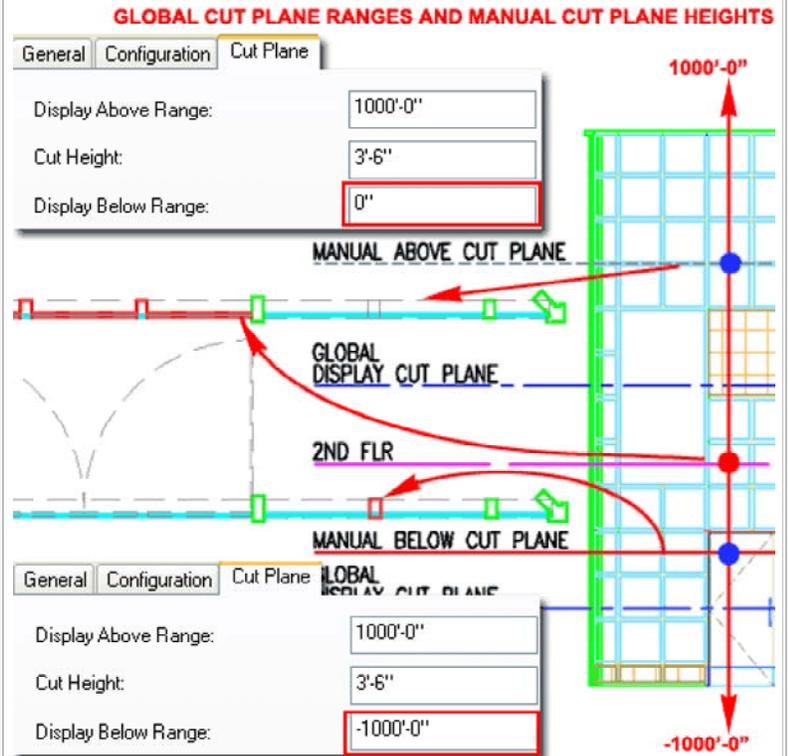
Display Properties - Custom Components

Each of the **Display Representations** for Curtain Wall Styles offer the option to **Add Custom Components** by means of **Attaching** a **Block**. Only the Model Display Representation Properties dialog uses the "Other" tab for this feature while all other Display Representations use the "**Custom Plan Components**" tab illustrated to the right.

Illustrated to the right I show how I have used the "**Custom Plan Components**" tab on the **Display Properties dialog** of the "Plan" Display Representation to Add... a Custom Block of a Mullion Section created earlier with the Detail Manager. By defining different Mullions for different parts of my Curtain Wall example, I was able to Select a specific Mullion type on the "Select Mullion Definition" dialog (**Select Element...** button).

ADDING CUSTOM COMPONENTS UNDER ONE DISPLAY REPRESENTATION

BLOCK

INSERTION POINT
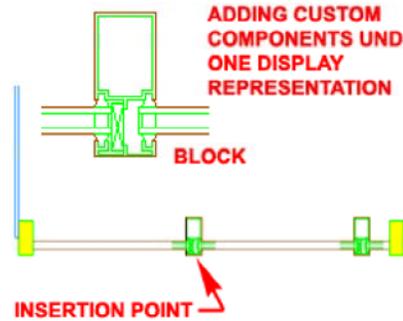
Draw Custom Graphics - use this checkbox to allow for the insertion of a Block in the position of the Component Name. If you elect not to use this option, you will not be able to Select a Block but you should find that you will now have a new Display Component Layer - see comments below under "Other tab".

Replace Graphics - use this checkbox to have the Block replace the Component's Graphical representation; i.e., substitute the Block for the default linework.

Select Block... - use this button to select any Block in your current drawing.

Scale, **Mirror** and **Insertion** options can be used to control how the Block is positioned relative to the Component. In some cases you may need to alter the block in order to get better results. Since there is no option to Rotate, you may find that you will need to get the right rotation before making your Block.
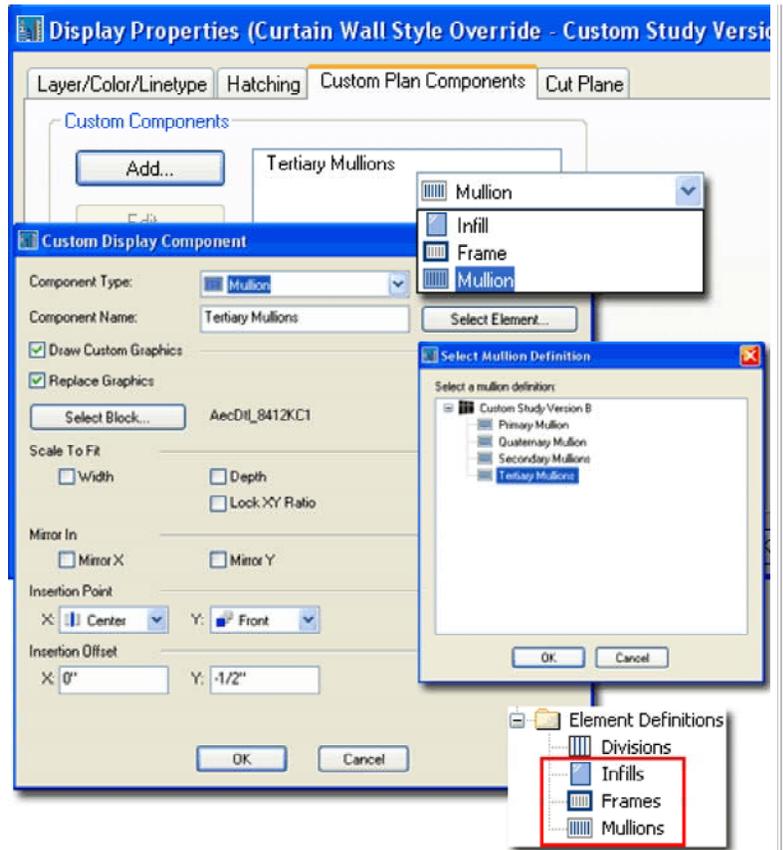
Display Properties - Other tab

When you Add Custom Components for Plan or Model Display Representations, you also receive new Display Component Layers with names to match the Selected Component Name. Be aware, however, that these Custom Display Component Layers **cannot** be set to "**By Material**" and are thus relegated to basic Color and Linetype settings.

Illustrated to the right I show the Display Properties dialog for the Model Display Representation. Notice that the Other tab offers the option to change the "Cell Marker Size" which is that little rectangle you see over Cells when editing in place. This **Cell Marker** is incredible useful when you need to Select Cells for such tasks as Merging or changing the Infill.

8 Curtain Wall Styles - Design Rules - Basics
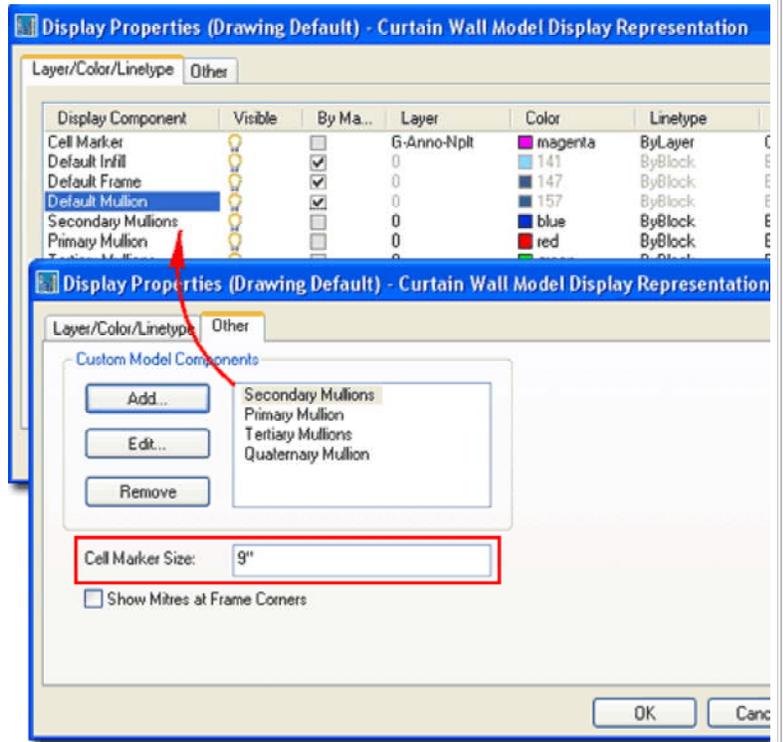
Design Rules - Basics

Alt.Menu Design> Curtain Walls> Curtain Wall Styles...

Keyboard **CurtainWallStyle**

Mouse Select a Curtain Wall Object, right-click and Select Edit Curtain Wall Style...

Links Style Manager - Curtain Walls - for information about the General and Default tabs.

For some, the process of mastering the Curtain Wall Style can be daunting while others seem to grasp the layering or "Nesting" of Divisions and Infills in seconds. I happen to be of the former category because I think more visually than mathematically. In the steps below I will start with a simple grid-based Curtain Wall Style and go on to more sophisticated options in Part 9.

In the illustration to the right I show that I have created a **New Curtain Wall Style** from **Scratch** that I named "**Custom Study Version A**". Skipping over to the Design Rules tab, we can begin the discussion right here.

Since most Curtain Wall Styles involve horizontal and vertical Frames and/or Mullions you will find that when you create a New Curtain Wall
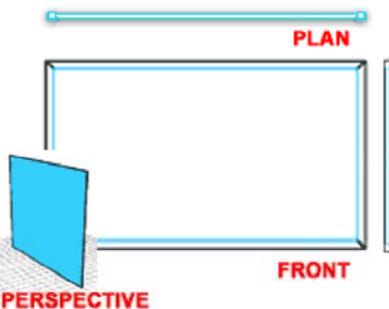
Style, there will be two Grids but if you don't want to use a second Grid, you can set the Cell Assignments to "**Default Infill**" or define a custom Infill. For a basic Curtain Wall Style, **do not** set the first Cell Assignment to ***NONE*** because you will not have a Curtain Wall Object if you do this. Notice that when remove the ***Nested Grid*** option as a Cell Assignment, you will find that the "New Nested Grid" category will drop out under the "Primary Grid" (Left side Tree View Pane) leaving you with a very simple and basic Curtain Wall Style.
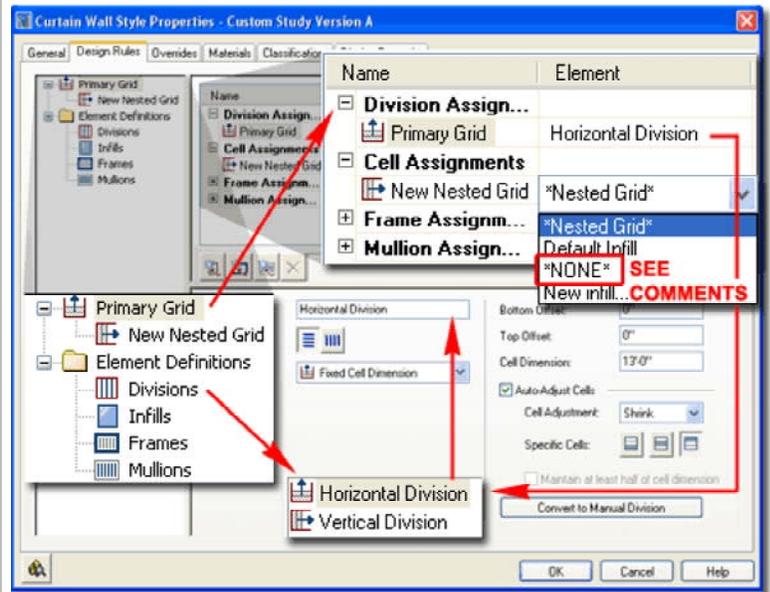
By highlighting the **Primary Grid** in the left pane (Tree View), we can see how the primary Curtain Wall Grid is configured. In the right pane (Table View), you can see that the Primary Grid uses a "**Horizontal Division**" and this Element is stored under the Element Divisions folder in the left pane as "**Divisions**". When you Select the Divisions category, you will see all the same settings that you are likely to see when you Select the Primary Grid category. This means that you can often make changes to Elements without actually going to the **Element Definitions Folder**.

Design Rules - Dividing a Cell
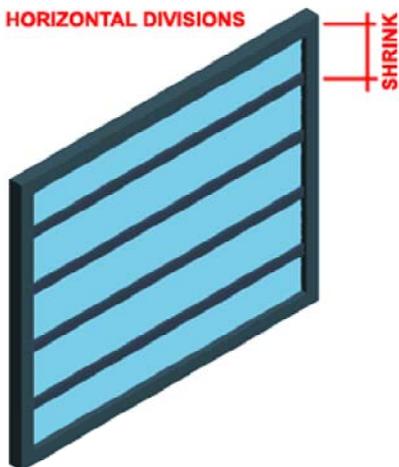
After you have created your New Curtain Wall Style, you are likely to want to define the grid layout first. By going to the **Divisions** category under Element Definitions in the Tree View of the Curtain Wall Style Manager, you can modify any default Divisions, Remove, Rename or Add new ones.

Illustrated to the right I show that I have selected the default "**Horizontal Division**" and changed the **Cell Dimension** to 2'-0" [610mm]. Though there are numerous other options to play with here, let's not worry too much about them until later so just confirm that you have an Orientation set to **horizontal** lines, a Division Type set to "**Fixed Cell Dimension**" and Cell
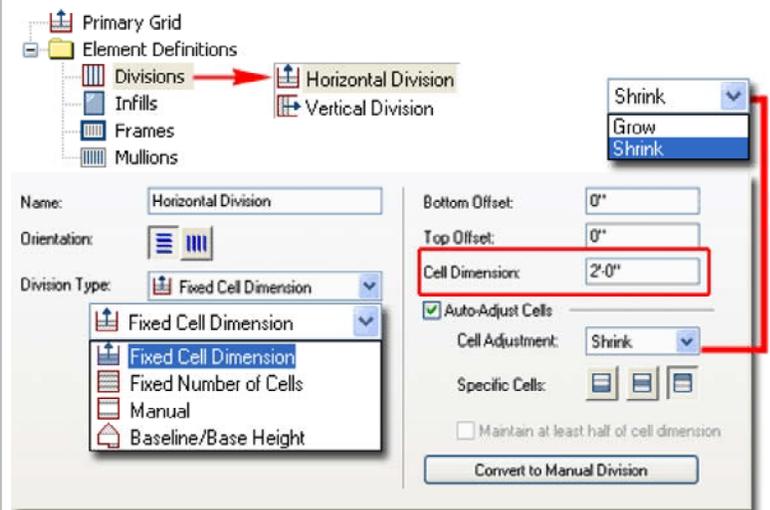
Adjustment set to "**Shrink**".

Creating a Curtain Wall Style with Horizontal Divisions is fairly easy but getting to the next step of adding **Vertical Divisions** may prove to be just a bit more difficult.

In the illustration to the right I show what it takes for a 2nd Division to be a part of the Primary Grid. The fundamental concept to comprehend here is that **one Grid** can only hold **one Division** Definition and thus cannot be both Horizontal and Vertical simultaneously. In order to get both a Horizontal and Vertical Division (as a true grid), you set one Grid to hold the Horizontal Divisions and layer or "Nest" another over it to hold the Vertical Divisions.

HOW A DIVISION BECOMES PART OF A PRIMARY GRID AS A NESTED GRID CELL ASSIGNMENT
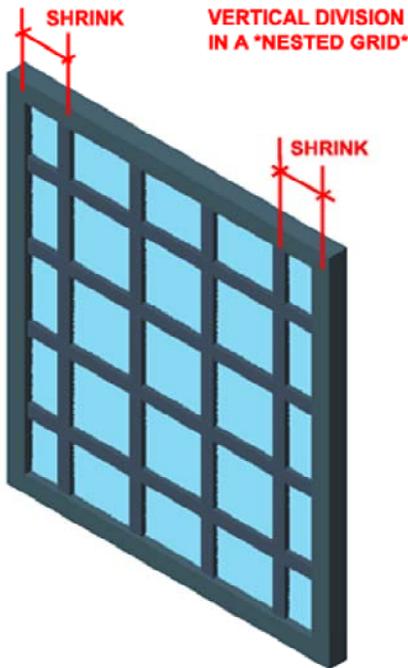
As with the Horizontal Division discussed above, I show that I have defined a rather simple Vertical Division to the right. Notice that the **Orientation** button is set to **vertical** lines, that I am using **Fixed Cell Dimensions** again set to **2'-0"** [610mm] but that I have decided to **Shrink** both **Ends** so my Curtain Wall will always remain symmetrical.

To make any new Division actually produce results in your Curtain Wall Style, you must use it as part of a Division Assignment. In order to Add new Division Assignments, you have to **Add** the *****Nested Grid***** **Element** as part of the **Parent Grid's Cell Assignments** (in this case, the Primary Grid). In other words, you are declaring that for a particular Grid's Cell Assignment you want to set another Grid that has its own Divisions.

Overview of Options and Settings

The **Name** field is used by you to keep track of these potentially confusing nested grids but you can name them just about anything, like "**1**".

The two **Orientation** buttons for the **Grid Assignments** (Primary, Secondary, Tertiary and so on) can be used at any point in the Curtain Wall design process and simply create horizontal or vertical Cells (these are expressed as Mullions by default).

Division Type can also be changed at any point in the design process. There are four options for the Primary Grid and four for all other Grids that follow.

Primary Grid

Fixed Cell Dimension - provides you with value fields for Start Offset, End Offset, Cell Dimension and the option to AutoAdjust Cells. The basic concept is that you specify the center-to-center dimensions with Offset adjustments at the ends where your Frame is probably wider than the mullions; thus, to keep everything even, you will need to offset inward to make your cells equall all the way across your Curtain Wall. The AutoAdjust options can be used to Shrink or Grow Cells to the Left, Bottom, Middle, Top or Right (depending on Cell direction) when a

Manual - this is a more complex system for managing the center-to-center distance of your Cells, but by using this option you can specify exactly where you want your Mullions relative to Left, Top, Middle, Bottom, Right (depending on Cell direction). You can even add Offsets to individual centerlines with this option.

Baseline/Base height - available only for Horizontal Cell Divisions. This is another easy option because it only offers you two choices: to add a Cell Division up from the bottom (**Baseline Offset**) or to add a Cell Division down from the top (**Base Height Offset**).

For the Base Height Offset, you can use a negative number to bring a division down into the main Frame area. The real purpose of this option is for irregular curtain wall profiles that have things like **gables** or **steps**. I might get into more on this later but the Help menu in ADT covers this fairly well.

Polyline - available only for Vertical Cell Divisions. This option is an interesting one because it reads the **vertex points** within a contiguous polyline used to generate a Curtain Wall and places a Mullion at those vertex points. If you want a fast solution to a very irregular set of vertical cells, just draw a contiguous polyline with points at every interval where you want a new cell.

Secondary, Tertiary, Quaternary, etc., Grid

Fixed Cell Dimension - see comments above.

Fixed Number of Cells - see comments above.

Manual - see comments above.

Baseline/Base height - see comments above.

Polyline - see comments above.

Curtain Wall is drawn longer, taller, shorter or anyway that is less than the optimum amount.

Fixed Number of Cells - the easiest to deal with because it just divides the Cell equally. You can use the Start and End Offset values to adjust and compensate for corner conditions where your Frame may be wider than the mullions; i.e., where center-to-center values need adjustment.

Design Rules - Infills

Under the Infills category, you will find a **Default Infill** that you can think of as Glazing, Solid Panels or any other default material for each of the Cells in your Curtain Wall Grid. Illustrated to the right I show that I have simply changed the **Panel Thickness** to something more appropriate for glass. Later I will discuss how to mix glass and solid panels for more custom Curtain Wall Styles.
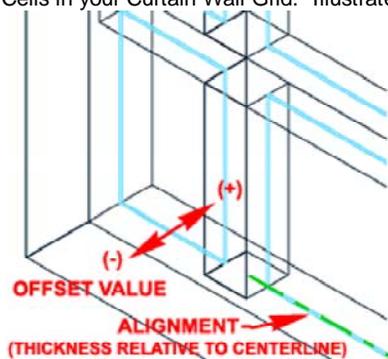
Notice that you can work with the three **Alignment** options (Front, Center and Back) to describe how you want the Infill to be centered; i.e. relative to the Front of the Panel based on its Thickness, to its Center or to its Back. In addition to this Alignment you can use the **Offset** to push the Infill in the Negative or Positive direction (even right out of the Grid).
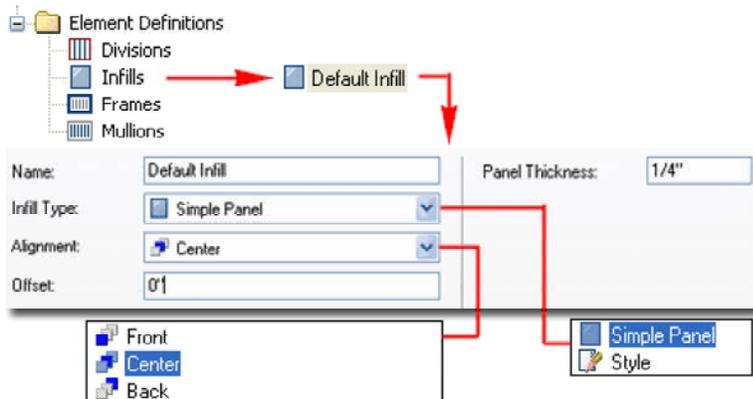
Design Rules - Frames and Mullions

SIMPLE GRID WITH UNIQUE FRAME, MULLION AND INFILL PANEL THICKNESS
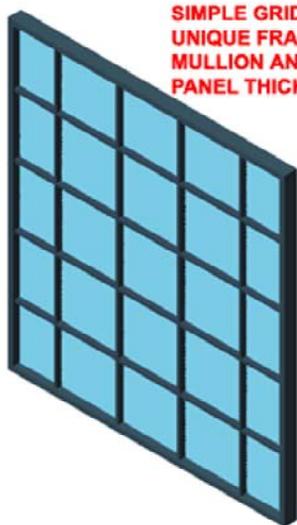
For the last part of working with the Desing Rules tab of your custom Curtain Wall Style, you will probably want to set the **Frame** and **Mullion dimensions**. Illustrated to the right I show that the Property Settings for Frames and Mullions are identical.

For my example I set the Frame Width and Depth to values a bit greater than those of the Mullions. Later I will discuss how you can work with individual Frame and Mullions to create such things as custom shapes and dimensions for Sills
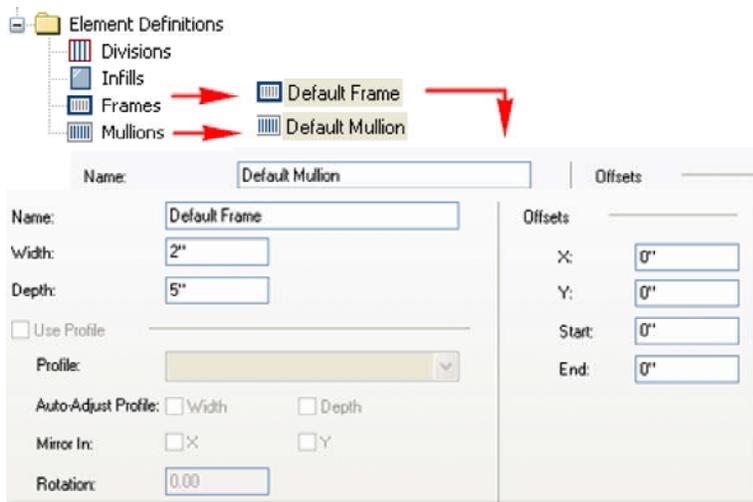
9
Curtain Wall Styles - Design Rules - Detailed

Design Rules - Primary Grid Division

Download to download this example Curtain Wall Style and see the completed results.

PRIMARY GRID DIVIDED VERTICALLY INTO THREE CELLS
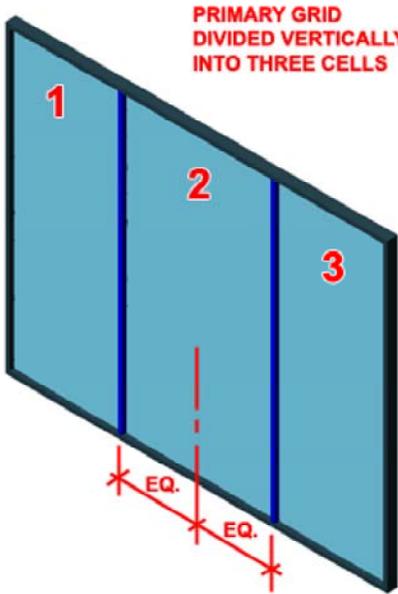
When creating more complex Curtain Wall Grid Configurations, you have to start from the outside and work your way inward towards the various **Cell Assignments**. Illustrated to the right I show how I have divided a **Primary Grid** into **Three Vertical Cells**. To allow the Right and Left Cells variable lengths, I show that I have set a **Manual Division Type** with a **positive** and **negative distance** from the Grid Middle to my Vertical Mullions. Using this technique will create a fixed center allowing you to Stretch the Curtain Wall out to the Right or Left. This Center or Middle Division will always remain centered so as you Stretch the Grid, the center will automatically readjust. At times, you may find that you want a set distance from one End instead.

Illustrated above left, I show that this work provides three individual Cells that can now receive a common or individual Cell Assignments.

Design Rules - "Nest Grid" Cell Assignment

From the Primary Grid, we can work with the three new Cell Divisions created above by Assigning a new ***Nested Grid*** to one or all three. Illustrated to the right I show that I have replaced the "Default Infill" Cell Assignment with the *Nested Grid* option. The default name for this new grid is "New Nested Grid" but in most cases, default Curtain Wall Styles will have this 2nd Grid named as "Secondary Grid".

HORIZONTAL DIVISION AS NESTED GRID FOR EACH OF THE THREE VERTICAL CELLS
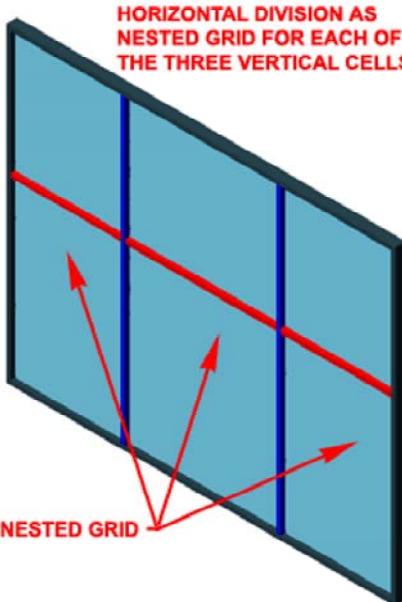
For this new Cell Division I show that I have a **Horizontal Orientation** set to **Manual Division Type** with a specific dimension measured from the Bottom. Using this technique, you can define a head frame or mullion for such things as Doors and Windows.

Illustrated to the left I show that because I only have one Cell Assignment for my Primary Grid, that Assignment will automatically be applied to each of the three Cells defined by the Primary Grid Division.

NESTED GRID

Design Rules - Locating Multiple Nested Grids

By adding more Cell Assignments for the Primary Grid, as illustrated to the right, you should find the option to use the **Index** or **Location dialog** to specify the position of each Cell Assignment. There will always be one that remains set to "**All unassigned cells**".

Illustrated to the right I show that I have added a total of three Cell Assignments to my Primary Grid and set each to a specific Location. I have also Renamed the Cell Assignments to match the Location for easier reading.

Note:
If the Primary Grid had been Divided Horizontally, instead of Vertically, the Location dialog would have offered Top, Middle and Bottom as positions. By using the **Index** option, you can type in the Index number(s) for the Cell positions; e.g., "1" might be the Bottom, "2" would be the next one up from the Bottom and "2,5" would be the second <u>and</u> the fifth.

Design Rules - Nested Grid inside a Nested Grid

In the step outlined above I illustrated how you can add multiple Cell Assignments as Nested Grids but those Nested Grids will use the same Division by default so more work will be required to see the results of this work.
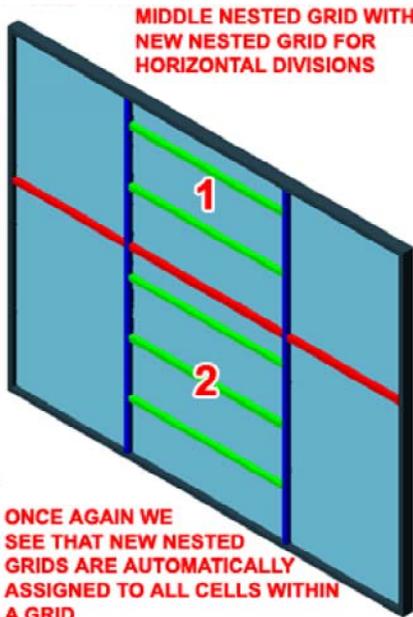
MIDDLE NESTED GRID WITH NEW NESTED GRID FOR HORIZONTAL DIVISIONS

Illustrated to the left I show how I have Selected one of the Three Cell Assignments as a sub-grid in the Tree View Pane. For this sub-grid I have left the Division as set but in order to introduce more Mullions, I added yet another Nested Grid as a Cell Assignment. In essence this is a sub-sub-grid that shows up under the parent sub-grid. For this sub-sub grid I show that I have created a New Division Assignment that I named at "24 inch Horizontal" to make it easy to read later.

ONCE AGAIN WE SEE THAT NEW NESTED GRIDS ARE AUTOMATICALLY ASSIGNED TO ALL CELLS WITHIN A GRID

For the configuration of this Horizontal Division, I set the Orientation to Horizontal, used the Fixed Cell Dimension to set a Cell Dimension of 24" [610mm].

Because I expect to use this Division for the top of this grid and not the bottom, I have set the Shrink to Top only.

Design Rules - Locating a Nested Grid inside a Nested Grid

MIDDLE GRID WITH NESTED GRID SET TO TOP LOCATION

In order to force the new "24 inch Horizontal" Division to only affect the top portion of my grid, I show that I have Select the parent sub-grid and added a New Cell Assignment that I set to "Default Infill". By adding this New Cell Assignment, I can use the Location dialog as discussed earlier, to force the sub-sub grid to the top as illustrated to the left.

Name	Element	Type	Used In
Division Assign...			
Middle Grid	Primary Horizontal Divisi...	Grid	This grid division
Cell Assignments			
Horizontal	*Nested Grid*	Default	All unassigned cells
New Cell Assign...	Default Infill	Location	Bottom
Frame Assignm...			
Default Frame A...	Default Frame	Location	*NONE*
Mullion Assign...			

Design Rules - Multiple Nested Grids

In order to make a true grid that used both Horizontal and Vertical Mullions, I show that I have to add yet another Nested Grid because one grid can only define one Division.

FOUR LEVELS OR LAYERS OF DIVISIONS TO PRODUCE THIS RESULT
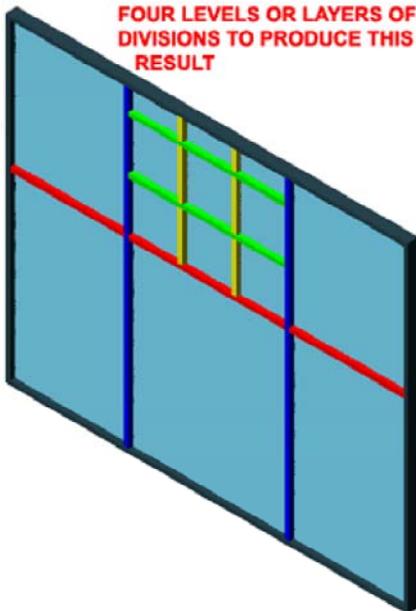
Illustrated to the right I show that I have Selected the sub-sub Grid created in the last step and added a Nested Grid as a Cell Assignment to create a sub-sub-sub Grid. For this deepest Grid, I show that I have added a New Division Assignment that I have named "24 inch Vertical" and configured as having a Vertical Orientation, Fixed Cell Dimension of 2'-0" with Shrink set to Left and Right

Name	Element	Type	Used In
Division Assign...			
Horizontal	24 inch Horizontal	Grid	This grid division
Cell Assignments			
Vertical	*Nested Grid*	Default	All unassigned cells
Frame Assignm...			

Name	Element	Type	Used In
Division Assign...			
Vertical	24 inch Vertical	Grid	This grid division
Cell Assignments			
Default Cell Assi...	Default Infill	Default	All unassigned cells
Frame Assignm			

Name:	24 inch Vertical	Start Offset:	0"
Orientation:	≡ ‖‖	End Offset:	0"
Division Type:	Fixed Cell Dimension	Cell Dimension:	2'-0"
		☑ Auto-Adjust Cells	
		Cell Adjustment:	Shrink
		Specific Cells:	
		☐ Maintain at least half of cell dimension	
		Convert to Manual Division	

Design Rules - Custom Styles as Cell Assignments

ADDING A DOOR STYLE AS A CUSTOM INFILL

CREATE A DOOR STYLE WITHOUT ANY FRAME DIMENSIONS
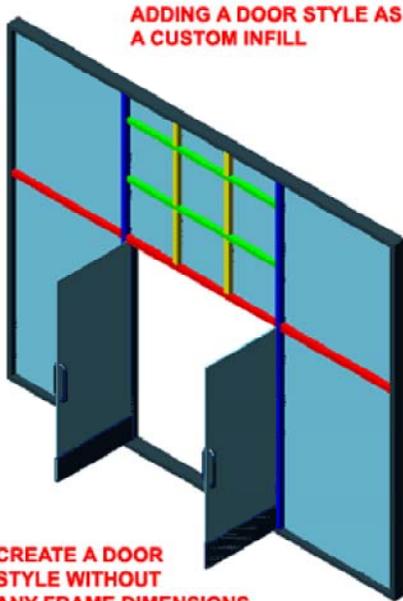
For the Bottom Cell of the Middle Grid I show that you can use the Cell Assignments to add things like Door and Window Styles. Notice that this is also how you add Curtain Wall Unit Styles for even more complex configurations.

Illustrated to the right I show that I have Added a new Cell Assignment to the Parent Middle Grid and set the Infill Type to Style to allow me to Select any of my current Door Styles. The Door Style that I have Selected and show to the left was custom Door Style created with no Frame so it will appear to hinge off the side Mullions.

Design Rules - Completing a custom Grid System

After you comprehend the steps taken above you should find that there is little more than extremely tedious redundancy for expanding those steps to a larger design solution.

In the illustration to the right I show how I repeated similar steps used to create the Grid above the Doors to the create Grids for the Top Start (Lower Left), Bottom Start (Lower Left), Top End (Upper Right) and Bottom End (Lower Right). You might argue that I have overdone the configuration but that all depends on the results you expect and how flexible you want the Style to be. I created a Lower Left and Right Grid Division in order to allow for Horizontal Mullions that can start at a unique height above the floor without affecting the entire Left Side; i.e., I isolated it to a Cell below the Door Head Mullion.

You should also notice that I have a lot of redundancy but that was necessary to allow for Vertical Mullions to Shrink to the Right on the Right and to the Left on the Left

Design Rules - Controlling Frames

Design Rules - Controlling Frames

Many have complained to me about how the Bottom Frame in Curtain Walls passes under Doors or Openings so here is an example of how you can expand on the work above to control this result.

BOTTOM FRAME IS NOW UNIQUE FOR THIS GRID CELL AND DOES NOT PASS UNDER THE DOOR
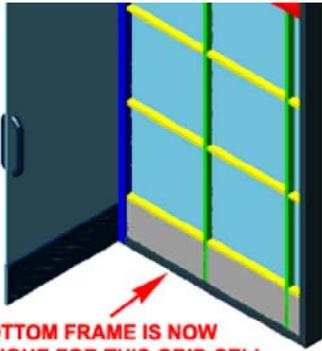
Illustrated to the right I show how I have returned to the **Primary Grid** by Selecting it in the Tree View Pane. Under the **Frame Assignments** category in the Table View I show that I have picked in the "**Used In**" column of the Frame row to activate the **Frame Location Assignment dialog** where I have **unchecked** the **Bottom** button. This will remove any Frame reference for the bottom of the Curtain Wall Style.

Because of how this example Curtain Wall Style was Divided, I show that I can now go to the **Start** or **End Grid** in the **Tree View** and put the Frame back. By repeating the same procedure to remove the Bottom Frame from the Primary Grid, I now Add it to the Sub-Grid by checking the **Bottom** button in the Frame Location Assignment dialog.

Though I show that I have used the "Default Frame", there is nothing stopping you from creating a custom Bottom Frame proportion or shape and using it here. If you are following this example as an exercise, you will need to repeat these steps for the other side of the Grid.
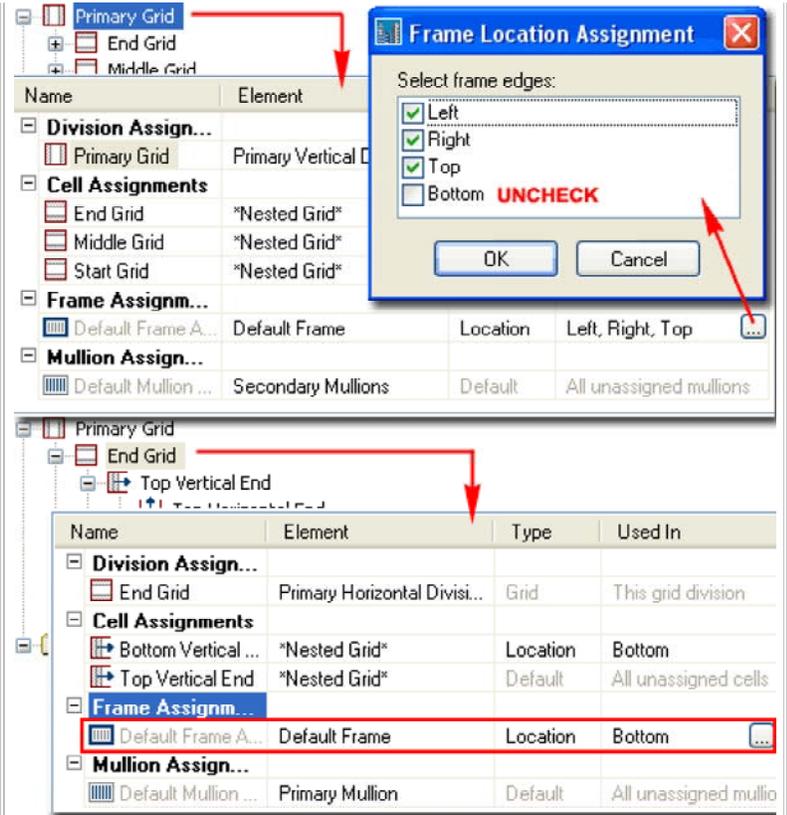
Design Rules - Using Custom Profiles for Frames and Mullions

Links Profiles - for information about creating Profiles from Polylines.

By the time you are this deep into customization chances are that you are well versed in the creating of **Profiles** but what might throw you for a tail spin is getting Frame and Mullion Profiles to site as you would like.

Illustrated to the right I show the tedious process I had to go through in order to use a **custom corner frame** Profile for a Curtain Wall layout. Though you will find options for **Auto-Adjust**, **Mirror**, **Rotate** and **Offsets**, you can spend an hour fussing over these settings or you can start off on the right foot and save some frustration as I finally learned in this example.

After drawing my corner Frame as a **Closed Polyline**, I positioned it right where I wanted it on my Curtain Wall end. Then by using the **Node OSNAP** I found the **Baseline** of the Curtain Wall and connected it with a perpendicular line off the **Midpoint** of my Frame edge as illustrated to the right.

Once set I created the **Profile Definition** using this calculated insertion point and set it for a Custom Edge Frame as illustrated below right. Notice that I was able to avoid using Auto-Adjust, Mirror, Rotation and any Offsets. However, what did catch me by surprise what figuring out how the get the Glass or Panel Infill to stop right where I wanted it to in my Profile detail. By using the distance indicated as **D₁** in the image to the right, I got the **Width** value that I needed to set on the Frame Settings Properties View listed below right.

Now, you are sure to have different design issues but hopefully this example will set you on the right path.

CUSTOM FRAME AND MULLION PROFILES

DRAWING A PROFILE WITH A POLYLINE IS THE EASY PART, GETTING IT POSITIONED RIGHT WHERE YOU WANT IT IS ANOTHER MATTER.

BY USING THE NODE OSNAP, YOU CAN LOCATE THE EDGE OF YOUR CURTAIN WALL AND CALCULATE THE REQUIRED INSERTION POINT FOR YOUR PROFILE RELATIVE TO THIS POINT.

USE THIS DISTANCE D₁ TO CONTROL WHERE THE GLAZING ENDS BY SETTING IT AS THE WIDTH

10 Curtain Wall Units
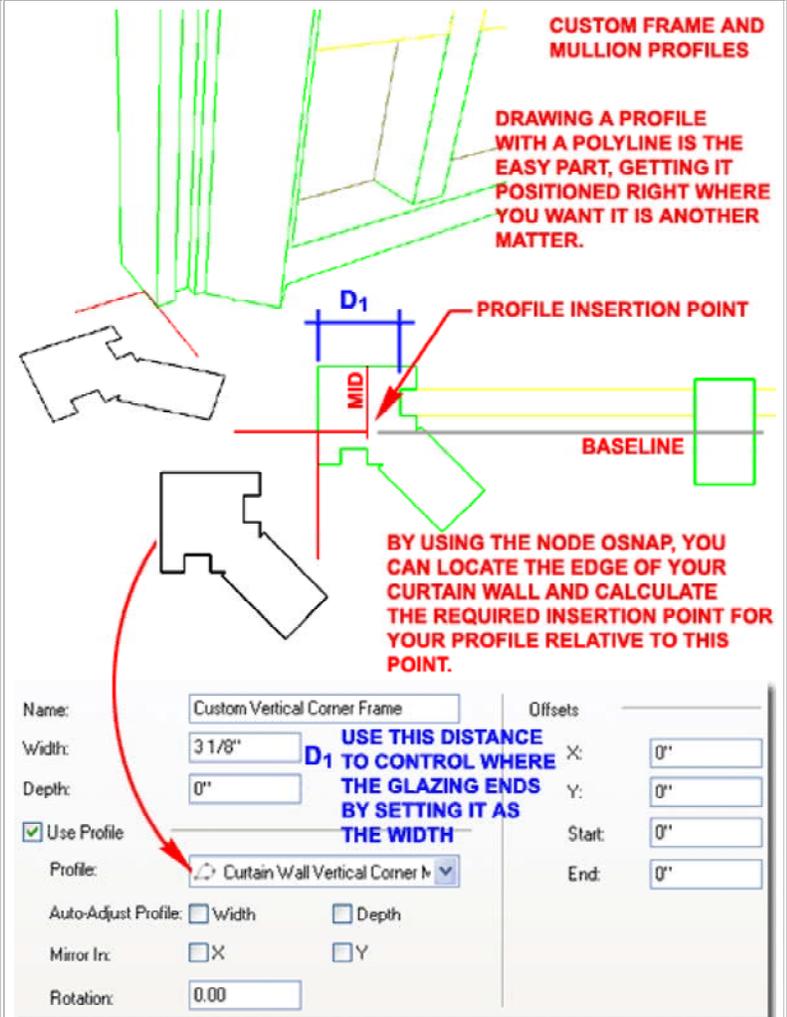
Add Curtain Wall Unit

Alt.Menu **Design> Curtain Walls> Add Curtain Wall Unit...**

Keyboard **CwUnitAdd**

Links Design Rules - Cell Assignments - for information on where you can insert a Curtain Wall Unit into a Curtain Wall.

When you **Add Curtain Wall Units**, there is no Properties Palette reaction with options and settings like with most other ADT objects because, well, I don't actually know why; even the keyboard version of this object varies dramatically from other typed commands (**CwUnitAdd** instead of CurtainWallUnitAdd). Actually, I guess I do know the answer to this peculiarity and it is because the Curtain Unit really isn't meant to be used as a direct Object but rather as an **insert** or **filler** within a Curtain Wall. The ability to Add a Curtain Wall Unit allows you to draw it so you can work on it in an isolated space. Of course, if a Curtain Wall Unit Style just happens to be the solution you need in place of a Curtain Wall Object, there is no reason not to Add it like a Curtain Wall
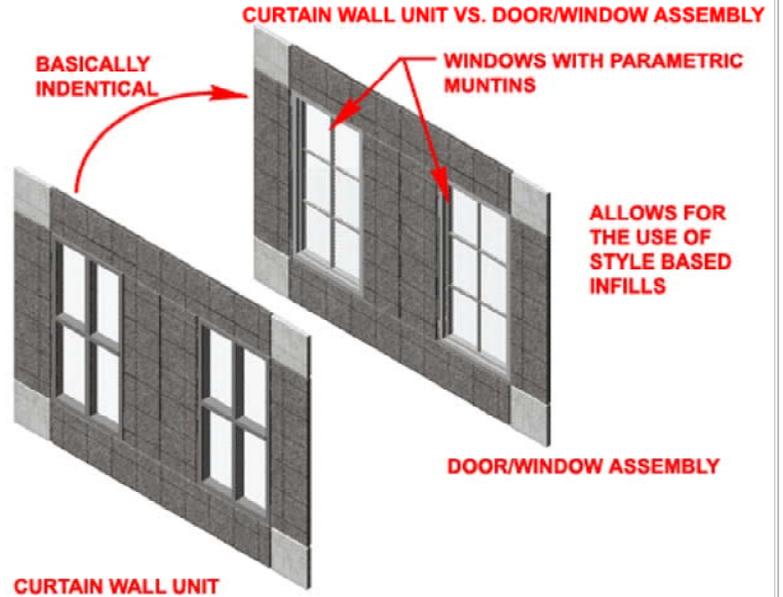
The really significant difference between Curtain Wall Units and Curtain Walls is that the Units do not allow for **Style Based Infills** so you can't create Curtain Wall Units with Doors, Windows, Assemblies or other Curtain Wall Units. What I recommend is that you consider using Door/Window Assemblies as Infills whenever you need to include Doors and/or Windows.

Converting Linework to Curtain Wall Units

Menu **N.A.**

Keyboard **CwUnitConvert**

Links Converting Linework to Curtain Walls - for more information.

Similar to Curtain Walls, use link above for more information.

Converting Layout Grids to Curtain Wall Units

Menu **N.A.**

Keyboard **CwUnitConvertGrid**

Links Converting Layout Grids to Curtain Walls - for more information.

Similar to Curtain Walls, use link above for more information.

Style Manager - Curtain Wall Unit

Alt.Menu **Design> Curtain Walls> Curtain Wall Unit Styles...**
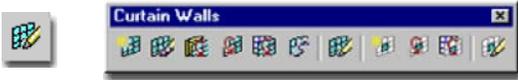
Keyboard **CwUnitStyle**

Links Loading Curtain Wall Styles - for information on how to load ADT Curtain Wall Unit Styles.

For **Curtain Wall Unit** Objects, you can use the **Style Manager** to load, modify, delete and create new Curtain Wall Units Styles.

Illustrated to the right I show how a Curtain Wall Unit basically offers all of the same settings and options on the **Design Rules tab** of the Style Properties dialog as Curtain Wall Styles.

---
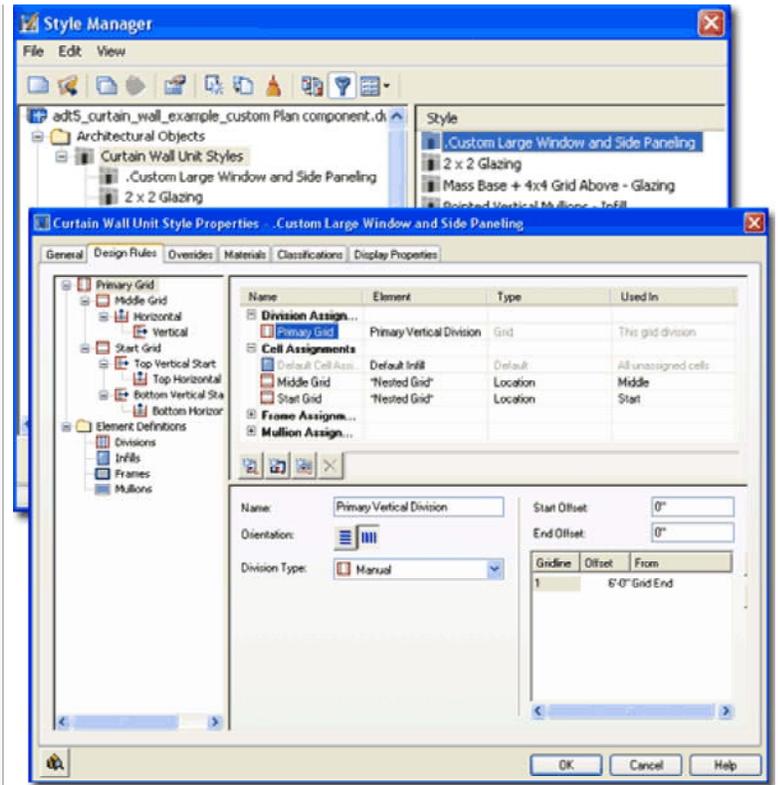
11 Curtain Walls - Customizing and Tricks

Design Rules - Cell Assignments - Positions

Starting back at the basic level of creating a custom Curtain Wall Style, notice how you can **Add New Cell Assignments** to the "**Primary Grid**" as illustrated to the right. Once you have more than one Cell Assignment, you should find that you will have the option to specify where the new Cell Assignment will be placed. Under the **Type column** look for the **Index/Location drop-down list** and select the option that is most useful for your desired result.

NEW CELL ASSIGNMENT WITH BOTTOM LOCATION ONLY
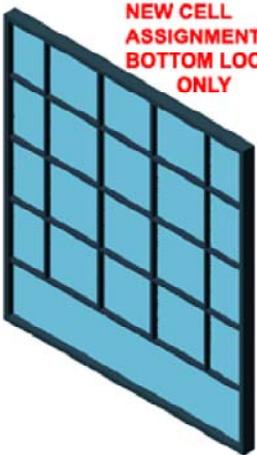
By using the **Location** option, you can only choose among three specific Cell positions: **Bottom**, **Middle** and **Top** or **Start**, **Middle** and **End** depending upon the Grid Division Orientation.

By using the **Index** option, you can type in the Index number(s) for the Cell positions; e.g., "1" might be the Bottom, "2" would be the next one up from the Bottom and "2,5" would be the second <u>and</u> the fifth.

When you have created a New Cell Assignment, you should find that the Default Infill is automatically assigned but you can now provide another Infill option or set it to a *Nested Grid* thus allowing for a unique Grid Division at this specific Index or Location position.
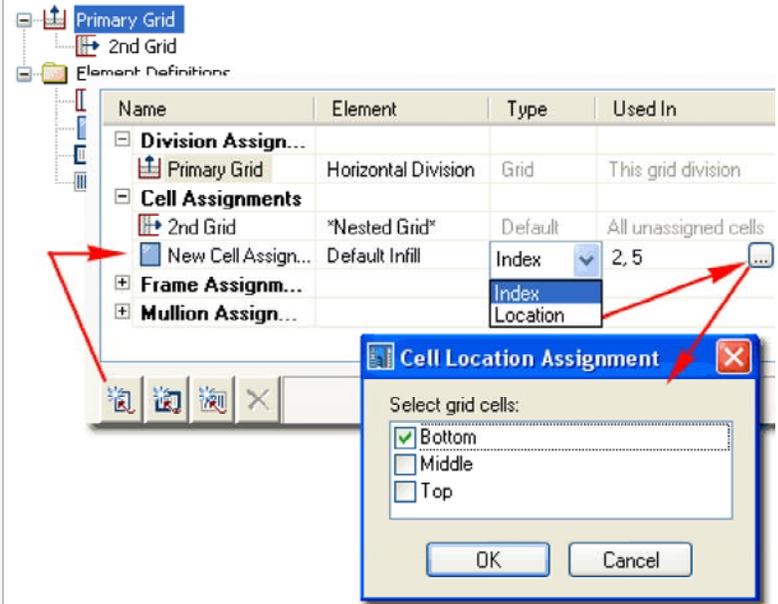
When you design a custom Curtain Wall Style and find the need for more than one *Nested Grid*, it will be important to chart out how you are going to divide your Primary Grid: Horizontally or Vertically. Choosing the right Division Orientation for the Primary Grid is deceptively of huge importance. I find that sketching out a diagram on paper helps me to figure out the most logical procedure for configuring grids.

Transferring Design Rules Data between Curtain Wall-like Styles

Because Door/Window Assemblies, Curtain Walls and Curtain Wall Units are all based on the same structure, you can actually transfer design configurations from one Object Style to the Other by using the **Set From...** option in the Style Manager. This is far different from Copying a Style because you are actually copying the data from another Object Style and not the same one.

This neat feature should be fairly obvious but did not come to me until I had accidentally designed a custom Curtain Wall Unit only to realize that it would work far better as a Door/Window Assembly where I could use real Window Objects.

THE SET FROM... OPTION CAN BE USED TO TRANSFER DESIGN DATA FROM CURTAIN WALLS, CURTAIN WALL UNITS AND DOOR/WINDOW ASSEMBLIES TO ANY OTHER OF THESE OBJECT STYLES.