



AutoCAD® Architecture 2008

Renovating AutoCAD Architecture

Paul Oakley

(S3-4)

Course Summary:

This session will examine the renovation/refurbishment of existing buildings using AutoCAD Architecture 2008. First we'll look at traditional methodology for working on existing buildings. We'll show you tricks for converting survey data into objects and how to create specific styles. We will also cover how classifications can be used to provide the necessary tool to filter your data using general design objects, but more specifically Scheduling and Display Themes. From wall styles to scheduling, we'll show you how to apply these techniques to an existing building project.

Instructor:

Paul has over 20 years of AEC industry experience specialising in CAD management, implementation and Autodesk training. As vice chairman of the AUGI-UK Chapter and a qualified architect, Paul has assisted Autodesk in the development of AutoCAD Architecture and chairs the technical forum for the ADT Community group. He has also been involved in various industry-led BIM initiatives and more recently Avanti. Paul is now an implementation specialist with UK based Cadpoint | AEC, an Autodesk Authorised Reseller and Training Centre. The company provides CAD consultancy services to clients ranging from small UK design companies to global architectural practices. Paul continues to present at major industry conferences throughout the world, providing industry professionals with guidance on improving efficiency, productivity and quality in the CAD arena.



Autodesk User Group International

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Renovating AutoCAD Architecture

For many Users, Autodesk appear to have down graded the Architectural Desktop software by renaming it AutoCAD Architecture. In fact I would argue that AutoCAD Architecture is a better product, but not because of what has happened in the 'Architectural' part of the product. The big changes over the last two releases have been in what has happened to the AutoCAD modeling engine and the advantages that this can bring. The change is that AutoCAD is now a usable 3D product in its own right and when used in conjunction with the additional AEC object functionality a variety of 3D objects can be efficiently created.

This session will look at AutoCAD Architecture and some of the techniques that can be employed when working on existing buildings. The advantages of drafting with objects as opposed to lines are well established, but sometimes it is necessary to mix and match the two in order to work productively. The initial part of this session will look at the set of tools required to carry out this type of work efficiently. The second part of the session will look as modeling techniques for creating custom content, either new or existing and will also cover some of the new modeling techniques available in AutoCAD and how these can be incorporated in AutoCAD Architecture.

Working with Existing buildings

For the first five years of my careers as an Architect using AutoCAD I was never given the opportunity to work on new buildings. All the projects that I worked on involved the renovation or refurbishment of existing buildings ranging from Grade 1 listed buildings to upgrading 1960 Leisure centres and schools. I was finally given the opportunity to carry out some new build projects and realized how easy new build is compared to working on existing buildings.

Most of these existing building projects were modeled using AutoCAD AEC and some solid modeling in AutoCAD. Others schemes created no 3d models at all, but still allowed me to draft more efficiently in 2D. A good command of the layer system to filter the required information was fundamental to success. Similar techniques can still be employed today using AutoCAD Architecture but there are far more powerful tools than just layers and the speed of production has increased dramatically.

This session will look at the options for the AutoCAD Architecture User involved in working with existing buildings. This will show the use of some of the little used functionality of AutoCAD Architecture such as Classifications and the additional power that these can provide when used in conjunction with property sets, display themes and display configurations.

In order to aid working with existing buildings a specific set of tools, working standards and methodology needs to be developed and a suggested set of tools will be discussed in order to aid the workflow.



Creating Content for 2D Drafting

Creating styles

In order to make AutoCAD Architecture work for you it is important to invest the time in creating a set of generic styles and tools necessary for the specific task. In order to work with existing buildings there are a series of basic styles that are necessary to at least get you started.

A suggested list of recommended styles is provided. Where full models for visualization are being created then the option to create additional styles to filter the model into External and Internal components should be developed. Also additional styles relating to specific existing project materials may be required. Suitable project Tool Palettes should be created to include these

Status	Recommended Styles	Additional Styles
Existing	<ul style="list-style-type: none"> Existing Wall Existing Windows Existing Single Door Existing Double Door Existing Uneven Door 	<ul style="list-style-type: none"> Existing External Wall Existing Internal Wall Existing Partition Wall Existing Specific material
Demolition	<ul style="list-style-type: none"> Demolition Wall Demolition Windows Demolition Single Door Demolition Double Door Demolition Uneven Door 	<ul style="list-style-type: none"> Demolition External Wall Demolition Internal Wall Demolition Partition Wall
Temporary	<ul style="list-style-type: none"> Temporary Wall Temporary Windows Temporary Single Door Temporary Double Door Temporary Uneven Door 	<ul style="list-style-type: none"> Temporary External Wall Temporary Internal Wall Temporary Partition Wall

Layer Key Overrides

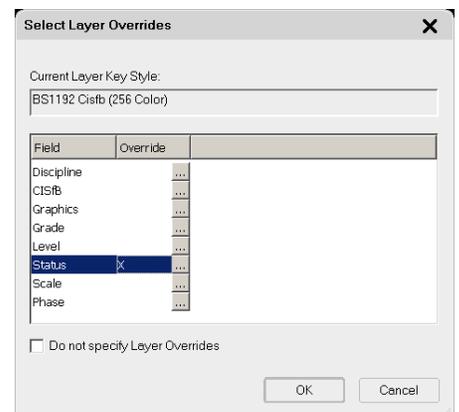
To aid Layer management AutoCAD Architecture provides the opportunity to use a Layer Override.

This is available by right clicking on a tool property.

With the BS1192 Cisfb (256 Color) Layer standard the option provides the opportunity to apply a Layer Override to the status field.

Select the appropriate field such as "Existing" and the additional Layer value will appear in the box.

The content will then be drawn on the correct layer.



Classifications

In order to filter objects effectively the use of Classifications should be mastered. The creation of a 'Status' classification that applies to all objects is useful when working on existing buildings. All styles can then be classified according to their 'status' when used in Schedules, Display Themes or even when using customized Display Configurations.

Typical Status Classification:

Status Classification

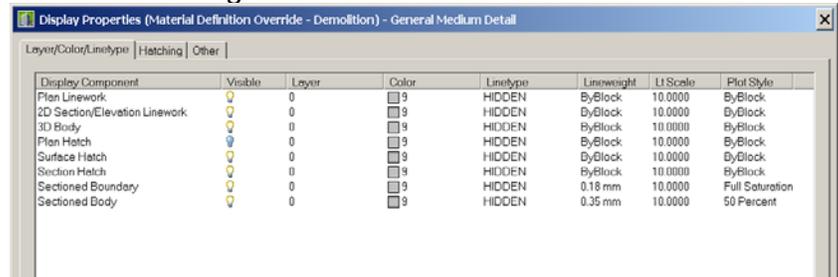
- New
- Existing
- Demolition
- Temp

Materials

In order to control the display of objects it is generally preferable to create a specific material to control the color, line type, hatch, etc of each type of object. Most styles default to using materials to control their display. It is therefore useful to create some generic materials as follows:

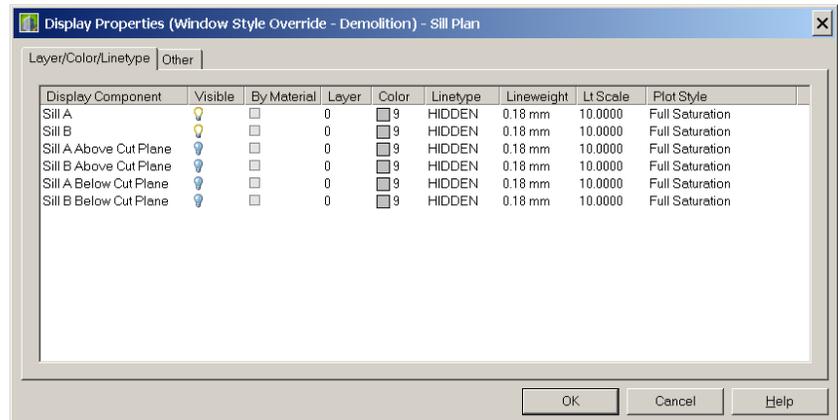
- Existing Material
- Existing Glass Material
- Existing Wall Material
- Demolition Material
- Temporary Material

An example of a material for Demolition may set all object colors to 8 with a thin line width and all linetypes to hidden.



With objects such as doors and windows, the specific display settings such as 'Sill Plan' are not controlled by material.

It is therefore necessary to go into each display property to update accordingly. It is also useful to check each of the display configurations to ensure that the styles are updating correctly. For this purpose the creation of different layouts showing each display rep is useful.



Drafting with AutoCAD Architecture

Not every AutoCAD Architecture scheme needs to be modeled in 3D.

Remember: *“Just because you can, does not mean that you should.”*

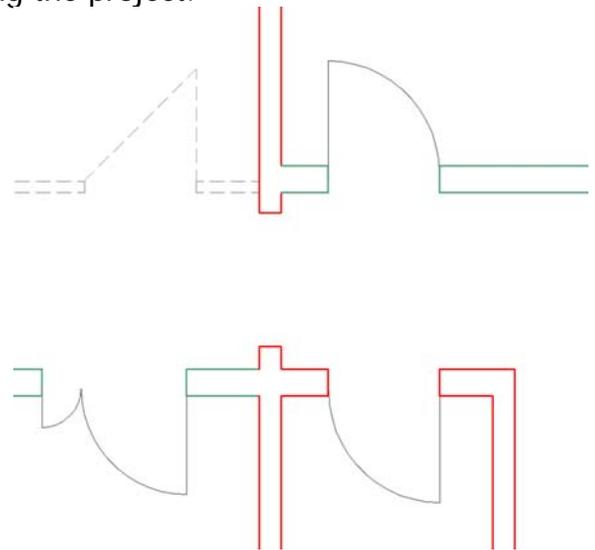
Instead the advantages of drafting with objects should be reviewed on a project-by-project basis. If the majority of a scheme is already drawn in line work what are the advantages of redrawing in objects?

Objects allow for quick changes with door flips, automatic clean ups and wall width changes. If the line work is not going to change or the project is well advanced then leaving the data in AutoCAD entity format may be the most efficient method of completing the project.

The plan illustration on the right shows how AEC objects can be mixed along with AutoCAD entities in the form of lines, polylines, arcs and circles to produce plan information.

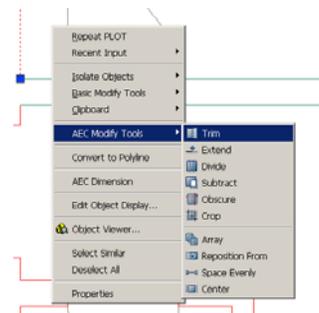
One trick with walls is to define ‘open endcaps’ using a polyline with a width. This can either be applied at style level or as an endcap override in specific locations.

If it is proposed to schedule objects such as doors, care need to be taken that all objects are what they are suppose to be and not a line and arc looking like a door object. Otherwise the door schedules will not be correct.



Mixing AEC objects AutoCAD Entities

AEC Modify tools provide a method of trimming and extending AutoCAD entities to specific wall components, instead of trimming to the walls baseline. Select either the entity of multiple entities and the right click to choose the appropriate AEC modify tool.



Property Sets.

In order to aid with scheduling and also as a basis for display themes a property set should be created based upon the status classification. In this case a style-based property set has been created.

One of the property options when creating a property in a property set is the 'Add Classification property'. Select this and choose the 'status' classification. This property set then needs to be then attached to all styles.

Another useful tool in property sets is the use of VB Scripting. In order to shorten the classification to a single letter this VB script looks at the 'STATUS' Property and then assigns a letter accordingly. New items or non-classified are not assigned a letter by the use of a 'Case Else' statement.

VB Script for Status

```
SELECT CASE "[Status]"
  Case "Existing"
    RESULT = "X"
  Case "Demolition"
    RESULT = "D"
  Case "Temporary"
    RESULT = "T"
  Case Else
    RESULT = ""
End Select
```

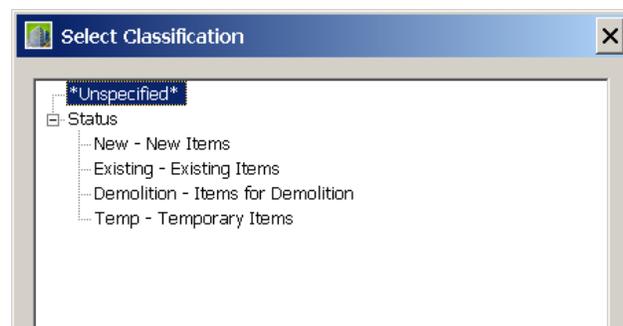
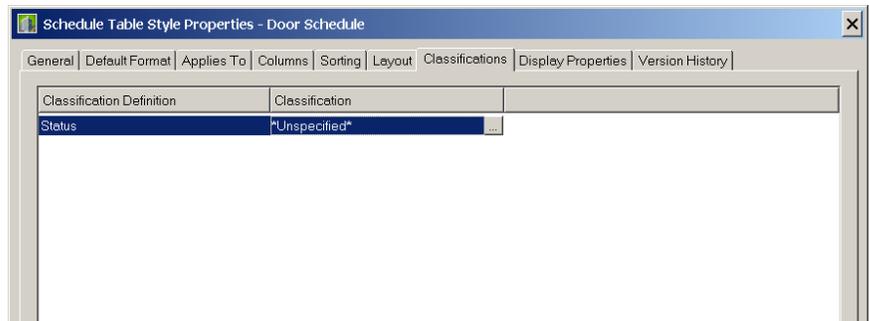
Schedule Tables

The ability to use classifications within schedule tables provides the opportunity to just schedule items with a specific classification.

In this door schedule the Status classification is automatically added as it applies to all objects.

By changing the classification type it is possible to schedule a specific classification of doors such as 'new'.

Copy and assign the Door schedule and change the classification to create separate schedules for existing doors and doors for demolition.



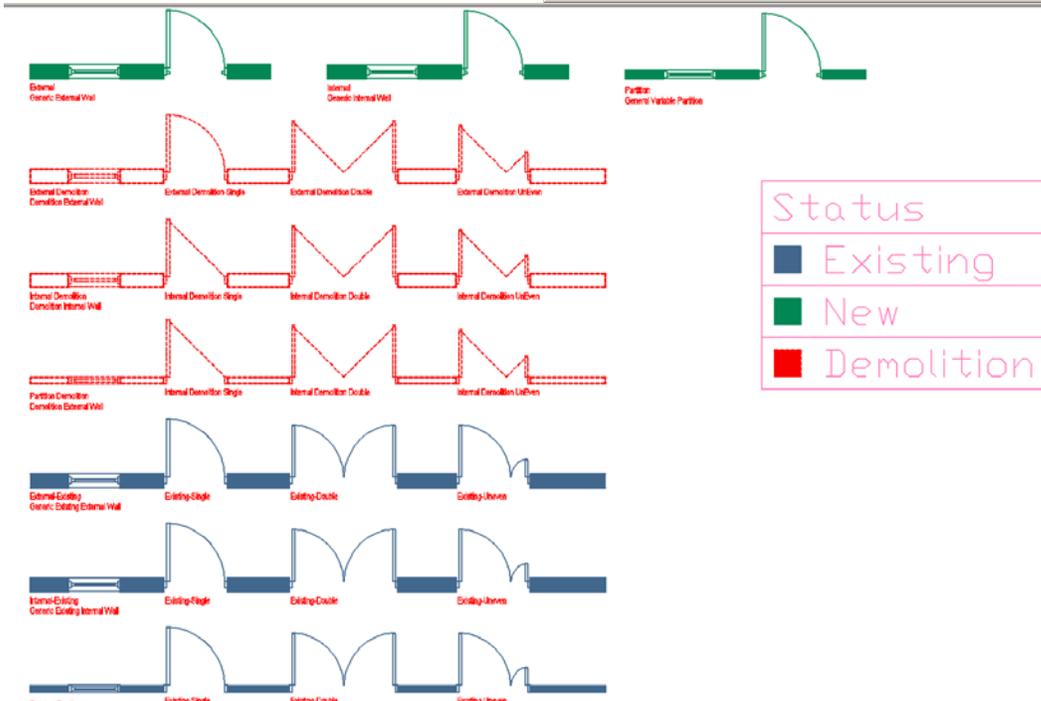
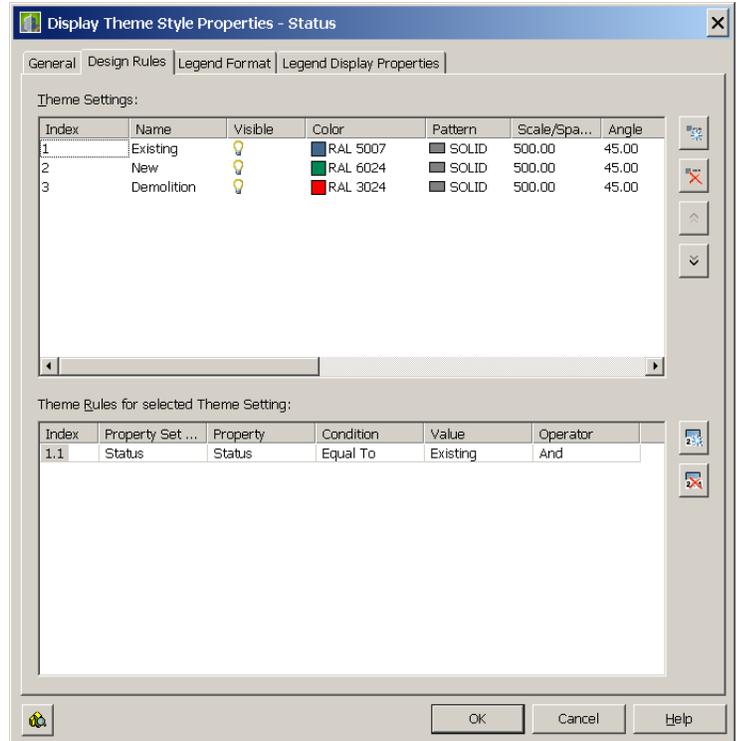
Display Themes

Having created a property set based upon the classification a Display theme can then be created to color the drawing according to the objects classification.

In the Theme settings an index name and display properties are set. Then in the Theme rules the status Property set created earlier is referenced and a value is added for each index.

In this Theme all Existing items will be colored RAL 5007, all New items RAL 6024 and Demolition items RAL 3024.

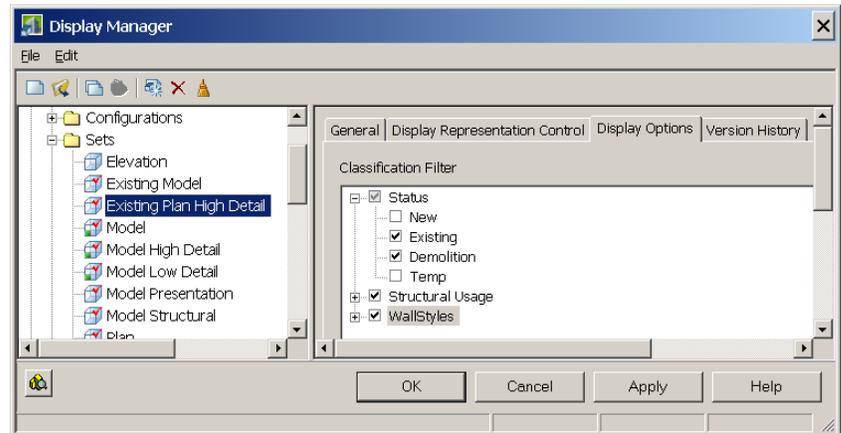
When applying the display theme the objects should change color. If they do not ensure that the property sets have been applied to the styles.



Display Configurations

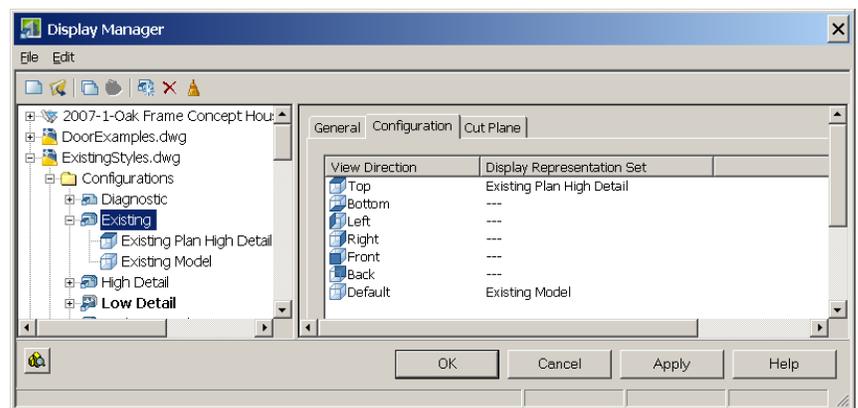
Having created a Status Classification and applied this to the various object styles also provides the opportunity to create a custom display configuration

Using the Display Manager the Plan High Detail Display set has been copied and then renamed Existing Plan High Detail. Under the Display Options the classification filter shows the 'Status' classification. The Existing and Demolition classification are left ticked and the others unticked. Similarly the model display set is also copied and renamed and the classification filters set.



Under the Display 'Configurations' the High Detail set is copied and renamed Existing.

The top view set to use the new Existing Plan High Detail and the Default the Existing Model View. The property set is then available to be used.



The 'Existing' Display options will then be available for use within the drawing. It is recommended that display configurations are used in a consistent manor across a project and should be set up within the project templates. The project standard allows the capabilities to manage the display configurations form this central location.

Design Options

Much is talked about the 'design option' capabilities with Revit. The ability to create classifications for any object and drive object display using these classifications provides a similar capability in AutoCAD Architecture. If the 'Status' classification was renamed Design option and then Option1, Option 2 etc.... a similar result could be achieved.

Creating 3D Content

Modelling in AutoCAD

The change in the modeling engine introduced in AutoCAD 2007 has given AutoCAD the ability to model most types of objects. Most Users seem to forget that AutoCAD Solids can be easily converted to AEC Mass Elements and visa versa. Also the Objects styles such as Doors and Windows can use AutoCAD geometry stored in blocks for custom objects to represent 3D views within the model, whilst line work blocks can be used to create basic 2D geometry.

This part of the session will look at the various options available for creating content to represent existing or bespoke new content. We will initially look at the UK Content Creation tools available to UK Subscription customers. This automates the creation of AEC Profiles or custom blocks and applies them directly to a style.

We will then look at the Elevation sketch option for Door and Window Assemblies. The ability to model most geometry will be reviewed with an exercise in producing a Doric column. This would have been a major project when attempting to model in AutoCAD Solids.

The use of Solids and Mass Elements will then be developed further to create blocks made up of 3D geometry for inclusion within Door or Window styles using the custom block display option. Finally some methods of mixing and matching the various techniques to get the required results will be reviewed.

Creating Custom Openings (Doors, Windows and Door & Window Assemblies).

When working with existing buildings it's the creation of custom components that generally create the most issues. However, AutoCAD Architecture offers numerous methods of creating custom component for the various types of openings.

The two main options are AEC Profiles and Custom Block Displays.

Traditionally you are required to create the profile and blocks and then add these to the opening components. The UK Content Creation Tools provided by Autodesk UK to subscription members offers a series of tools to automate these tasks. The Options for creating custom Windows and Doors are similar with either the option to create a style or a catalog style. The basic style generally uses either standard types or an AEC profile to create content. A Catalog styles provide the option to add a series of specific sizes and will also create custom block displays. Lets look at the two options based upon a door style.

Create a Door Style

The Create Door Style option uses either a plain or custom shape created from polylines. The routine will create an AEC profile to create a custom shaped door.

Almost any shape can be drawn as a closed Polyline for the external door profile and also for the glazing areas.

Ensure that the size of the profile is correct for the size of doors required and select the custom shape and glazing option.

The Proposed style name and a suitable description should be added. When creating a profile the custom shape and glazing option should be selected.

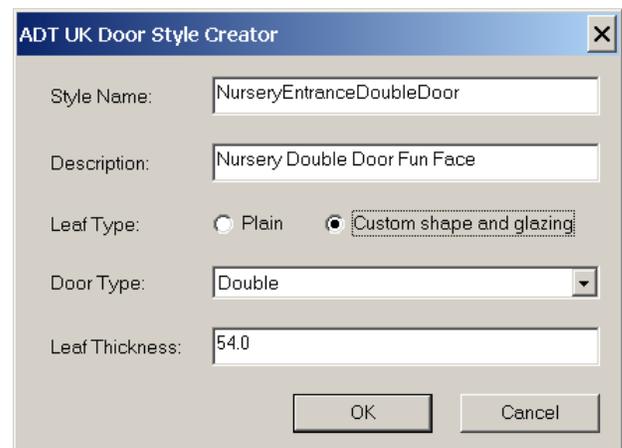
Select the door type. As this is a Double door note that the profile will be split in half. Define the leaf thickness. Press Ok and you will be prompted to select the doorframe. Then selected the glazed areas.

Insert a door into a wall and change the door style to match your created style.

Note that the materials are standard and need to be set after creation. Also any other specific requirements such as classifications.

Note that in the new door style that the under Design Rules the use profile option is selected and the profile has been given the same name as the door style.

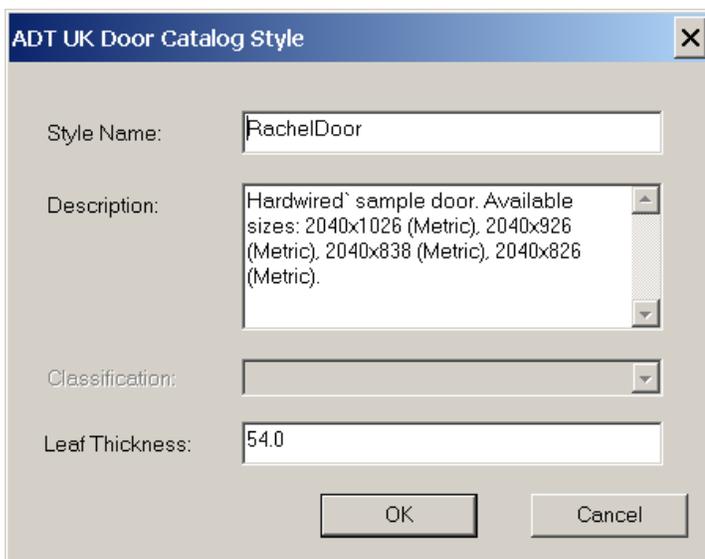
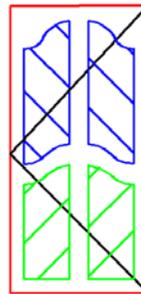
A similar routine exists for windows styles.



Creating A Door Catalog Style

The Door catalog style creates a range of doors based upon the sizes specified in the test fields.

- This utility looks for specific AEC Polygon styles and if they are not found inserts a sample to be modified. A single door leaf outline defined by a polygon with style "DoorDef_Leaf" (illustrated in red). Where appropriate, the door must be drawn with the hinge-side on the left.
- A single line of text in the form "Style: nnnnn", specifying the door style name (e.g. "Style: SampleDoor" in the example above). This is optional as the style name can be entered in the utility dialog. However, selecting the name from the drawing is a convenient way if you are defining a range of styles.
- Like the style name, a single line of text in the form "Desc: nnnnn", can be used to specify the door style description (e.g. "Desc: Hardwired sample door"). The description will also be appended with the range of sizes that the door is available in.
- Additional lines of text that specify a range of applicable sizes for the door. The format of these is "Size: <height>x<width> <anything>", where <height> and <width> represent the door size and <anything> is additional info that will be included in the door style description.
- Glazing lights are defined in the door through the "DoorDef_Glazing" polygon style - illustrated in blue in the example below. You may include any number of these.
- Recessed panels are defined in the door through the "DoorDef_Panel" polygon style - illustrated in green in the example below. You may include any number of these.

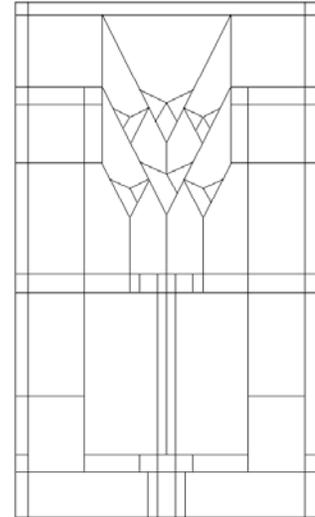
```
Style: RachelDoor
Desc: Hardwired sample door
Size: 2040x826 (Metric)
Size: 2040x838 (Metric)
Size: 2040x926 (Metric)
Size: 2040x1026 (Metric)
```

Custom Grid Door and Window Assemblies

Creating bespoke door and window assembly objects can be created from an elevation sketch. Create line work for the centre positions of the frames and mullions.

Style Tip

First create a suitable Door and Window Assembly style with the appropriate mullions and frame sizes, infill's and materials. This will make the editing of the design rules easier. Add this style to a palette or change the property of the default style.



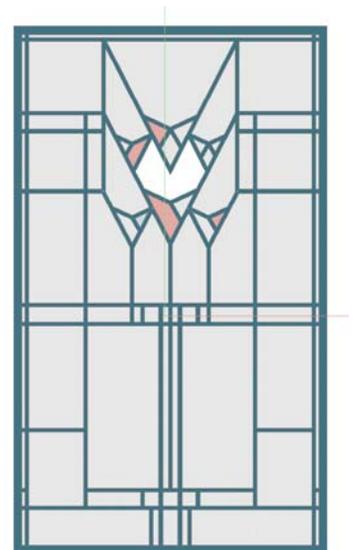
Right click on the Door and Window Assembly Tool and select the "Apply Tool Properties to" and the "Elevation Sketch" option.

Select the line work created and either select a baseline or accept the default. If the default is chosen the object will automatically rotate from the plan to model view.

Having created the custom object this cannot be edited via the style. Selected the object and on the 'Properties Palette' under 'Advanced' is the 'Design Rules' options.

This allows access to change the frame and mullion styles and also create additional infill's etc. Having a range of materials for different glazing styles and other components is always useful.

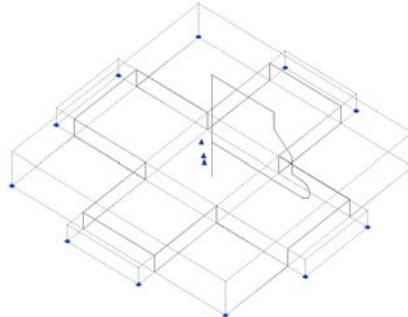
Right Click on the object and select the 'Edit object display' option. Materials can then be assigned to new infills in this manner.



Modelling in Solids - Doric Column

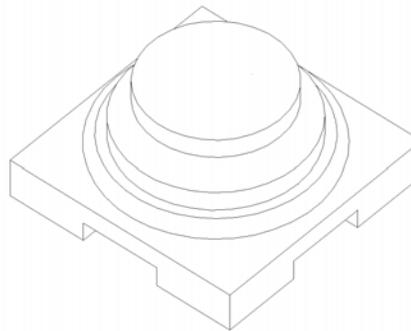
A 600mm square base is extruded to 100mm high. Two further Polylines are extruded to create boxes for the cutouts. The subtract tool is used to subtract the boxes from the base.

Note that each element can be selected and edited using the control key to select subtractive elements that are no longer visible. This allows editing of all components even after the Boolean operations have taken place.



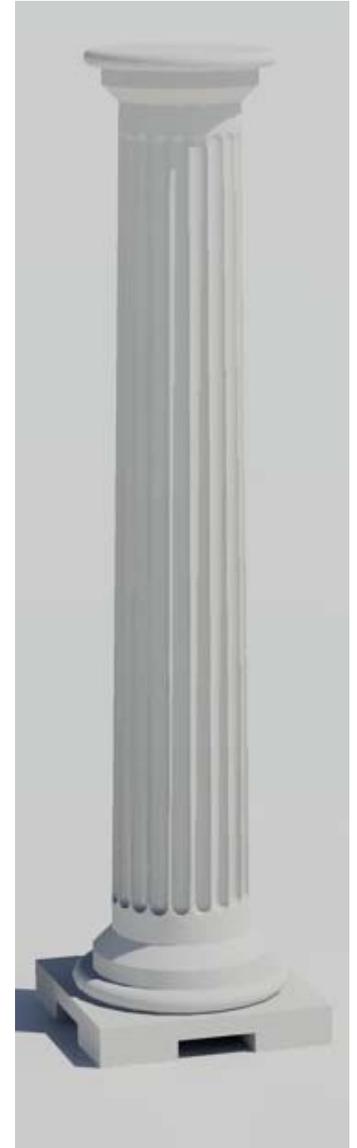
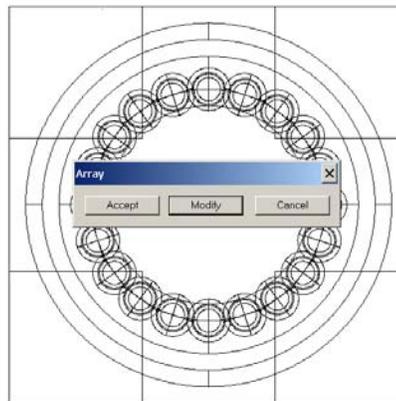
Base Push pull

A profile for the foot of the column is then drawn in the elevation view and the revolve tool is used selecting the profile and a 360 degree revolution chosen. This should provide a column base as illustrated. Then add a Cone using the centre of the base and the profile width. The cone should be 2100 high with a top radius of 150mm. (Ratio of 6:1)



Using Revolve tool

The Doric order has 20 concave parallel grooves or flutes around the column. In order to replicate this a 25mm cone is created at an elevation of 350mm. The top radius is set to 37.5mm and a 37.5mm sphere is added at the top. Use the polar array to copy the cones and spheres around the main column. Then use the subtract command to subtract the 40 spheres and 20 cones to create the flutes.



Rendered Image.

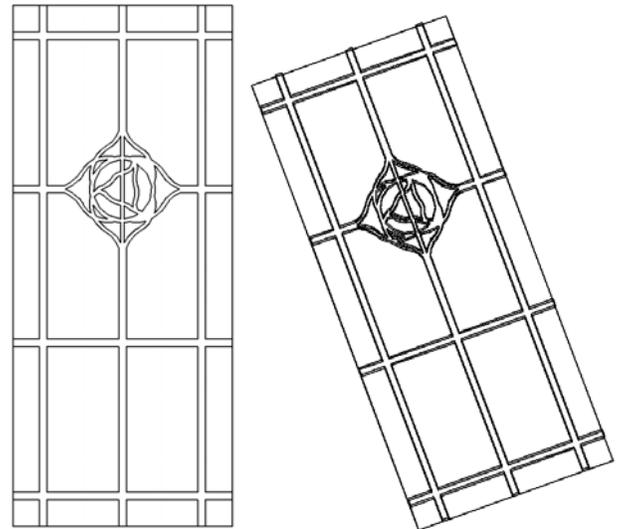
Finally, select the all the solids and use the isolate in elevation option selecting one side of the base as the elevation. Mirror the base along the midpoint of the column to create a head and then rescale to 150mm radius. A Union can then be used on the solids prior to conversion to mass elements to allow control by style.

Creating Custom Blocks for Objects

For complicated modeling the AutoCAD Solid modeling tools can be used. For a flat glazing type panel using the AutoCAD Solid Push/Pull option can be used to create the effect of glazing bars when created from polylines.

Convert these to mass elements. The advantage of mass elements is that you can apply materials by style and then update the mass element style to affect all materials.

A similar exercise is carried out to model the rest of the door and glazing.



Polylines

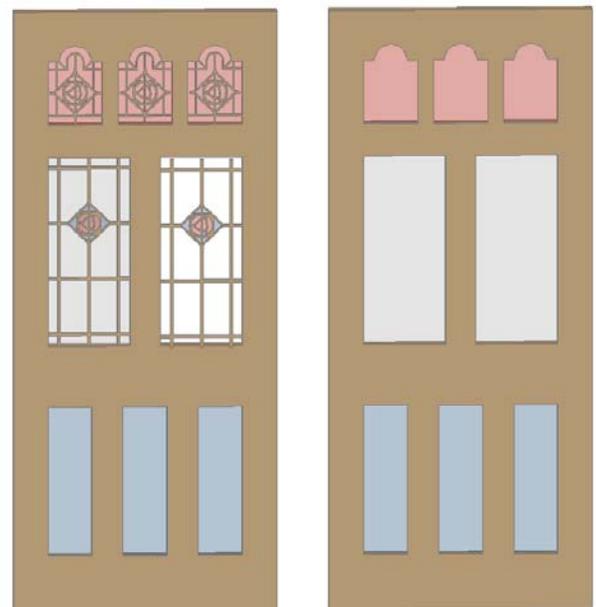
Push pull to create solids

Having created the door as a series of Mass elements we can then create some mass element styles. In this door there are 3 different glass materials, clear, red and blue and these have been applied to 3 different mass element styles named similarly.

A simple and a complex version of the block have been created for use in high and medium detail displays.

Again the level of detail should be considered before over elaborating the model. Door furniture etc could also be modeled but take into account that "just because you can, doesn't mean you should!"

On a scheme with 100 Units the model overhead would generally be too high unless you specifically have a need for a specific reason and then it would probably be better to create a special display configuration to handle this.

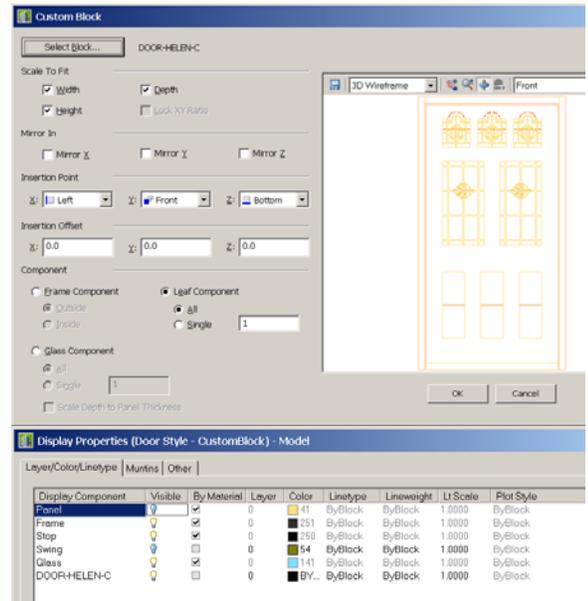


High Detail & Medium Detail Blocks

Having Created my door style the display properties of the door are accessed. The High Detail is selected for the complex block and a similar exercise is carried out for the simple block. On the display properties the 'other' tab is selected. Use the Add custom block option and the dialog appears.

Select the required block and then define the component type. In this case the component is a Leaf component. The Scale to fit option is ticked to allow the block to change to the appropriate sizes set in the properties dialog. Repeat for the other display properties as required.

Back in the display Properties turn off visibility of the panel component as this will conflict with the New Door-Helen-C display component



Mix and Match to create Components

The real power in creating custom AEC objects comes when you start to put these various tools together. AutoCAD Blocks can be used as custom block components in many AEC objects styles.

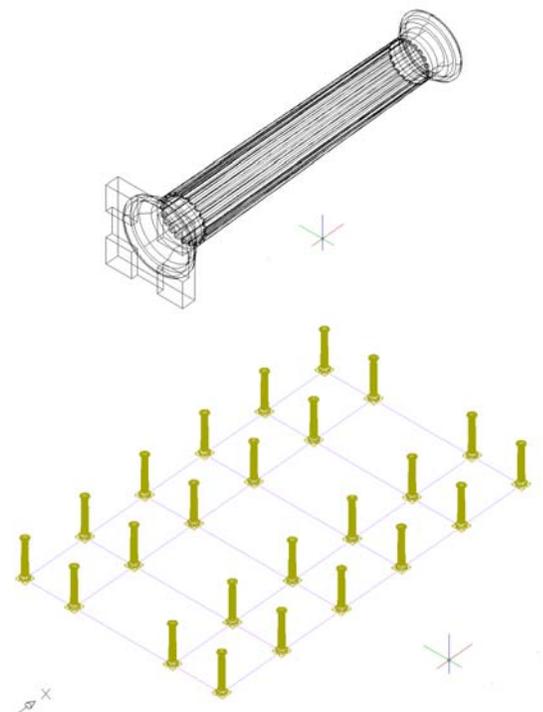
Custom Structural Components

Structural components can work a similar way with the inclusion of custom block components. The Doric Column created previously can be converted into a block. This can then be added to a structural member style. Be careful on the orientation here, as the structural member style does not want the block to be vertical! Use block edit and 3d rotate to obtain the required results.

Options to include the block automatically in other display reps can be chosen along with the opportunity to make the block scale as required.

Having created a Doric Column Structural member this can now be added to a structural grid and the grid used to automatically update the column positions.

If only the early Greeks and Romans had had AutoCAD Architecture.....



AEC Objects in Blocks

Any AEC objects can also be included in an AutoCAD Block. This simple capability provides a very powerful solution to creating bespoke content.

The Elevation sketch for our Door and Window assembly can be converted into an AutoCAD Block. The appropriate infill's, frames and mullions are assigned using the custom editing tools as required.

The Door and Windows Assembly object is then turned into an AutoCAD Block. With the previous door object we applied the block as a leaf object. This time a glass component is selected and the block applied to this. Again the scale to height and width options is chosen.

Review of custom content

From the various selected components created within this session the range of possibilities in creating AEC content must be apparent. The advantage of AutoCAD Architecture over AutoCAD when dealing with complex geometry is the use of display configurations that can determine when you see specific geometry. This can aid working speed in large drawings.

The basic rules of creating geometry are model only what is required to create the desired result. If you are only looking in plan view then why create any 3D geometry at all. If you are required to create specific 3D visualizations, elevations etc from the model then make use of the display configurations to only add custom components in the high detail displays.

Remember: *"Just because you can, does not mean that you should."*

I hope that you have enjoyed this session and that it has provided a useful insight into how it is possible to work with AutoCAD Architecture on existing buildings. Remember, use AutoCAD Architecture for what is good at. Creating Custom styles can be fun, but don't go to far over the top. If you require any further information then please contact me at CADPoint on the email below.

Thanks for attending Renovating AutoCAD Architecture.

Paul Oakley
CADPOINT|AEC

Email : POakley@Cadpoint.co.uk



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