Display Overview – Concepts and Terms

The display system in Architectural Desktop is one of the more complex aspects of working with this software. Both powerful and complex, the task of setting up the templates for your office can be daunting. Although this task is generally reserved for the CAD Manager, I find that in order to understand what AEC Objects are, you need to have a general understanding of the display system. This document is presented as both an introduction to the display system and a review for those setting up the system for the office. This chapter starts with a very in depth glossary that describes each of the display components and then looks at Material styles and how they effect the display properties. ADT 2004 introduced materials into the mix. Materials are the default way to show Building Objects, but the display system is still at the heart of how objects are represented and how ever object that is not a "Building Object" is still represented in ADT

Display System Overview

Five levels control how all objects are displayed
Components>Display Representations>(materials)>Display Sets>Display Configurations

Objects and their Components

- Each Representation for each object will have a different set of components.
- Components are both the things you can touch in the building (door panel, GWB) and the things that help you to convey information in the drawing (shrinkwrap, above cut plane components, below cut plane components).

Display Representations

- Are the set of instructions to the graphics card saying "show me this object, this way"
- Are the basic building blocks of the display system
- Edit through the display manager (system or drawing default) or override this with the object style or the object display.

Display Sets

- Are groups of display representations gathered together in one place. Ie. The plan rep for the door, the plan rep for the wall, the plan rep for the window etc.

Display Configurations

- Are applied to viewports
- Assign a display set to each direction. For example: use the plan (2D) Display Set when I see the building model from the top, show me the Model Display set when I view the building model in iso.

Materials

- Materials are assigned at the sub component level of object styles.
- Materials may control many sub-components in different types of objects simultaneously.
- Materials control:
- Plan outline,
- Plan, section and elevation surface hatches
- Rendered material in shaded view and in Viz Render.
- Materials are applied per display representation.
- Material definitions are controlled through the style manager.

General Usage

90% of the time you will go here is because something does not show up in the viewport you are working in, so you need to turn it on. – go to display manager and go directly to the Sets – look for the disappeared object and put a check in the appropriate representative box

Display Concepts

Small to Large = Display Property – Display Representation – Display Set – Display Configuration

Lowest Level: Display Property (Sub-Objects)
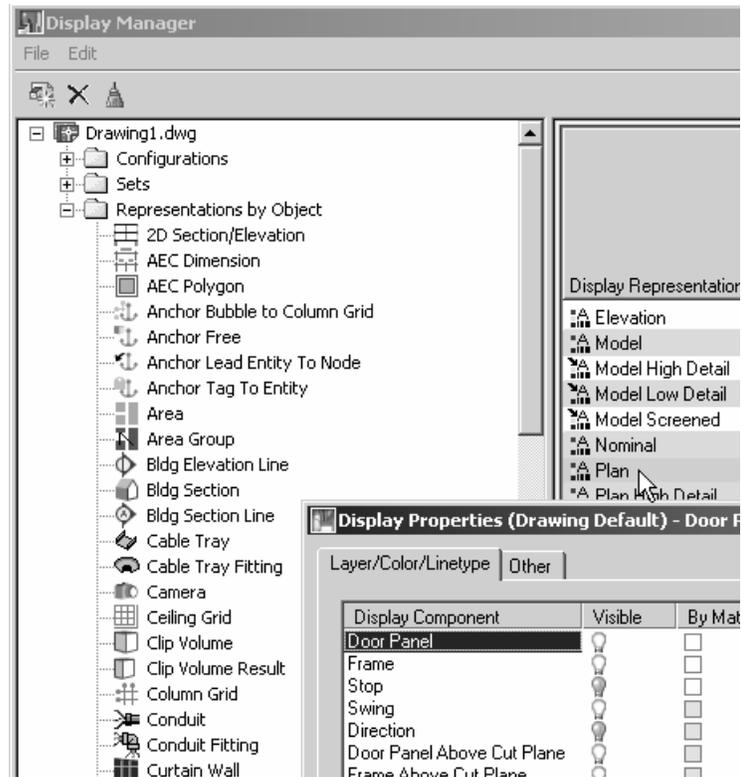
A display property is the base display aspect of each AEC object. It allows access to all of the sub-entities which make up the object. It controls the visibility, layers and/or colors they will be assigned in a specific view for each sub-object. Each different type of object will have a different set of variables making up the display property

- In plan, a door is displayed as a rectangle panel, a pair of rectangle frames with stops, and an arc for the swing. In model view, a door can be represented by the full 3 dimensional representations of the panel and frame.
- In a block wall with furring, the appearance of each sub-object (the brick, the air space, the furring) may be controlled individually by manipulating the display properties of the wall.

Sub-Objects have an analogy in AutoCAD of the nested block. Sub objects by default are be assigned to layer 0, color by-layer in which case the sub object inherits it's display properties from the parent object. You may also set the sub objects up to be assigned to a specific layer. This enables you to have control by layer of the sub-objects. Most walls styles are set up this way. Display Properties are held in groups called Display Representations.

Next level: Display Representation

The basic set of instructions to the graphic system telling it how to show an AEC Object on the screen (plotted).

- Each representation may have similar or unique sub objects for the same object.
- Representations may be duplicated creating a 'Manual' representation.
- The Display Properties held in a representation may be overridden by style or individual object
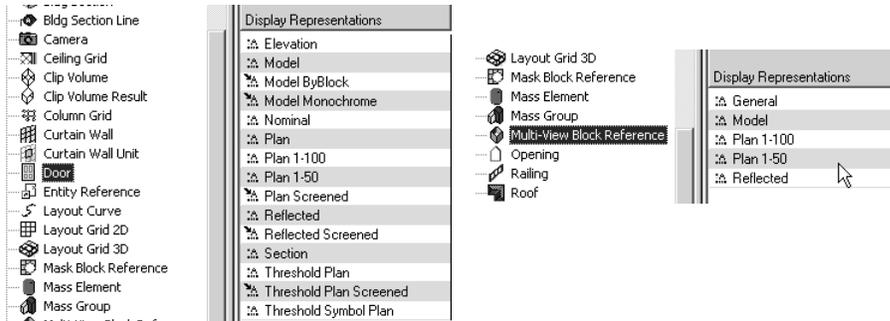
Each Object has multiple representations

- A wall has 'Native' Display Representations of Graph, model, plan, reflected, sketch.
- A camera only has one representation – General.
- A Door has the following display representations: Elevation, Nominal, model, plan, reflected, and threshold plan.
- The Representations: Plan 1:100, Plan 1:50 are used to possible create annotation that uses one size block for large scale plots and a different size block for smaller scale plots (i.e. a column grid needs a different block to plot at 1/8" scale than ½" scale).

Each of the display representation uses the display properties assigned to it. For the plan representation of a wall you may want to show the brick and the furring, but for the reflected representation you might just want to show the outline of the wall without showing each of the sub components brick, CMU etc.
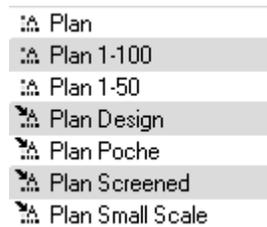
Representations are "Native" – one of the basic programmed – or "Manual" (created by someone by 'duplicating' one of the native ones).
The ones with the arrows are Manual. There will be times when you will need to create manual types of representations. These will give you the ability to show the same object differently in different viewports. The manual representations shown here are available by default in the standard template.

Each Representation will have different options and sub components. An example is a wall, you will not have access to a hatch component in the model representation, but the plan and reflected will have a hatch for each part of the wall. Continuing with the wall example, the Plan representation has two extra tabs, the cut plane and the "Other". These extra display settings allow you to set variables about how you want to see the wall in plan.
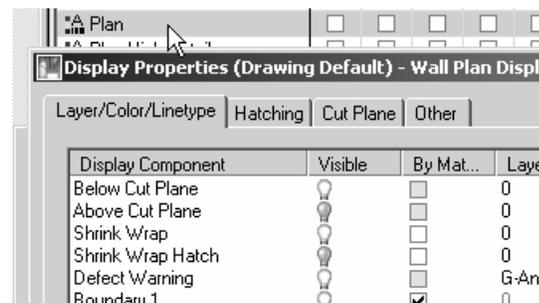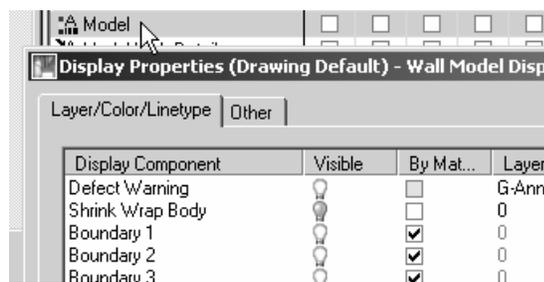

Control:

Control of the display properties happens at three levels: The drawing level, the style and the individual object. Display properties may be controlled by the (Drawing Default). Display representations may also

be controlled at the style level. When you make changes to the Display Representations at the style level, you are overriding any settings that exist at the system default or drawing level. Individual objects may also have overrides applied. The object level overrides both the style settings and system default settings.
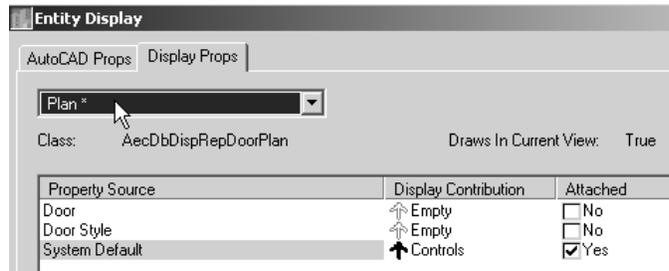
Remember that if you edit these values in the Display Manager, that the changes you make may be overridden in the drawing by the style or by the object. Most of the time you will want to edit by style.

Almost all of the Wall styles in the templates have overrides. The other objects tend not to, but there are some exceptions in each category. Most of the door styles do not have overrides, but the Overhead Sectional does, and needs these overrides to create the door. Likewise with the stairs, most do not have overrides, but the concrete ramp - an exception to how stairs look, has overrides to the representation by style.

An obvious, but overlooked and useful fact is that. If you create a new 'manual representation' for an object, it will never have overrides for the style.

Accessing Display Representations

Display representations may be accessed from three places: The Display manager, the Style or from the Object itself. These access points override each other in that order

Display Manager:
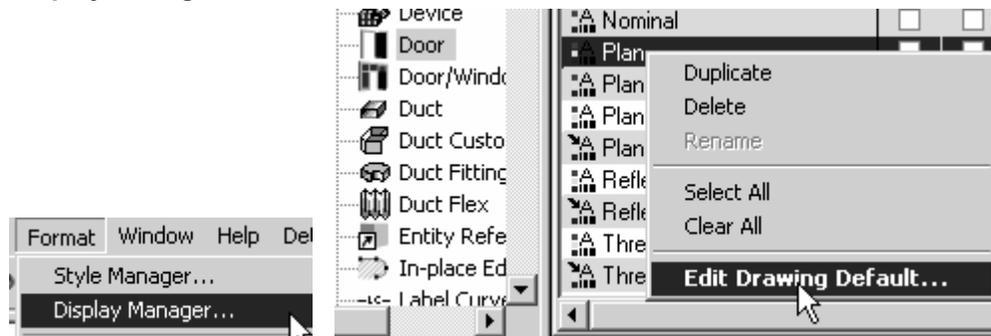
When working at this level you are working on the System Default (really the Drawing Default)

From the style (Right Click> Edit Style)
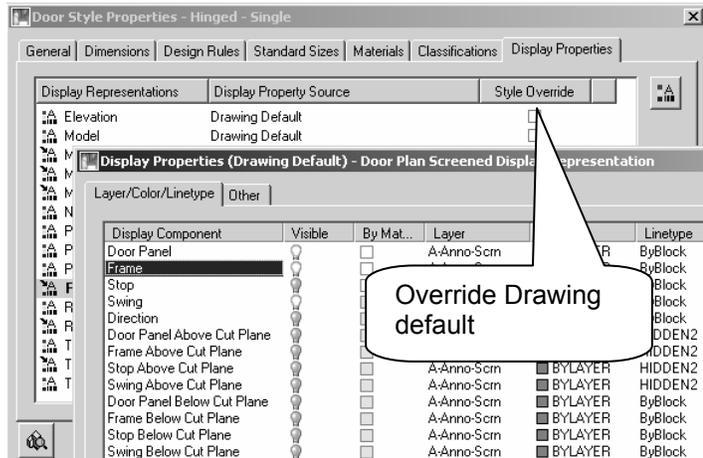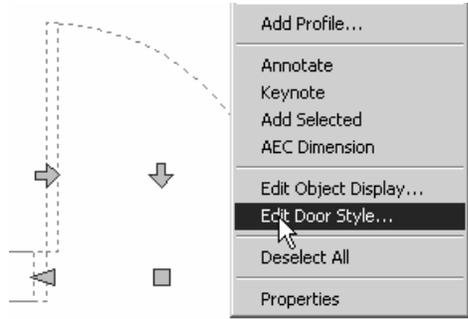

You may override the System Defaults/Drawing Defaults by changing the display properties for the style so that each style may appear differently in the drawing. (DemoDoorStyle, Panel and swing = grey dashed, NewDoorStyle = blue, Continuous)

**From the Object's Entity Display (Right Click> Entity Display)**
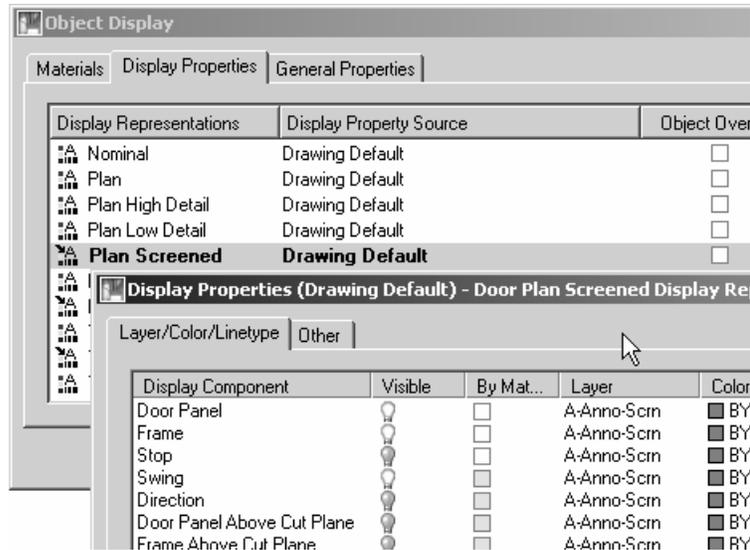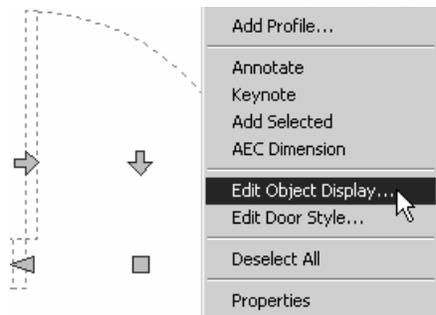
You can apply an override to the individual objects in the drawing. Setting you make here will override both the System default and the style Display settings.

Display Sets

### Third level: Display Representation Set

A Display Representation SET is a collection of display representations of each object. This is most often where you will need to go if you need to universally turn on or off objects in the viewport.
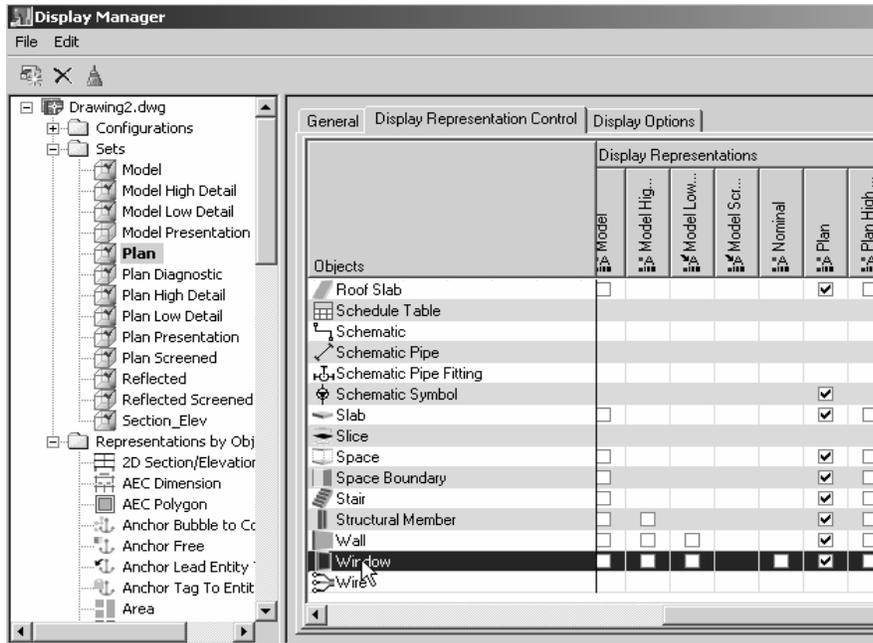
A Plan display set says "Make a collection of all of the Plan and General representations so that when I look at the building from the top view, I get the plan or general **representation** of all of these objects." The only reason the 'SET' exists is so that you can assign it to a view in the configuration. The plan SET has checks in the boxes for the plan representations of the Wall, the Door and the Window. You may assign more that one representation for an object in a set, i.e. to show the sills for the door and window, so these two objects will have two boxes checked for this SET. Some objects such as MultiView blocks and the camera do not have a 'plan representation' and instead use the 'General' representation for plan. Not all objects have a Plan representation; some use the Model or the General representation when seen in Plan view.

Display Configurations

A display configuration is a tool used to assign display representation SETS to specific viewports.
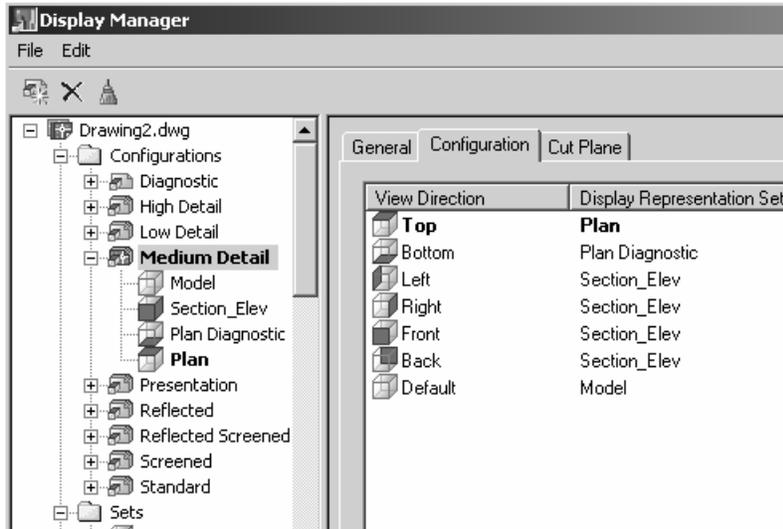
This is the mechanism by which when you view a drawing from the top, you get the plan view (hatched walls). When you view the drawing from an isometric point, you get the 3D view of things.

- Example: you can set up a viewport to show only the 2 dimensional representations (PLAN representations) of the AEC objects when you look at them from the top view. If in the same viewport you switch to an isometric view, the objects will display the 3D image of the object (MODEL representation).

For Each View Direction you assign a display Set. If you leave a view direction blank, it will use the Default Display representation set.

The display configuration is now also the location that the cut plane is held. This is new to 04/05/06. The display configuration cut plane applies to all objects by default (exceptions, stairs, and casework walls)

Materials:

Introduced in 2004 ADT, you can control visibility of all sub objects by materials – if an object style has materials assigned to the sub-objects. Default template in 04/05/06 will have the drawing default settings set to **By Material** for most of the sub-objects. This means that most of the options in the layer color linetype fields will be grayed out. – you need to then operate on the material you want to change – so if you have a concrete wall, and a concrete mass element, changing the layer/color linetype of the material concrete will change the display for both of these elements.

Most of the 'architectural' objects (things you could touch in the real building) have the ability to be assigned a material.

Most of the other ADT object such as annotation and schedules do not have the capacity to hold a material definition. While perhaps obvious, I just wanted to put this here to reinforce the idea that you will need to understand and work with the display manager's configurations, sets and reps to get the job done.

Side Note: Materials and R3 and R4 interoperability:

The templates for R3 and R4 are set up very differently – as are the styles that ship with the product. By default in R3, most of the wall and stair styles have style based display overrides. To get the hatch of one wall style different than another – you had to override the style. Otherwise all wall styles would use the system default for the hatch. Now in R4 styles in general do not have overrides. Because the hatch is determined by the material style assigned to the component. This will cause a bit of misbehavior if you are using a mixture of ADT3 objects and ADT 4 objects.
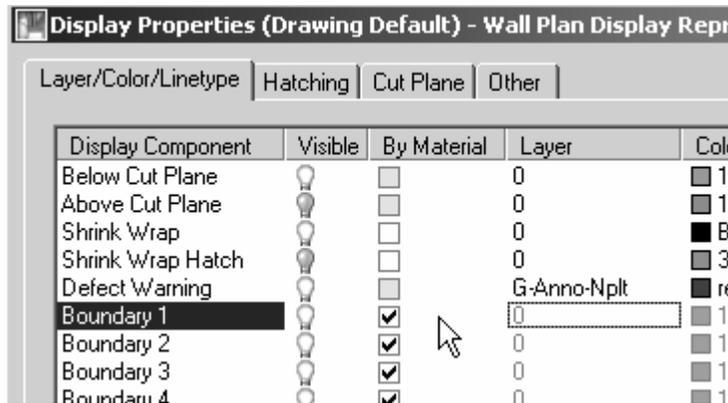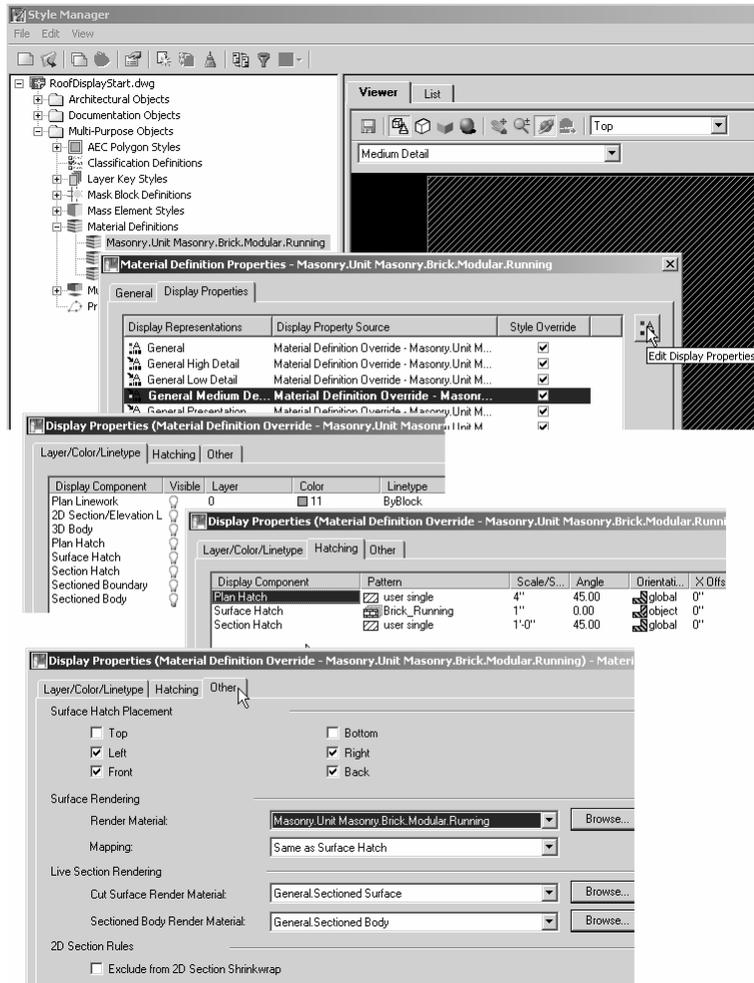
Materials:

|	
Materials are style definitions accessed controlled and modified through the style manager. Double click or right click > edit on name to access the display props dialog box.	
The organization of the material is by display representation. Hit the properties button to edit the materials style override for any given display representation.	
The three tabs here are **layer color linetype**, **Hatching** and **Other**. Layer / Color / Linetype determine the display characteristics for sub-objects in the drawing	
The hatching tab controls the hatch as seen in plan, elevation and section. Including live section and the 2D section object.	
The Other tab controls the materials used with either the internal ACAD rendering engine or the VIZ render package. Note that although you can drag materials from the Viz render into ADT, what you are creating is the Render Material shown here, and NOT a material style. Also Viz render allows you to get down and dirty with the materials – many of the settings can only be approximated by the ACAD render engine.	
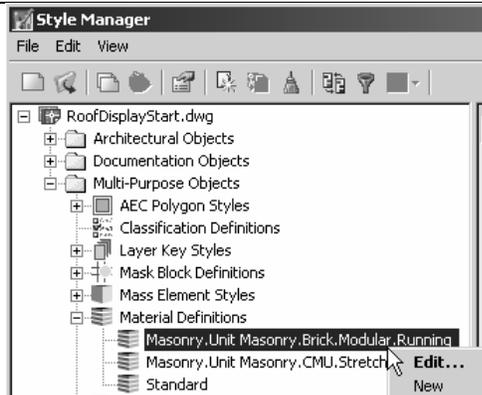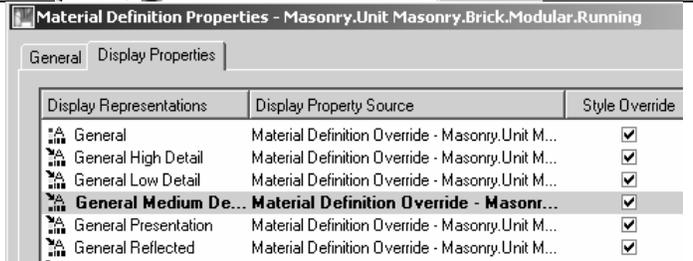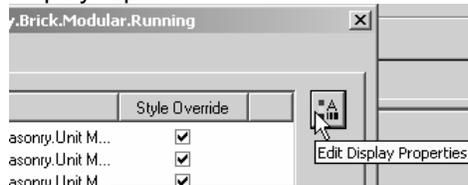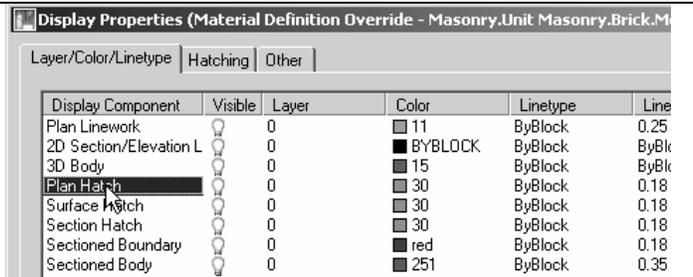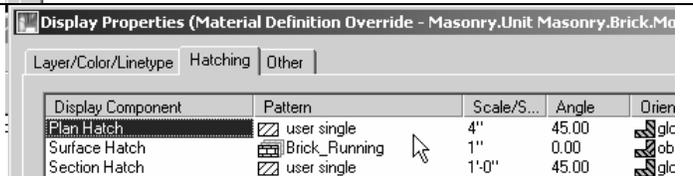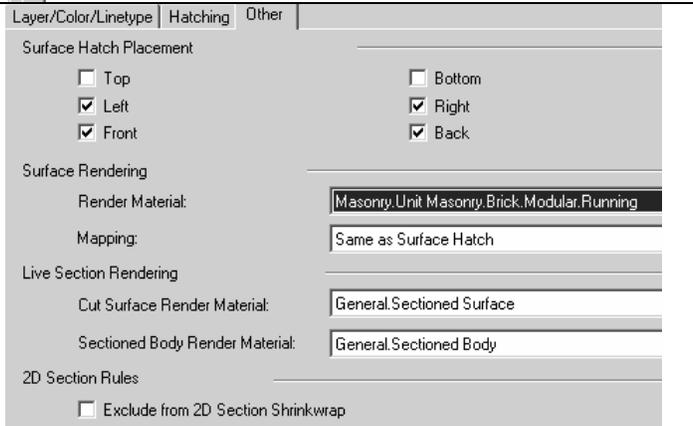
The organization of materials looks like this
Layer Color and Linetype controls the following parts of the display

Display Properties (Material Definition Override - Masonry.Unit Masonry.Brick.Modular.Running) - Material Defi

Layer/Color/Linetype | Hatching | Other

Display Component	Visible	Layer	Color	Linetype	Lineweight	Lt Scale	Plot Style
Plan Linework	💡	0	☐ 11	ByBlock	0.25 mm	1.0000	Thin
2D Section/Elevation L	💡	0	■ BYBLOCK	ByBlock	ByBlock	1.0000	ByBlock
3D Body	💡	0	■ 15	ByBlock	ByBlock	1.0000	ByBlock
Plan Hatch	💡	0	☐ 30	ByBlock	0.18 mm	1.0000	Fine
Surface Hatch	💡	0	☐ 30	ByBlock	0.18 mm	1.0000	Fine
Section Hatch	💡	0	☐ 30	ByBlock	0.18 mm	1.0000	Fine
Sectioned Boundary	💡	0	■ red	ByBlock	0.18 mm	1.0000	Fine
Sectioned Body	💡	0	■ 251	ByBlock	0.35 mm	1.0000	Medium Sc...

Section Elevation Linework

3D body

Plan Hatch

Plan Linework

Surface Hatch
(Shows up in elevations)
Section Boundary
(for multi-component walls,
or mass groups - think profile)
Sectioned Body

Section Hatch
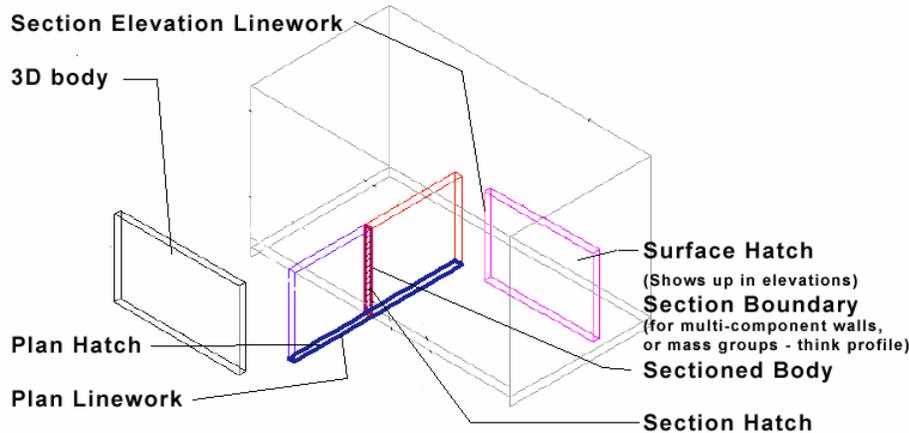
So to change the color of the brick hatch in the wall style Brick-4 Brick-4, you would edit the material Masonry.Unit Masonry.Brick.Modular.Running that is used to control its visibility.
Some notes on these settings.
- Pick on the value you want to change to modify it
- You can only assign a layer that already exists in the drawing.
- Assigning a layer to a sub-object will give you layer control over the sub-object – and exploding drawing down to its basic ACAD entities will inherit these properties.

Likewise with the hatch pattern itself – it too is stored in the material definition, on the next tab.

Display Properties (Material Definition Override - Masonry.Unit Masonry.Brick.Modular.Running) - Materia

Layer/Color/Linetype | Hatching | Other

Display Component	Pattern	Scale/S...	Angle	Orientati...	X Offset	Y Offset
Plan Hatch	▨ user single	4"	45.00	▨ global	0"	0"
Surface Hatch	▦ Brick_Running	1"	0.00	▨ object	0"	0"
Section Hatch	▨ user single	1'-0"	45.00	▨ global	0"	0"

Change the pattern here by picking on the table cell **user single** to bring up a dialog box that lets you pick from the standard ACAD hatch patterns.
The Orientation column is a toggle that sets the hatch either Global or Object – do you want the hatch to be 45 degrees to the world UCS, or to the object itself.

Display System Exercises

Lesson Overview:

This lesson will create a display configuration to use as a roof plan display configuration. You may or may not show your objects the way this exercise does, but the intent is to go through the process to illustrate object control using the Display Manger.

We will create a display configuration that shows the roof as magenta and not show the 'eave' in plan, the exterior walls and doors will be shown as gray and dashed. The interior walls and doors will not be shown.

When done, you will set up a plot sheet and look at the two different ways to get the custom RoofPlanConfig display configuration to apply to the plot sheet.

Process:
- Create Layout
- Create Display Representations for walls, doors and roofs (Roof Slabs if needed)
- Gather Display representation together into RoofPlanSet
- Create Configuration that uses the RoofPlanSet, and model….
- Apply the configuration to the viewport

Extra:
- Create new drawing, saveas A205.dwg
- Import/export display configuration or
- Design Center drag and drop the roofPlan layout to import the custom Roofplan Configuration together with the sets and reps needed to create itself

Open \\Display\RoofDisplayStart.dwg
And ADT3roofPlanDisplay

Tab through the layouts, review display reps, sets and configs. ADT 2004 is set up quite differently than R3. The default Display Configs are very generalized.
The drawing you will use is the RoofDisplayStart.dwg, so close the ADT3roofPlanDisplay drawing. The RoofDisplayStart.dwg has been moved up from ADT3.3, so the wall, door and window styles do not use materials. The roof however does use materials and must be changed first. The focus of this exercise is to use the display manager not the material settings.

Creating a Roof Plan Display Configuration

Create New Layout and make the roof not use materials

1. Saveas MyDoneRoofPlan

2. RC on a layout and create a new layout, rename the new layout to Roof Plan

3. Select layout, accept defaults to create viewport

4. The default display configuration for new layouts is set in the drawing setup> display tab and is Medium Detail by default.

5. Select the roof, RightClick and select **Edit Object Display**. Because the roof object is not a style based object you use the Edit Object Display options.

6. On the display properties tab, make sure plan is bold and pick the properties icon at upper right.

7. Uncheck the ByMaterial for the roof, and pick OK 3 xs.

8. Go to model space, pull-down Format > Display Manager

Create Custom Representations for the Door, Wall and Roof objects

Create new representation for a door and wall:

1. In Display manager, expand Representations by Object.

2. Highlight **Door** on the left, Highlight Plan on the right, RC>Duplicate.

3. Rename the new representation to RoofPlan.

4. Note this is CasE Sensitive. While you are here, cntl-C to copy this name into the clipboard because we will be using it several more times

5. Right click on the RoofPlan representation and select **Edit Drawing Default**.

6. Change the frame, stop and swing to color 254 and linetype to hidden

7. Repeat these steps to create a RoofPlan representation for a Wall.

8. Under Representations by Object, highlight Wall on the left, Highlight Plan on the right, RC>Duplicate and Rename the new representation to RoofPlan

Adjust the wall display representations for RoofPlan

9. On the left select wall, On the right select the RoofPlan Display rep, RC> **Edit Drawing Default**

10. Turn on the shrink wrap, change its color to 254, and linetype to hidden2

11. Turn off all the boundaries and hatches and remove the ByMaterial designation.

Repeat these steps to create and modify A RoofPlan representation for the Roof
1. Duplicate the plan representation, rename it, Turn Off the **Eave**, change the **Roof** to magenta

Ok back out of everything and Save the drawing. Nothing appears to have changed – it has and has not – you have created some new ways to display the walls and roof, but you have not told any of the display configurations to use these new representations.

Create new Display Set

1. Return to the display manager. On the left, highlight the folder that says Sets, RC>New

2. Rename the new Set to RoofPlanSet. With this set highlighted, on the right, use the bottom scrollbar to move the window over so you can see RoofPlan along the top of the screen

3. RC Roof Plan Display representation and select all

4. Scroll down the list and door, roof and wall should have check boxes and should be checked. Window will not have a box here because you did not make a RoofPlan Representation for it.

> If you highlight one of the existing Display Sets and right click New, you get a duplicate of the set you started with rather than an empty set. This is handy if you want a set that is similar to an existing set with only a few modifications

Create a new Configuration

5. On the left highlight the folder named Configurations RC>new

6. Rename the new configuration to RoofPlanConfig and Select it on the left

7. Pick the configuration tab on the right and pick **Plan** under the display set, (view direction top) to get a pull down of all the sets in the drawing, select the **RooPlanSet**.

Apply the configuration to the current view port

8. In the display manager, on the left, highlight the RoofPlanConfig, then RC>Set to current viewport, pick OK to get back to the drawing.

9. You can also set the display configuration with the drop down / pop up at the bottom right of the drawing screen

10. Drawing RoofPlanDisplayD1.dwg shows the exercise to this point

Minor changes

Note because the display representation we created is new, none of the styles will have overrides applied

11. Change the interior doors to not display.

12. Select an interior door, RC edit Style. On the display props tab, RoofPlan is shown as the current representation. Put a check here on this lines (for RoofPlan) under the Style Override column

13. And turn all elements of the door off. OK back to the drawing – the interior doors now do not display. The exterior door does not change as it is a different style.

14. Change the window gap to 254 and hidden:

15. Select the wall where the window opening is showing, RC>Edit style; apply style override, Edit display props. Change 'below cut plane' to color 254 and linetype to Hidden2.

Optional:

16. You could proceed to edit the styles to turn off the interior doors and walls

17. Select interior wall RC edit wall style. Display props tab, attach style override, turn everything off, Repeat for inner door.

18. Save and close this drawing

19. You could also manipulate the cut plane of the wall styles to be above the doors and windows to get a different effect, or use the global cut plane on the display configuration (Display manager, cut plane tab) to get the same effect.

Creating a Plot sheet with a custom display configuration

20. Create new drawing from ADT ctb View template and Saveas A-205.dwg in the class projects folder

21. Xref in the RoofPlanDisplayDone.dwg into model space (model tab)

22. Switch to the paper space layout and create a viewport (MV at the command line) and adjust the view to see the roof plan.

23. Save the drawing because there are two different things you will do next that do the same thing.

24. The display configuration you created exists in the xref file. There are two ways to get a custom Display rep to apply to a plot sheet:

Import Display Configuration #1 (2004 only)

25. Override the parent display configuration with one in the xref (new 2004)

26. Select the xref, RC>Edit Object Display

27. Xref Display tab, check Override display configuration set in host drawing.

28. Scroll down the list and select "RoofPlanConfig"

29. Undo 1x so you can do Procedure #2a which you bring the display configuration into the plot sheet

Import Display Configuration #2a

You can import and export Display Configurations from the Display manager

30. Open the display manager (Format>Display manager)

31. Select the Configurations folder RC>import/export

32. Pick the open button and browse to the drawing MyDoneRoofPlan where you created the Display configuration

33. Select the RoofPlanConfig on the right and Import button to bring it into the current drawing

34. OK back to the drawing and apply the RoofPlanConfig to the current viewport with the dropdown at the lower right

Import Display Configuration #2b

35. You can use the Design Center to drag the layout into the current drawing – this will bring the display configuration assigned to it into the current drawing as well.

36. Open DesignCenter

37. Pick the Folders tab to see the tree view of things, and browse to the MyDoneRoofPlan drawing

38. Expand the drawing and drill into the layouts

39. Drag the RoofPlan layout into the current drawing

40. Close the design center

41. The layout is added to the drawing, but you don't need it, just apply the RoofPlanConfig to the current viewport with the dropdown at the lower right.

Done deal.

Another Display Configuration I find useful is one that shows all the plan stuff AND the reflected ceiling stuff. You can make this by:
Right click on Medium Detail Configuration and create a new called BothConfig.
Then go down to the SETS and right click new on Plan set. Call this new set BothSet.
To the BothSet, add the Ceiling Grid Plan representation, along with the Multiview Block Reflected representation.
Go back up to the BothConfig and switch out the BothSet for the top view.

You now have a display configuration that allows you to see both your plan items (furnishings, counters etc) as will as the ceiling objects.