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Ideas Best Practice

Creating Assembly Drawings with Section Views

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Problem: **In the ADMS group we need to document miles of tunnel installations. To design magnet stands and verify clearances for associated utility systems we require thousands of cross section views. It would be of tremendous value if these section views maintain associativity to the master beam line model. Whenever a beam lattice is changed, or an additional utility system added, we have many sections on many drawings that are affected. When generating drawings that require section views of large assemblies, the library drawing (mdf) file can easily become too cumbersome to be functional. A simple cross section view of an assembly can create a (mdf) file over 100 MB in size, and result in library check in times of over an hour. This document describes how to utilize assembly configurations, suppress and prune sets, and most importantly SIMPLIFIED PARENT VIEWS for your section views.**

References: **The user should consult the online help for general information on Assembly Configurations. There is also a Best Practices for Large Assemblies section in the Design user guide.**

Background: **This procedure was developed for use with Beam Line drawings in the Mechanical Support group, but the techniques apply to many other Assembly drawings. The gory details of the problems encountered, and statistics for the test files are located in the AssemblyDrawingReductionTest.pdf.**

Before proceeding with an Assembly determine an overall strategy. Correct use of Sub-Assemblies will increase your chance of success when generating large Assemblies. This document does not address the assembly strategies but assumes that you have structured your assembly reasonably well, at least to the point where opening the hierarchy form doesn't show you a list of 1000 instances that must be manipulated individually. You have created some Sub-Assembly structure so that when an entire area of the Top Level assembly is not required for a section view you are able to hide, suppress, and prune it by selecting the Sub-Assembly name.

1) Create your Assembly, or Get an Existing Assembly to the workbench.

a) Create a Configuration for the complete state Assembly, name it using AssemblyName_FULL, and [designate this as the Design configuration. Create a Prune Set of this configuration, name it using AssemblyName_FULL

b) Create Model Views for any Standard Drawing views you will need, i.e. PLAN, FRONT, ELEV etc. Consider if you are only going to create a partial view, then a Model View will provide you with clipping of geometry outside the view port. This also gives you a view you can utilize later for creating your sections. You can also use a Model View to capture any orientation you place your Assembly in on screen. For example we often show a tunnel plan view rotated from it's actual x, y coordinates to place it along the long axis of the drawing.

c) Go to Master Drafting and create your base drawing. Define only views using your Model View definitions, or Standard Default Views. Create the view necessary to define your section cutting plane line(s).

d) Draw 2D lines to define your section cutting planes. Select File Export, To Solids, and export these cutting plane lines to the workbench. You will utilize these lines for manipulating your Assembly and eventually defining the actual cutting planes.

e) Go to Master Modeler, the lines you just exported should be displayed. Select these lines and name them as a Part using AssemblyNameCuttingPlanes. You're now ready to manipulate your Assembly and create the section views you need.

2) Go to Master Assembly and get your Assembly. Position the Assembly on screen so that you can see your cutting plane lines. Create a Configuration, name it using AssemblyName_SECT# where # will be the section label you want A, B, C etc. activate this Configuration with the Use button.

a) With your Assembly displayed exactly as you want it to appear for the section view, create a Model View, name it using AssemblyName_SECT#, to match the Configuration name. You can now always use Annotate, Model Views, and Manage to activate this view. This view is also available when creating drawing views using this Assembly configuration.

b) With this configuration active you now want to suppress and prune ALL instances that are not required for your SECT# view. There are several ways to do this. You may want to select only the instances to keep, and then use the Invert Selection button to select everything else, or you may select all the instances to prune individually. The proximity selection toll is also very useful for this task. This is a place where Sub-Assemblies can really help you. When you have the target instances selected, suppress them, and then prune them. Continue until you have everything except the participating instances suppressed and pruned; i.e. only instances that the cutting plane crosses should remain.

c) Create a Prune Set, name it using AssemblyName_SECT#. Now you can always return the Assembly to this state by activating the Configuration and prune set.

d) If you modified the screen display during the prune operation, simply go to Annotate, Model Views, and select AssemblyName_SECT#. Note: if AssemblyName_SECT# is active but the display is not correct you can select any other view, select Use, then reselect AssemblyName_SECT# and select Use.

e) You now have your assembly optimized to use as the Parent view of a cross section.

3) Go to Master Drafting. Get the drawing created in Step 1d to the workbench. You are going to create a very small view utilizing your AssemblyName_SECT# Configuration and Model View. Select Create View; drag a reasonably small rectangle in a corner area where your section view will be located. Process this view as desired (use precise geometry).

a) Now you're ready to generate your optimized Section View. Set your work view to the view you created in Step 1d. You want to transfer the correct section cutting plane line from this view to the new view you just created. Use VT – View Transfer, select the cutting plane line, enter X 0, Y 0 as the transfer position, Select the small view you just created as the target view, enter X 0, Y 0 as the transfer position.

b) Select VZ – Section View, select the small AssemblyName_SECT# as the Parent view, select the first end of the cutting plane line you transferred, select the other end, select done, select the side to keep, set view parameters as required for the section view (NOTE: it appears that for a plane cut there is some depth, and it also appears that the depth is determined by the arrow size. Set the arrow size to a very small value, like .010 if you don't want the cut to include an item that would fall in the zone defined by the arrow length.) Select the view center location. The view cut will be processed, name the view AssemblyName_SECT#. Use precise geometry and set the scale and other options as desired.

c) You will find that it's often necessary to use VB – View Border to resize your section view. Once the view is sized correctly you can use VS – View Scale and the Center Geometry option to get the entities displayed in the center of the view, you may need to hit the Center Geometry button several times.

d) You can now simply hide all the geometry in the small parent view. **DO NOT HIDE** the view border, as this view is the Parent of the section view. It will cause problems if another user works on the drawing, and doesn't know about the hidden view.

4) You now have a drawing with the most optimized Section Views I could figure out. Some other considerations.

a) When documenting large assemblies up front preparation is vital to the overall success. If a drawing is your final product then you should plan the drawing up front since it will affect how you sub divide the assembly. It's probably worthwhile to utilize old school drafting methods to plan the drawing views, scales and layout similar to paper drafting days.

b) Create a naming scheme for assembly configurations, model views, and prune sets. Keep them consistent and use the same name for each to identify that they are all used for the same purpose.

c) When creating a drafting section view observe the list window closely. If the list includes many instances that report cut not performed, instances do not touch etc. Cancel the process and prune the items that will not participate in the cut. These items appear to be the cause of the large mdf file sizes and check in times. Information for these items must be getting stored in the file.

d) Utilize the minimal parent view for the actual cutting process. You can drawing your cutting plane lines in the main standard view and easily transfer them to the minimal parent views by using x0, y0 as the from and to locations. When the process is complete, it's easy to use View Visibility to hide the parent view contents, leave the border displayed so other users can easily find the view.

e) We often require two section views close together, like at each support stand for one magnet. In this case you can utilize a single small view as the parent of both sections.

f) For a really complex Assembly, or one that may go through several iterations, you may want to place all section views on sheets other than your main standard views. This way you can modify the Assembly and the standard view drawing sheet without updating the section view sheets until the design has stabilized.

g) If you must model high overhead parts, like bellows, consider making the bellows a sub-assembly split so that you can suppress and prune half of the bellows rather than forcing a plane cut every time your drafting view requires and update.

h) Many times a section view can actually be avoided by suppressing and pruning items in the assembly to show the detail you really want. Example, maybe you suppress the shell of an item to show the internal components, or suppress the front plate of a vacuum box to show the internal components. Give careful thought to the actual section view, there are times when you can get the results you want by pruning the assembly and creating a model view normal to where you would cut. Also I have observed situations where the desired result can be achieved by simply pruning instances to a depth where the cut would be.

i) If you are performing a full section on an assembly, consider pruning any items that are hidden from the direction of view. These will be items that report do not touch during the cut. Suppressing and pruning instances that will be completely hidden in your section view also appears to help reduce the mdf file size. I'm not sure why, but when I cut a section and the list window reports all the does not touch status for instances, the final file size appears to grow.