



DESIGN FOR CHANGE



Skeleton Sketch Part (SSP)

Design For Change

BY JOHN STOLTZFUS – PRODUCT DEVELOPMENT SPECIALIST –

KEYSTONE COLLECTIONS – MYERSTOWN PA

(SUSQUEHANNA VALLEY USER GROUP PRESENTATION MARCH 8, 2018)

Background

- Used SolidWorks Since 1997
- (1) Patent
- General Fabrication – Lots of Sheet Metal
- Custom Material Handling Equipment
- Plastic Components
- Furniture
- and One Crime Scene
- Assemblies of over 5,000 components
- and.... Yeah I –

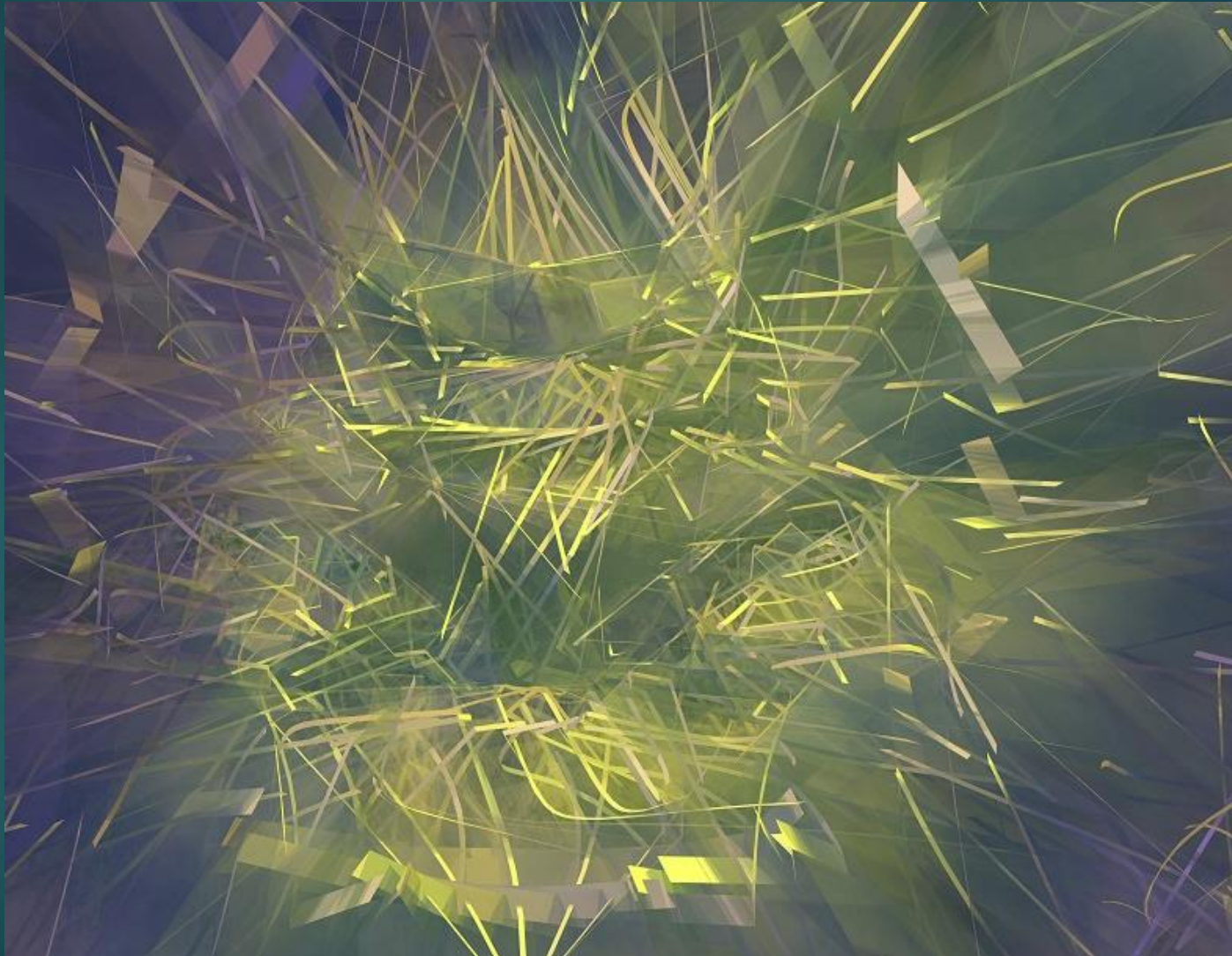
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Furniture Design



SolidWorks Art

The Straw That Broke The Camels Back



SolidWorks Art

The Straw That Broke The Camels Back



Challenges With Furniture Design

- ▶ “The Feel” – “The Look” – “The Function” is all part of Furniture Design
- ▶ This Creates An Element For Multiple Design Changes
- ▶ Keeping Original Design Elements, Makes For Manufacturing Process Challenges
- ▶ Keeping the original Design Elements and at the same time we Design for Structural Integrity and Manufacturability
- ▶ I get anything from a crude sketch, pictures or professional drawings
- ▶ Sometimes I need to work with Iges, Step or other solid models and yes I re-draw, none of the customer supplied solid models are used, if I.....

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SSP – A Sales Tool

- ▶ In New Product Development using the SSP process can make a big difference in closing your next project, how?
- ▶ Design flexibility, In today's business and information environment, people are demanding instant service, instant orders, and the quicker your process time is, the quicker you'll close the "Deal"
- ▶ Using macros and custom properties and assist with the Quotation and Sales Information required
- ▶ In the late 1990's I used print outs of different views and closed a lot of deals that way, today using laptops and Ipads information is right there and if you set it up for easy changes, your running ahead of the pack, if you....

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SSP – A Collaboration Tool

* ZONES * (part 1)

- ▶ Use the SSP to setup one common component that “Drives” the entire Main Assembly.
- ▶ Setup your SSP with Zones and have each different person work only on his or her Zone
- ▶ Each Zone would be a Sub-Assembly
- ▶ Since they share a common point of origin location it is easy to drop them into a Main Assembly and if everyone uses the same information there are no interferences, when you.....

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SSP – A Collaboration Tool

* ZONES * (part 2)

- ▶ Using the SSP Workflow there are “No” geographical boundaries multiple personnel working on the same project at the same time
- ▶ Send each person the Main SSP used in the Main Assembly with instructions on which Zone they need to work on and at the end of the day, they send you the completed Sub-Assembly and you insert that Sub-Assembly into the Main Assembly by letting it snap to the point of origin.
- ▶ Now if there are any changes required, adjust the SSP sketches and everything will move, because you....

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Are You Struggling With Your Designs

- ▶ Assembly Blow Up's – Unstable Components
- ▶ Missing Relationships
- ▶ Is it **Hard** To Make Changes
- ▶ When You Make Changes, Does The Feature Tree Become A **Forest Fire**?
- ▶ Circular Rebuilds – Are One Of The Greatest Performance/Resource Drains In SolidWorks
- ▶ If you say yes to any of the above, now it's time to...

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What Is The SSP?

- ▶ I define the Skeleton Sketch Part as “The Main Driving Force” of an Assembly.
- ▶ A Part with just Sketches, Axis and Planes
- ▶ A Part with Sketches, Axis, Planes and Surfaces
- ▶ A Part with Sketches, Axis, Planes, Surfaces and Solids
- ▶ Other Names that have been used – Design Sketches – Master Sketches – Master Parts
- ▶ The SSP is structured to make Changes easy – Take a serious look at your Engineering/Design Department, are you really concerned about....

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Understanding The SW Rebuild Process (Part 1)

- ▶ The SolidWorks Feature Tree Rebuilds From The Top Down, Starting with the First Feature in Parts and Starting with the First Part in Assemblies..
- ▶ Always Push Information Down the Feature Tree – Never Ever Pull Information Up
- ▶ Avoid Sketches, Axis or Planes at the bottom of the Feature Tree that drive parts above it, you can have reference sketches, that would show size or positions of other parts, these would be non driving sketches and would only be used for reference
- ▶ Knowing this makes for better designs

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Understanding The SW Rebuild Process (part 2)

- ▶ Using the SSP correctly will eliminate Circular Rebuilds
- ▶ Using the SSP correctly will eliminate Interferences
- ▶ Having a Sketch in the Assembly Template File is much better than adding one after you insert the first part.
- ▶ Changes are easy if the SSP is setup properly and this will open up new design possibilities, new design processes, and an open horizon so you can design without limits.
- ▶ Be prepared to spend more time in the Design Intent and less time in actual modeling, when you.....

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Design Intent

- ▶ One of the most important, the most difficult and most often overlooked Design Element is = **DESIGN INTENT**
- ▶ SolidWorks only follows your input, are you using the proper Tools?
- ▶ Understanding your Product
- ▶ Understanding what can change
- ▶ Understanding how those changes effect items/assemblies downstream
- ▶ Zero, Zero, Zero Where is the Point Of Origin and what it affects and where it's important and where it isn't..
- ▶ Do you redraw a customers lges solid model or not? I do because I,

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Presentation Model

Point of Origin – Zero, Zero, Zero



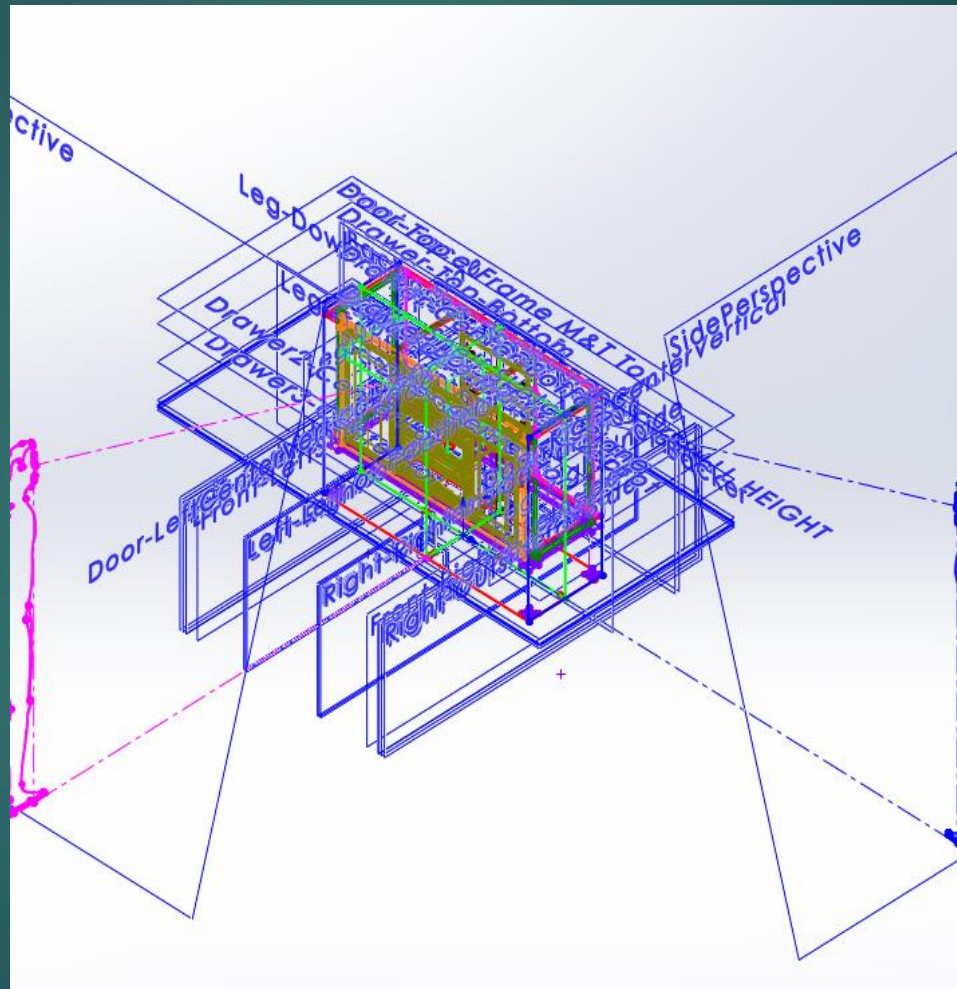
Setting Up the SSP

- ▶ If you're interested in changing your process – Start Small and expand from there.
- ▶ Only add Sketches, Planes, Solids, Surfaces for items that have common detail between 2 or more components
- ▶ Apply Color To The Sketches
- ▶ Name Your Sketches so they are easy to find
- ▶ Name Your Dimensions that are the most prone to change, like Height, Width, Length etc.
- ▶ Add the Sketches, Solids or Surfaces in Named Folders – this makes it easier to find, isolate etc., when you....

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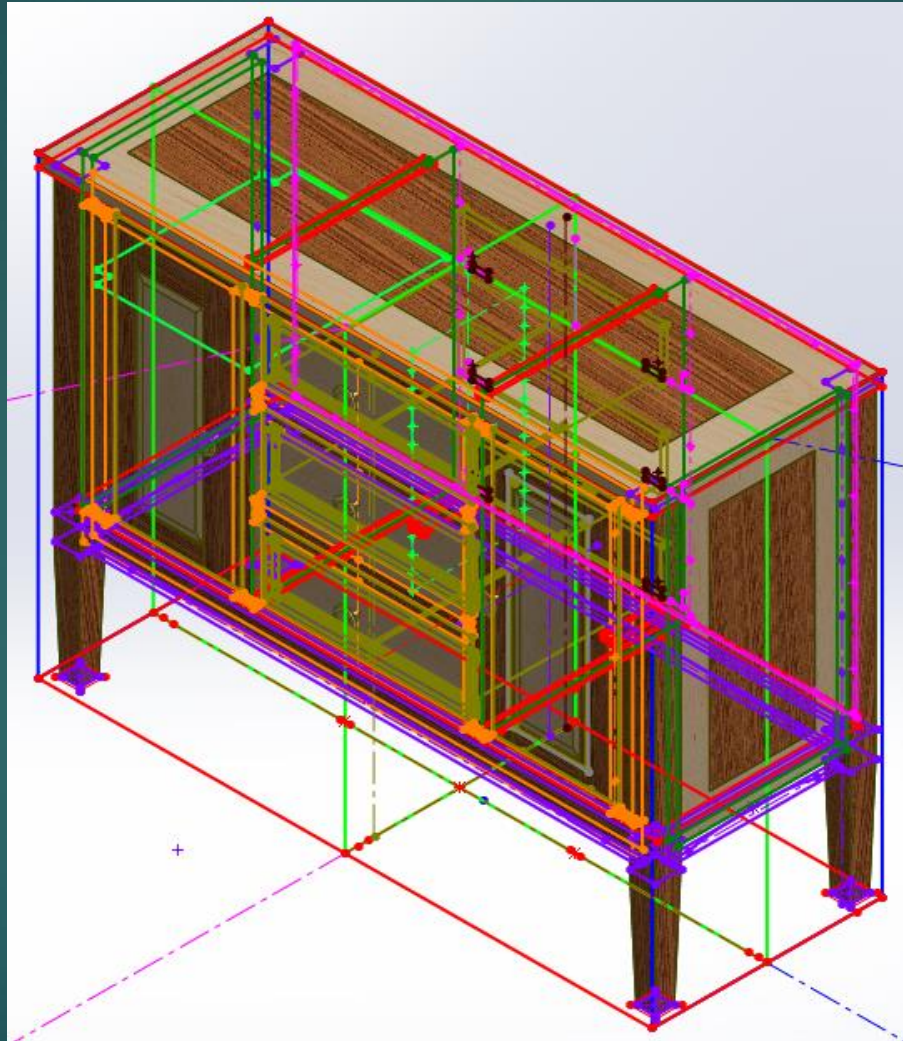
SSP

(showing all the Sketches & Planes)

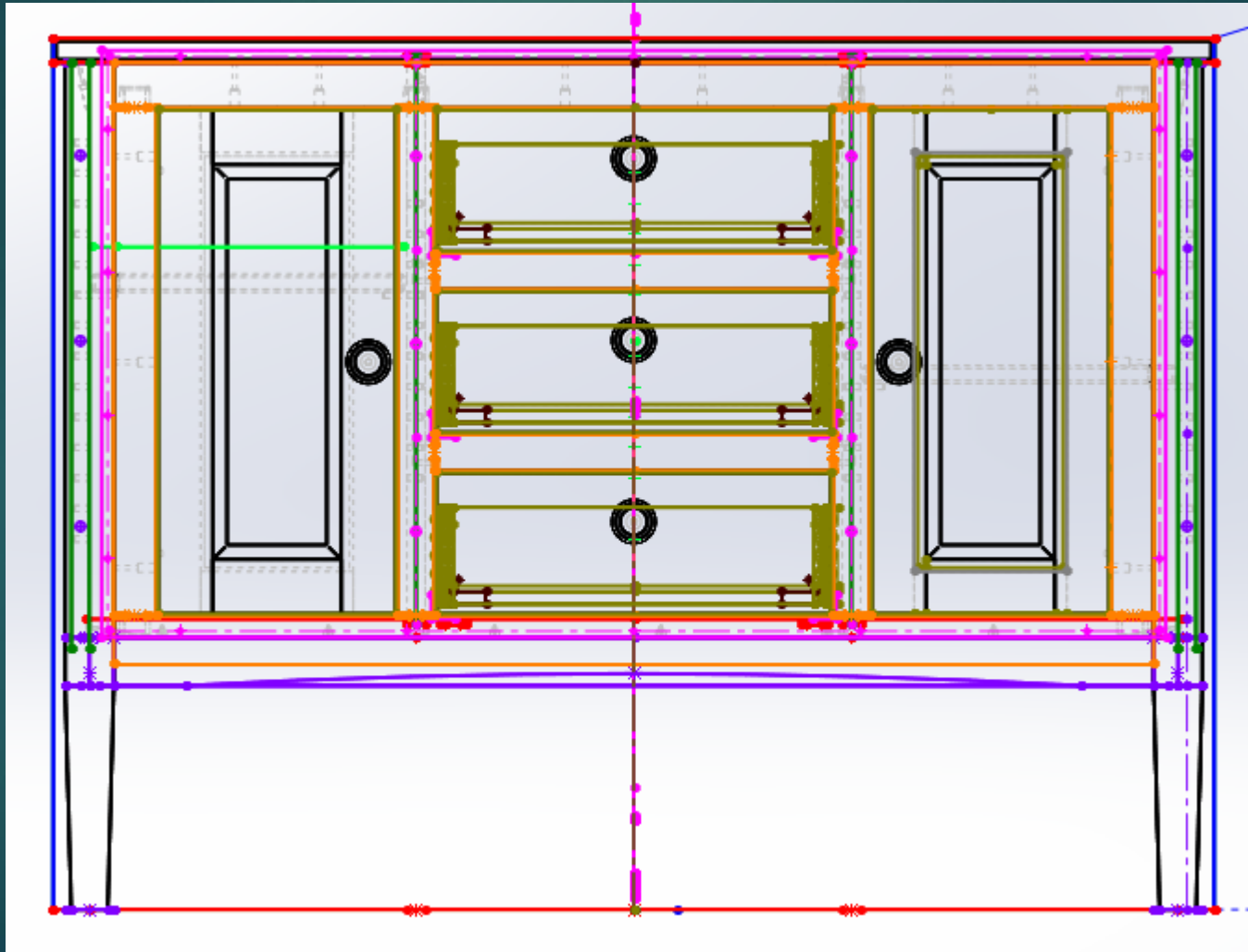


SSP

(showing all the Sketches Shaded with Edges)



SSP (showing colored Sketches in Wire Frame)

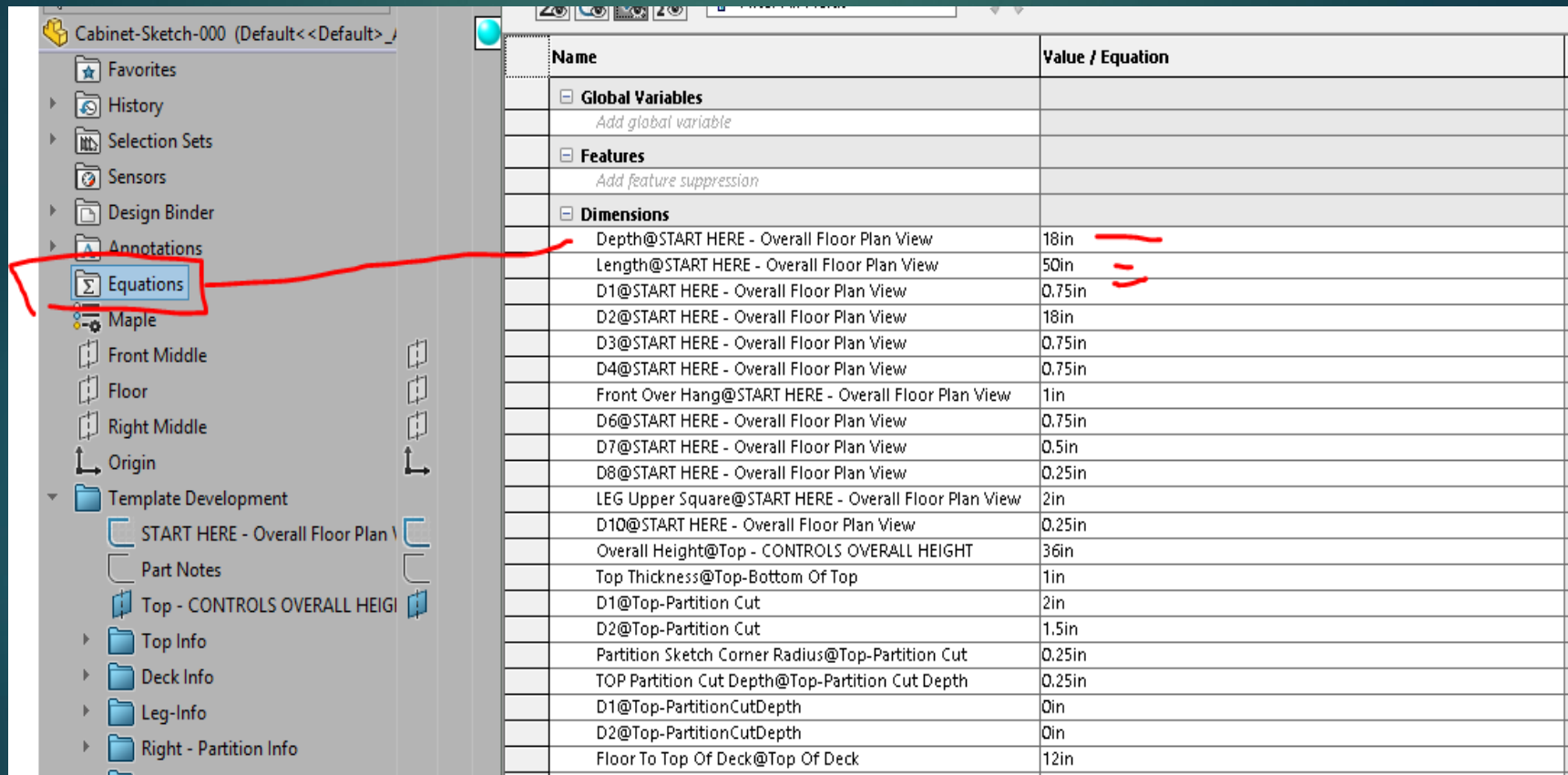


Tip – Equation Filters

- ▶ Did you know you can right click the equations folder and filter all the dimensions in a part and change the dimensions there and when you hit Ok, everything moves.
- ▶ Using the SSP – You can open the SSP go to the Equations Folder and change the dimensions then save and close and then open the main assembly and all the affected components will be changed.
- ▶ You can also double click a sketch in the SSP to show the dimensions and modify from there, then when you rebuild, the model changes, that's called.....

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Example



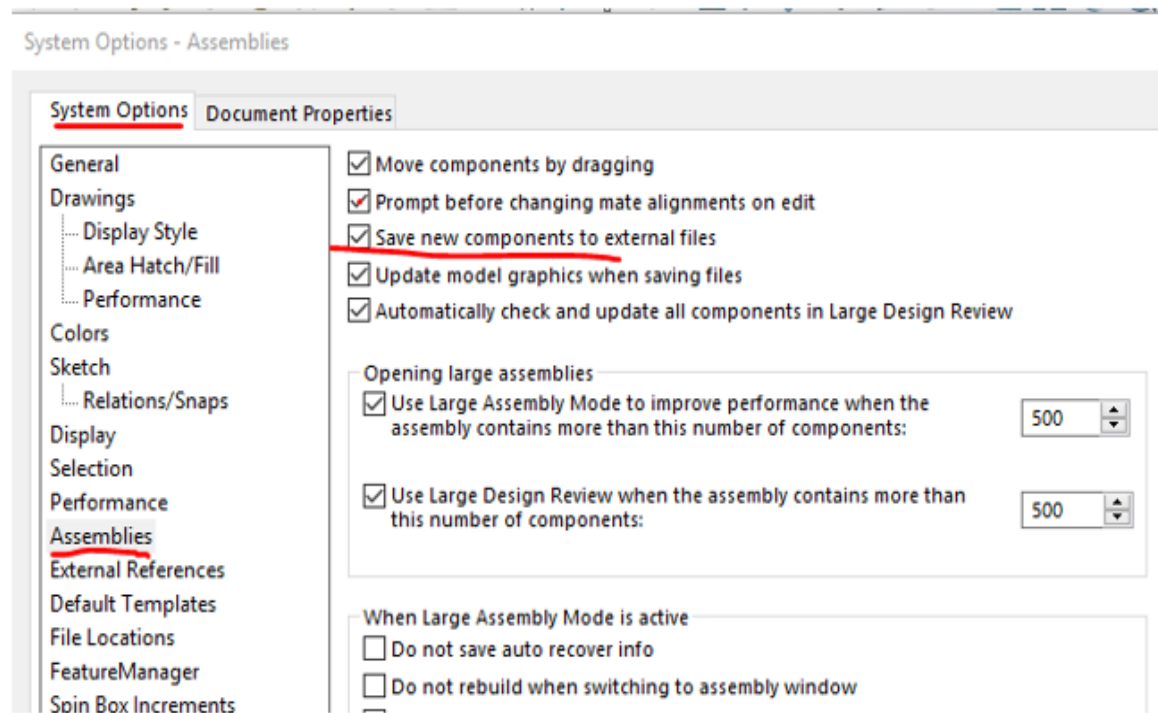
Cabinet-Sketch-000 (Default << Default >>)

Equations

Name	Value / Equation
Global Variables	
Add global variable	
Features	
Add feature suppression	
Dimensions	
Depth@START HERE - Overall Floor Plan View	18in
Length@START HERE - Overall Floor Plan View	50in
D1@START HERE - Overall Floor Plan View	0.75in
D2@START HERE - Overall Floor Plan View	18in
D3@START HERE - Overall Floor Plan View	0.75in
D4@START HERE - Overall Floor Plan View	0.75in
Front Over Hang@START HERE - Overall Floor Plan View	1in
D6@START HERE - Overall Floor Plan View	0.75in
D7@START HERE - Overall Floor Plan View	0.5in
D8@START HERE - Overall Floor Plan View	0.25in
LEG Upper Square@START HERE - Overall Floor Plan View	2in
D10@START HERE - Overall Floor Plan View	0.25in
Overall Height@Top - CONTROLS OVERALL HEIGHT	36in
Top Thickness@Top-Bottom Of Top	1in
D1@Top-Partition Cut	2in
D2@Top-Partition Cut	1.5in
Partition Sketch Corner Radius@Top-Partition Cut	0.25in
TOP Partition Cut Depth@Top-Partition Cut Depth	0.25in
D1@Top-PartitionCutDepth	0in
D2@Top-PartitionCutDepth	0in
Floor To Top Of Deck@Top Of Deck	12in

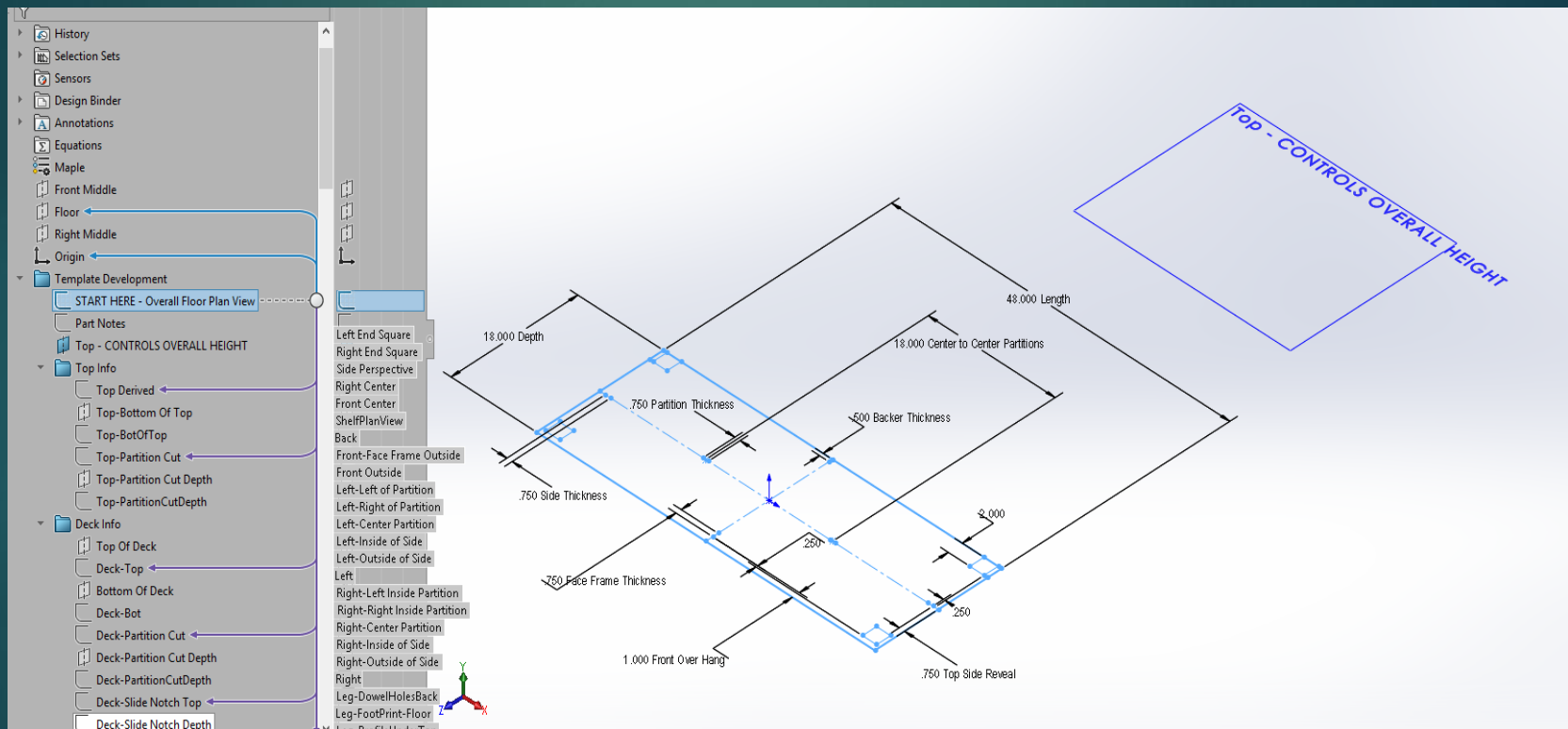
Check Your Settings Before Inserting a New Component Example

1. Go to Tools/Settings/Assemblies – Check the box that reads - “Save New Components to External Files”



Having this unchecked will prompt to save as a virtual file, ok - that is what you want...

Base Sketch



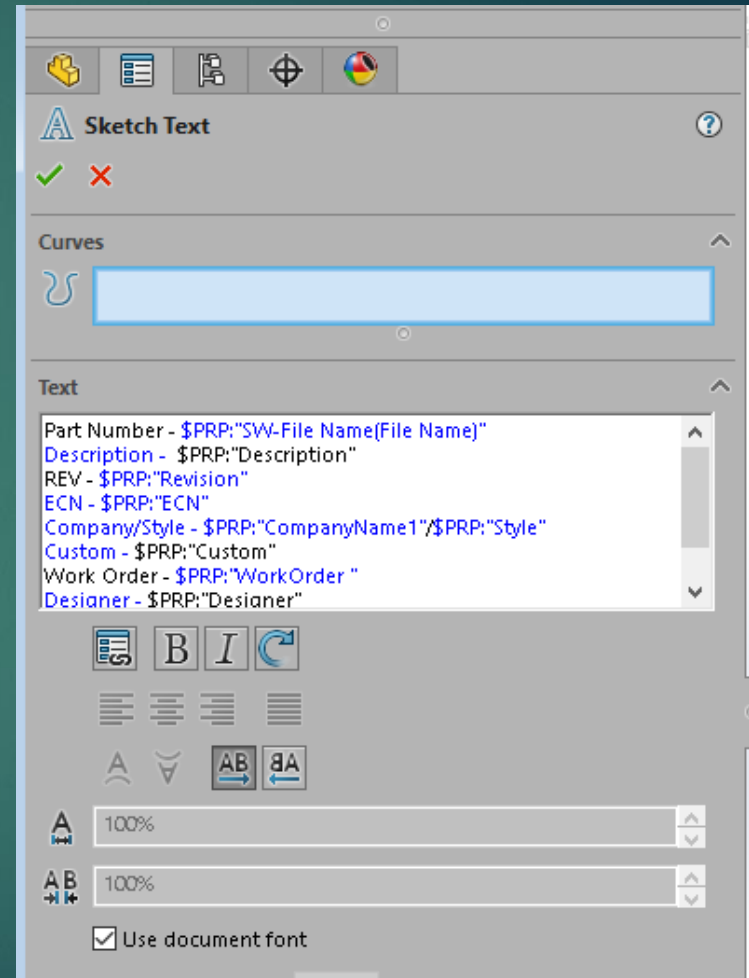
Presentation Model



Tip - Sketches

- ▶ Color Your Sketches
- ▶ Name Your Sketches
- ▶ Name The Dimensions that need to be changed later, new models etc...
- ▶ Did you know that you can insert a note in a sketch that is connected to your Custom Properties, making it easier to.....

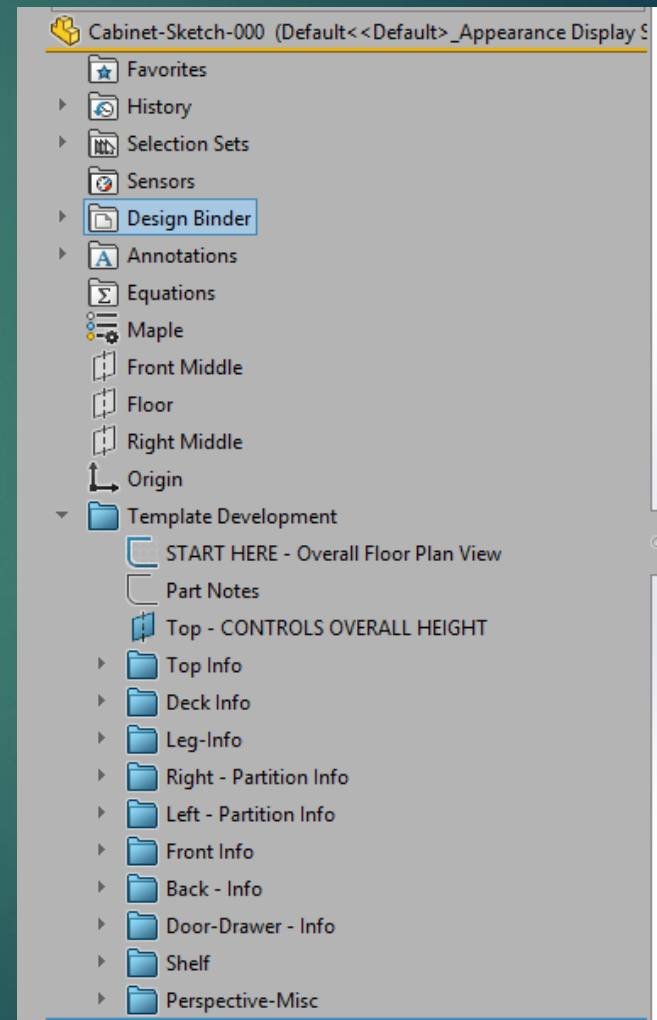
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Feature Tree

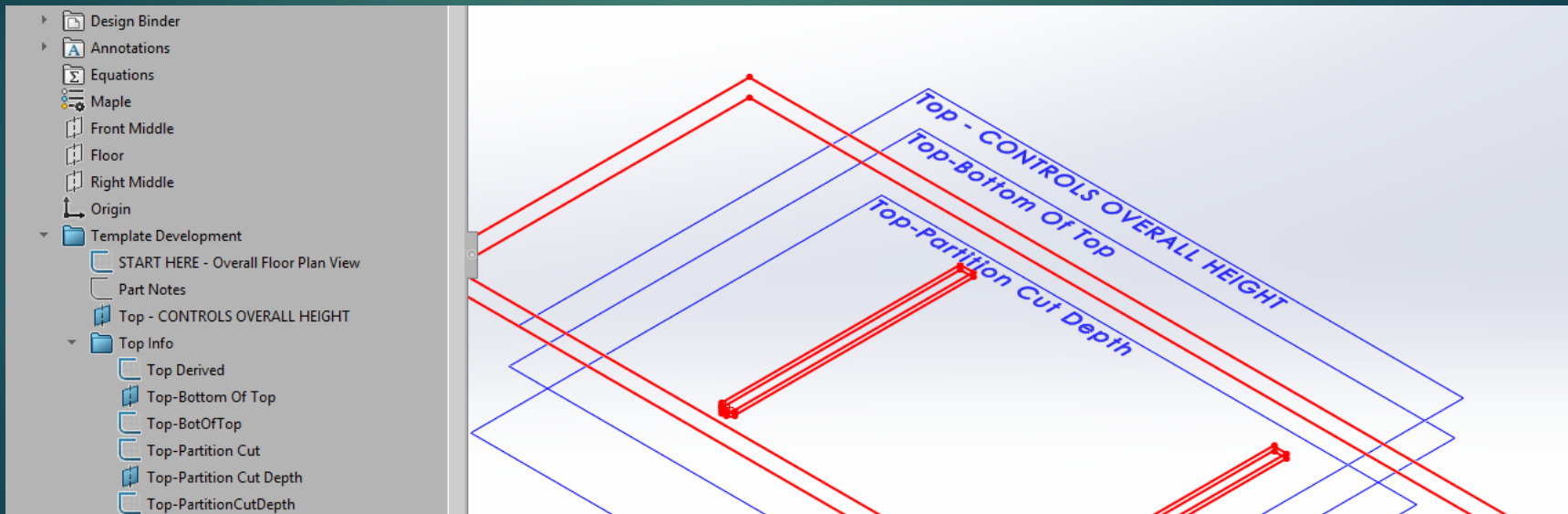
- An Organized Feature Tree makes Changes easier when you.....

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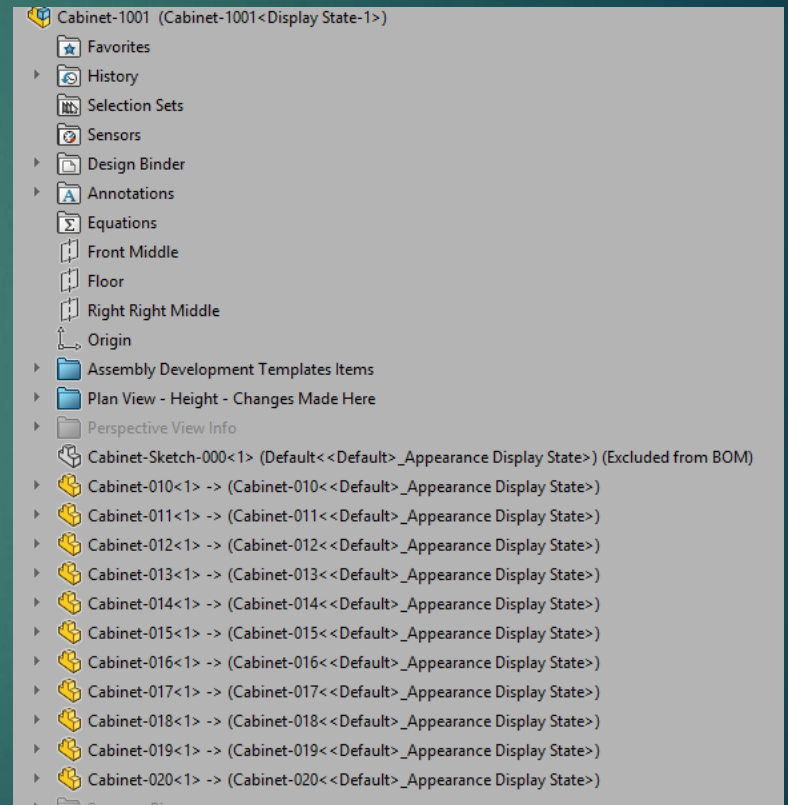


Feature Tree

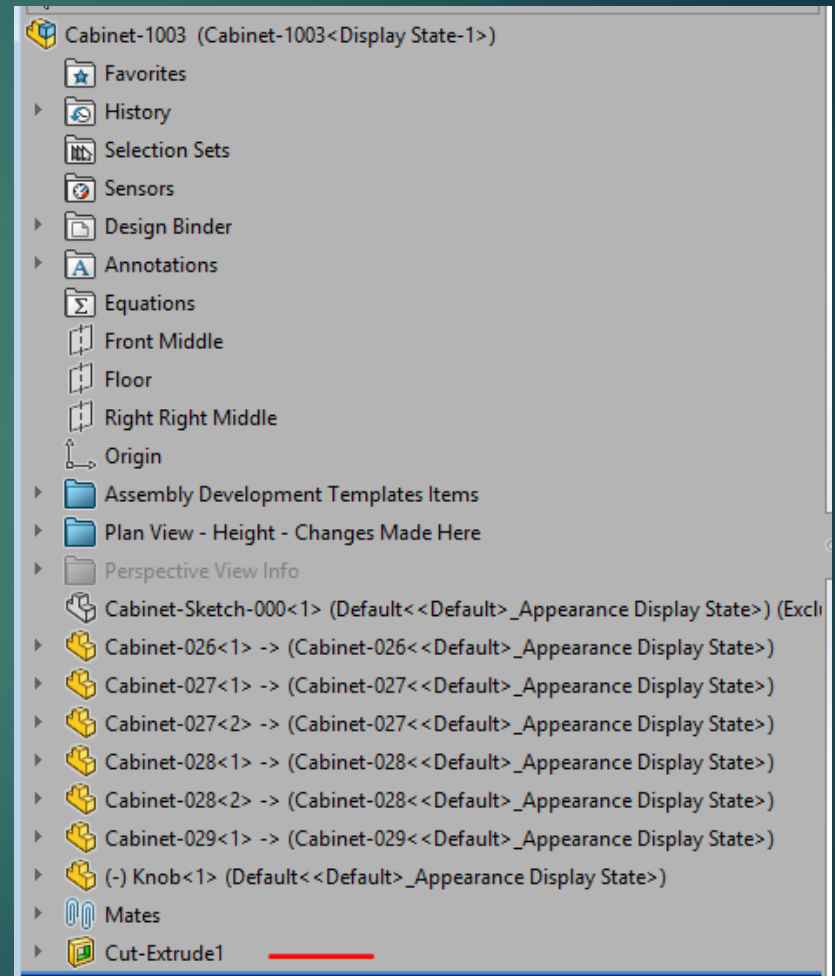
- ▶ Show only what you need to show when you're adding a "New" component



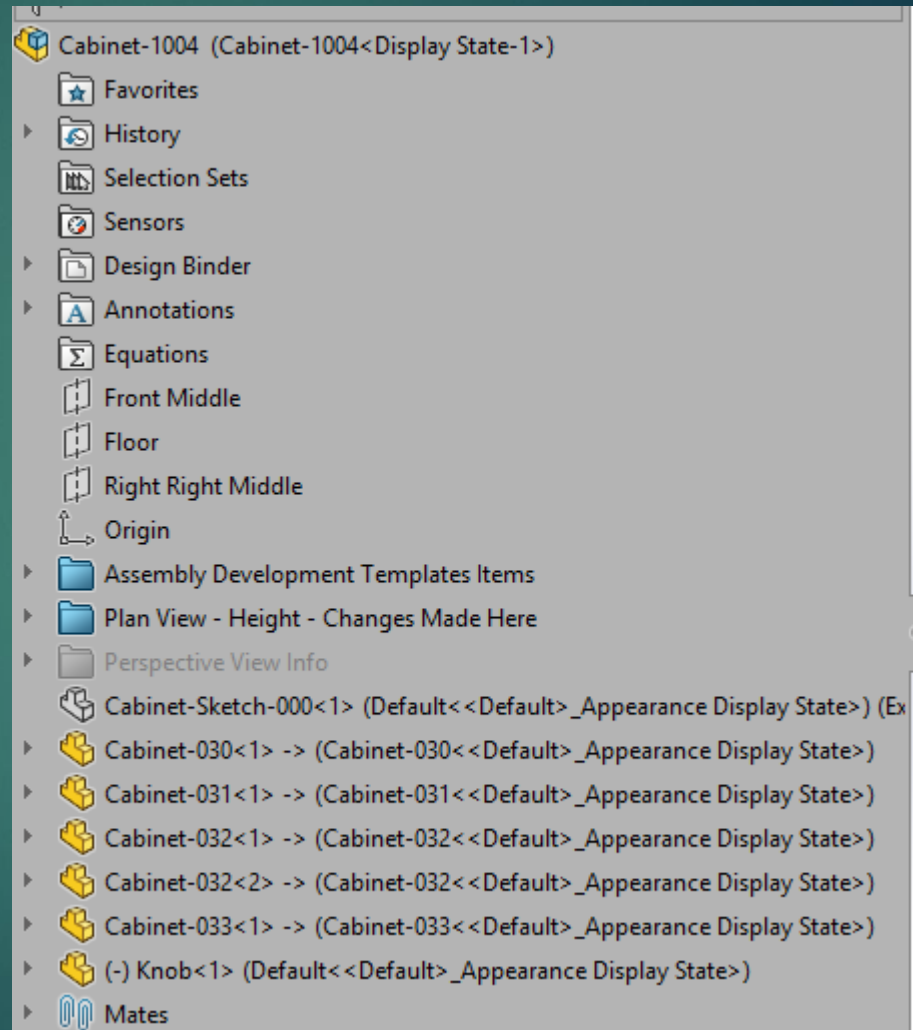
Cabinet Frame Assembly & Feature Tree



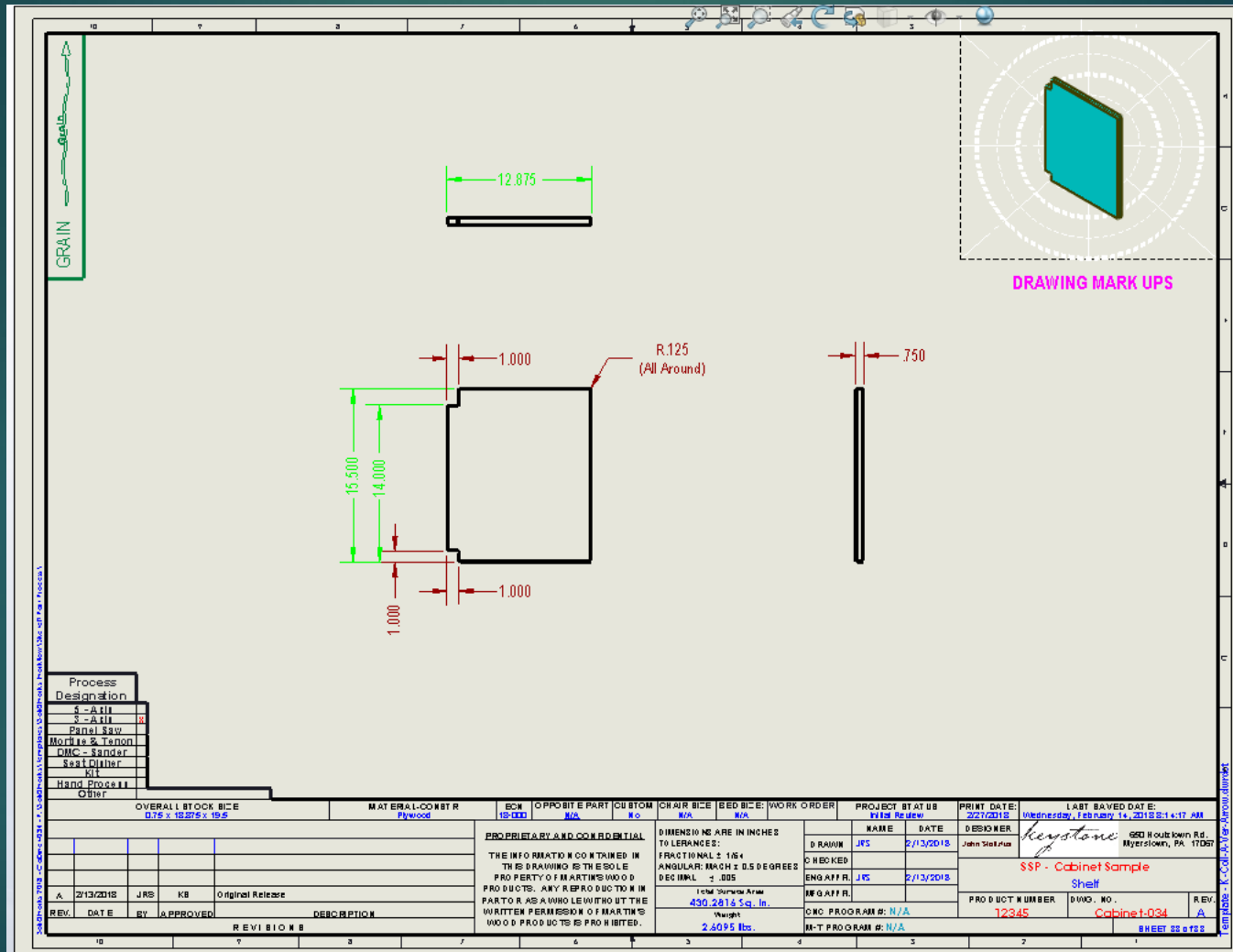
Drawer Assembly & Feature Tree



Door Assembly & Feature Tree



Go to the Tools/Options/Color//Drawings, Changed Dimensions – This changes the dimension colors the next time you open the drawing.



Basic SSP Principles (part1)

- ▶ The SSP is the first Part in every Assembly Feature Tree – Main Assembly and All Sub-Assemblies
- ▶ Setup the SSP and then insert the SSP into an Assembly and Save
- ▶ Then what I do is do a Save As Copy for every Sub-Assembly – then add all the Sub-Assemblies into the Main Assembly – I do this before I start drawing
- ▶ Insert a Saved “New” Part

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Basic SSP Principles (part2)

- ▶ Always Isolate the “New” Part and the SSP
- ▶ Only Show the Sketches needed in the SSP – hide the rest to reduce the Clutter and to ensure you’re not picking the wrong line/vertex or line point etc.
- ▶ In a multi-level user environment you could have (3) three Separate people working on the project at the same time, (1) for the Main Cabinet, (1) for the Drawer Assembly and (1) for the door assembly
- ▶ You can use Blocks within the SSP sketches as well, a great tool when you.....

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How I Apply The SSP (part 1)

- Open a “New” part and save it as the SSP.
- Apply the overall dimensions (Floor Plan View & Top)
- Add known Planes/Sketches and use those sketches to build the design. (Tip – Name the Planes/Sketches, so they’re easy to find) – (Tip – try to keep similar Zone Items together so they can be dropped in a folder, this takes away the feature tree confusion syndrome)
- You can add surfaces as well as solid extrusions if it helps in the process
- Add planes or sketch lines to use the option “Extrude Up To” when you do the solid modeling, this eliminates any connection to any of the other components, in case you would need to delete the part..

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How I Apply The SSP (part 2)

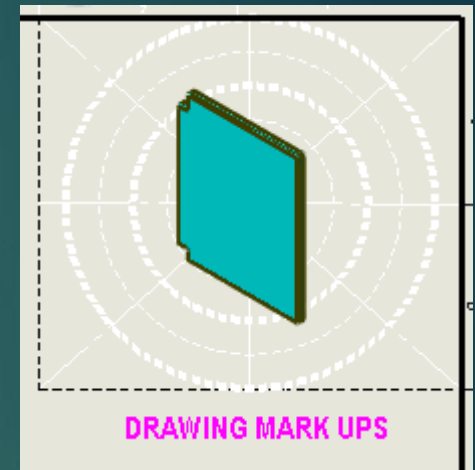
- Figure out approximately how many Sub-Assemblies I need
- Open a “New” Assembly and save it (you will need one assembly to represent your Main Assembly)
- Insert the SSP in the just created Assembly file, by hovering over the point of origin and when you see the Double Arrow let it drop
- Save
- Then do a Save As Copy for however many Sub-Assemblies you think would be required for the entire project, this don't have to be accurate, you can always delete any Sub-Assembly you don't need or add another one.
- Now open the Main Assembly
- Insert all the just created Sub-Assemblies
- Save and close

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Tip – Layers

I just like a lot of templates & I like a lot of layers to add specific details

Layers					
Name	Description				
BORDER	BORDER				
TEXT	TEXT				
FORMAT					
DIMENSIONS					
TABLES					
VIEWS					
NOTES					
TITLE BLOCK					
ISO					
DRAWING MARK UPS					
ARROW VERTICAL					
ARROW HORIZONTAL					
PROGRAMMING					



Tip – Memorization Chart

This Memorization Chart is within a sketch in the Feature Tree for a quick visual. What I do is suppress this sketch – then when I just hover over it the sketch will show – I have this in my part and assembly templates.



The SSP/Zone Advantage (part 1)

- It doesn't matter which Zone you are working in, you can easily change Each Zone shares the same geometry, therefore double click on any sketch or plane in the feature tree and have dimension pop up to change, without opening the part.
- Each Zone also shares the same Point Of Origin, which makes it a Snap to Assemble the project, drag and drop, reduces mates.
- Zero Interferences if you use the correct Planes and Sketches
- If there is a known change request, you can open only the SSP and change the known sketch, without having to open any assembly or part, then when you open the assembly the change will occur within the assembly and part files that would have been affected.
- You can edit the SSP in any of the different Zones/Sub-Assemblies, without opening up the SSP separately.

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The SSP/Zone Advantage (part 2)

- Use “Isolate” when adding or editing – and when Editing the SSP
- Parametric Changes, change a dimension and watch the part move instantly when the part is rebuilt (Ctrl Q)
- Stack multiple SSP's, driving different Zones, more than (1) SSP, they need to be in every sub-assembly so all connection points are met.
- You can Cut/Boss Extrude up to planes or vertexes, this assures no direct link from part to part, which can be a huge advantage in any “New” design processes, since there is no direct link when you delete a part in the feature tree, there are no “Errors” from one part to the other.
- Add Design Tables, Configurations and you can also use Blocks, when you.....

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Inserting A Part (part 1)

- Open a Sub-Assembly where you want the part to be built
- Save the Part file – Save a lot of part files (if you have a big assembly)
- Open an Assembly
- Go Insert Components, Browse for the Part, select the Part and hit the Green Checkmark – that will drop the Part in Fixed – No Mates and No Inplace Mates either
- Select the proper sketch from the SSP and convert entities.
- Extrude up to either a vertex or a plane

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Inserting A Part (part 2)

- This is where it pays to spend a little more time with the sketches and planes in the SSP, it may take me a day setting one up, but with an hour or so my assemblies are complete and ready for review, of course that really depends on the number of pcs and the complexity of the design.
- “ALWAYS” When you insert any subsequent components always select the SSP and the New Part in the feature tree and right click and **“Isolate”** – This eliminates in context relations from part to part and allows you to delete any item in the feature tree and not create errors.
- Use the SSP to create a systematic workflow to create robust parametric solid models and great designs every time.
- The SSP plays an important role when you use the Pack and Go for a “New” Model or “New” Size, only when you.....

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Did You Know?

- That - You can Color Your Sketches – making them easier to find?
- That - You can add Configurations to the SSP
- That - SSP eliminates Circular Rebuilds
- That – SSP eliminates Part/Assembly Interferences
- That - Creating Parts and Assemblies with SSP – you can reduce the number of Mates, by dragging and dropping the part or assembly onto the point of Origin
- That - Designing/Modeling is only a small portion of the work in getting the information to manufacturing or to potential clients
- That the introduction of Custom Property Tab Builder had been an awesome boost when it comes to getting the information consistent, easy to change etc...

Did You Know?

- That the introduction of Custom Property Tab Builder had been an awesome boost when it comes to getting the information consistent, easy to change etc...
- Using Macros can help keep your designs consistent
- That Mates, Sketch Patterns and Component Patterns reduce performance
- That 90% or more Mates can fix a component by using only (2) Two Coincident or Concentric Mates
- You look for better ways when you...

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Did You Know?

- That - I work with multiple tab drawings, (some over a 100 drawing sheet pages), and never ever ever want to go back to single drawing files or drawing file per part. Using that many drawing tabs can slow the performance, however it is still quicker than opening and closing a 100 files. My drawing setup does have the ability to have individual part or individual assembly information within the part file, you change one part, the CPTB is also setup to handle up to 3 revisions, so the information is right where it needs to be, with that part or assembly. Any interchangeable component is listed in the BOM only and there is a drawing in some folder somewhere within the system.
- I use well over a 200 custom property fields, naturally I don't use nearly all of them, every time, but I do have the flexibility to use them when I need to. Each of the Custom Properties were needed at some time or the other, so I would just keep them in the CPTB file. Within that CPTB file I have room for 60 notes and most times I might only use 3 or 4 lines per part, one assembly had over 40 lines of notes, so I just added a few more.
- That -the New "Visualize" does some awesome renderings
- That - the SW Forum is a good place to get help
- Years ago I uploaded a lot of SolidWorks Models to www.3dcontentcentral.com – some may be good and some may not be so good, your choice, but you can go there to download files, if you need Motors, CEMA equipment, Hardware plus some other stuff.
- You can connect via www.linkedin.com
- Email jffiiigg@yahoo.com

Questions – Comments

- ▶ Using a Skeleton Sketch Part Works
- ▶ Let's collaborate and share information

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Tips - Macros

I use the following macros on a daily basis and they reduce, not only time but they are consistent and reduce the amount of Human error

In the drawing Files

- ▶ A macro to rename the Sheet Tables from the Configuration Name to the File Name, a macro to open and rebuild every drawing view, a macro to reload the Drawing Formats, a macro to Count the actual drawing sheets, a macro to add the tab names to the Drawing Custom Properties, 20 macros to adjust the drawing scale size

In the Part/Assembly Files

- ▶ Macro to delete all the empty spaces in the custom property dialog box, a macro to rename the part or assembly Default Configuration to the file name, a macro to add overall bounding box sizes and a macro called Super Rebuild
- ▶ SolidWorks and Macros – a great combination , when you.....

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Tips

- ▶ Betty Baker, Domestic Casegoods Product Engineer from Ashley Furniture from Arcadia WI - I am on her weekly SW tips email blast
- ▶ D – Key = Breadcrumbs
- ▶ S – Key = Quick Tool bar
- ▶ Alt A = Allows you to drag and drop Sub-Assemblies in the feature tree
- ▶ For all uppercase letters, there is a setting in the Document Properties
- ▶ I have a document where I save snap shots of all my Document & SW settings, that way if I do have a major crash, I can get right back where I was
- ▶ Save often – and also save out the Drafting Standards
- ▶ I use a lot of templates, how many, guessing about 25 or 30
- ▶ Use Custom Properties and Custom Property Tab Builder

Tips Design Journal

Use the Design Journal to store information – you can also link files, however if you link to many large files it will affect the performance.

Did you know you can create your own Design Journal that shows the custom properties

Design Journal

File Name	1469601-006.SLDPRT
Old Part Number	Error! Unknown document property.
Opposite Part	
Chair Size	
Bed Size	N/A
Custom	No
Description	Rail, Deck, Side, Right
Last Saved	2/28/2018 7:05 AM
Revision	A
Date Drawn/By	12/2/2016 - JRS
Date Checked/By	12/12/2016 - KB
Date Manf Appr/By	12/12/2016 - JS
Sales/Mark/ Appr	12/12/2016 - KS-email
ECN/ECR	16-081 - 123
Company/Style	Katy Skelton - Caravan Sofa
CNC Program	
Work Order	Error! Unknown document property.
Weight	2.5939
Total Surface	322.6426
5 Axis	
3 Axis	
Mortise - Tenon	
DMC -Sander	
Seat Disher	
Kit	
Hand Process	
Other	

Additional Notes:

1. See Main Assembly For Product Development Notes
2. 4416C-86143-000 - Design Journal

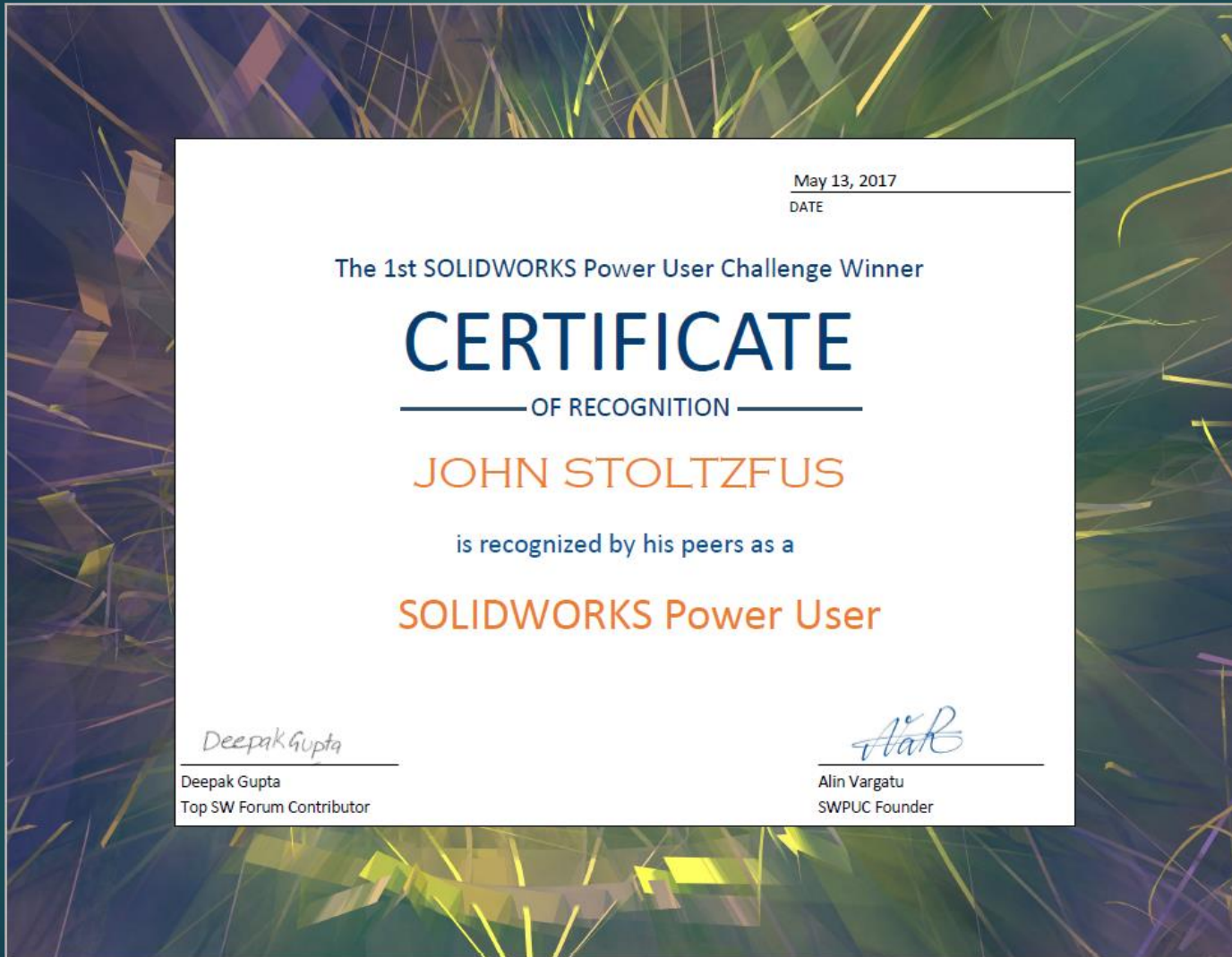
Tips – SolidWorks Forum

TAKE ADVANTAGE OF AND USE THE SOLIDWORKS FORUM

- ▶ Do a search for “Tricks”
- ▶ Do a search for “Makes my Blood Boil”
- ▶ Do a search for “Zero, Zero, Zero
- ▶ Do a search for “Weekly Challenges”
- ▶ Do a search for “SSP” “Skeleton Sketch Part”
- ▶ Do a search for “Master Part” & “Design Sketch”
- ▶ Follow the top ten guys, minimum – There also are a lot of knowledgeable guy’s that have given away points to stay out of the top ten – Kelvin Lamport is one of them...
- ▶ Best guy for all information is Deepak Gupta
- ▶ Best guy for Surfacing is Paul Salvador
- ▶ Best guy for Sheet Metal Dennis Bacon
- ▶ Best guy for equations and special stuff is Robert Edwards (Excel Driven Sketches etc.)
- ▶ Alin Vargatu runs the Forum Challenges and it has been proven to me that using SolidWorks nothing is impossible, take a look at the results.
- ▶ There is a lot of great information and a lot of awesome guys that will bend over backward to help “If” you make an attempt and show you definitely want to learn how to.....

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Tips – SolidWorks Forum



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Contact Information

- ▶ Email – jiffiigg@yahoo.com
- ▶ Tel- 717-949-2672
- ▶ Connect via LinkedIn
- ▶ If you're interested in all my macros that I use, template examples, Custom Property Tab Builder templates and everything SolidWorks – I have a Dropbox folder that I would be happy to share (just give me your email and I'll add you to the Share)
- ▶ SolidWorks Hands On Consulting Services Available



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