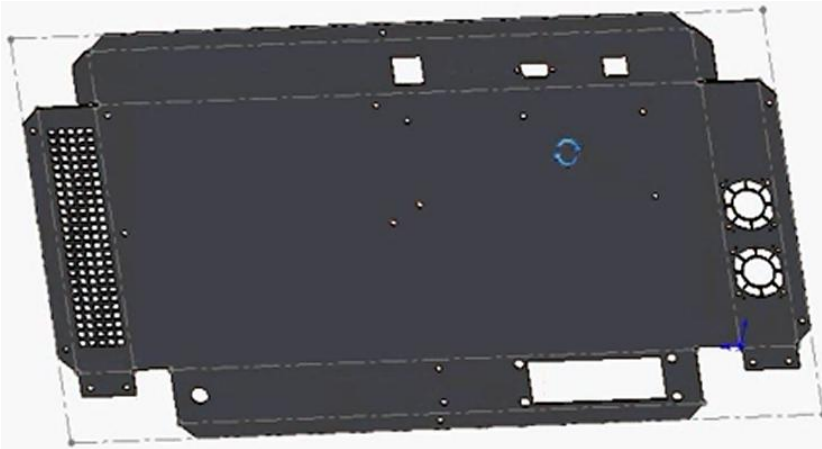


Advanced Sheet Metal – Design Faster



Steve Lynch
Rapid Sheet Metal

Intro

Rapid Sheet Metal®

- Dedicated to quick turn prototype sheet metal parts
- 15 seats of SolidWorks 2013
- CAD Quotes in under 8 hours
- Unfinished parts in 7 days
- Plated parts in 9 days
- We do not design parts
- 2,500 unique parts quoted a month on average
- Quoting & Manufacturing from 3D CAD Data



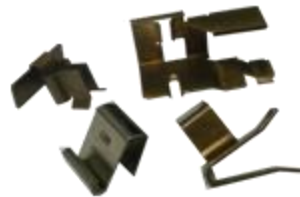
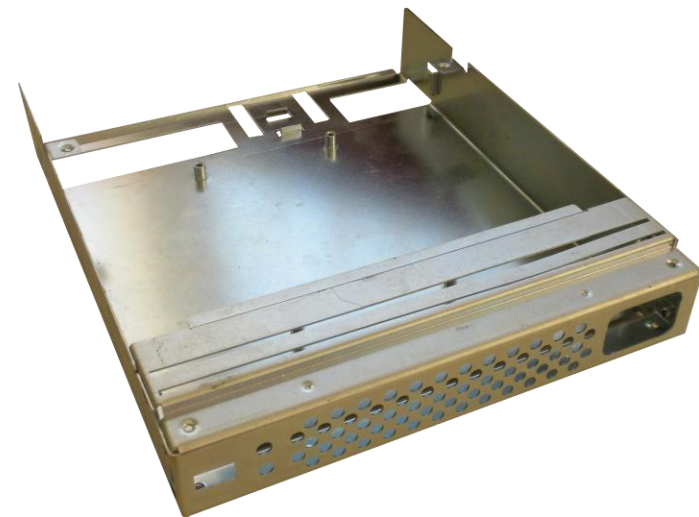
Overview

- **Counter Sinks**
 - How to find through hole size
- **Hardware**
 - RSM web site table
 - Mate references
 - Hole Sizes $+0.003 -0.000$
- **Rapid Forming tools**
 - Forming tools from our web site
- **Be careful with SolidWorks Sheet Metal Defaults**
 - Bend Radii
 - Material selection
- **Custom Properties**
 - **Add data to your part, Assembly, and Print fast!**
- **Welded box & cover with equations**
 - Save time, make it once
 - Get the idea completed and manufactured
 - Add welding locking features rapidly
- **Advanced Bend Relief examples**
 - Using library feature
 - Using subtract bodies



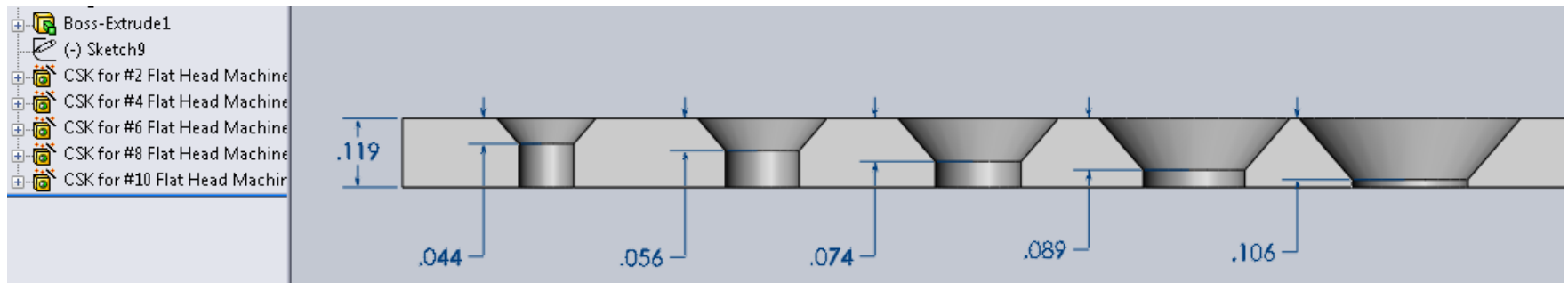
Overview Cont.

- **Videos**
 - Hem
 - Offset
 - Bump forming
- **Design Fast**
 - Use shell
 - Delete face
 - Get the idea down then engineer the design
- **Pictures of before and after**
 - Welding
 - Solid parts cut for manufacturing

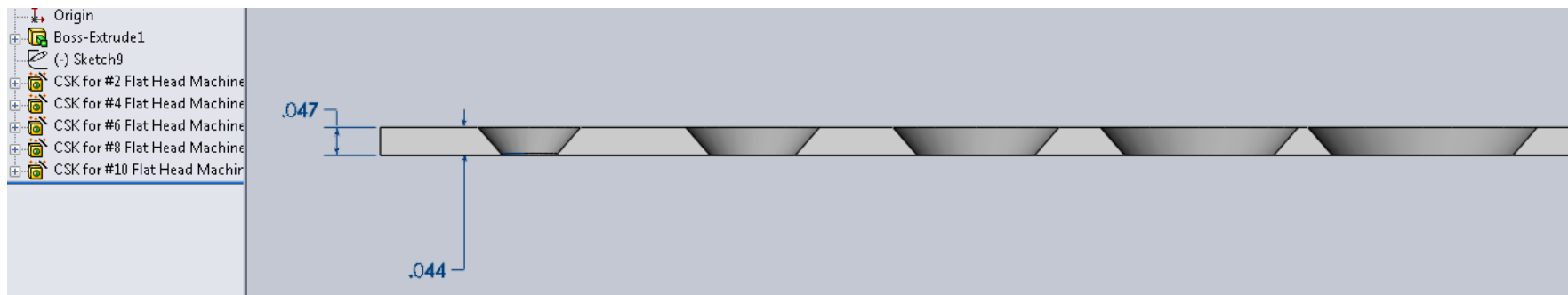


Counter Sinks

82° Counter Sink in .119" steel.

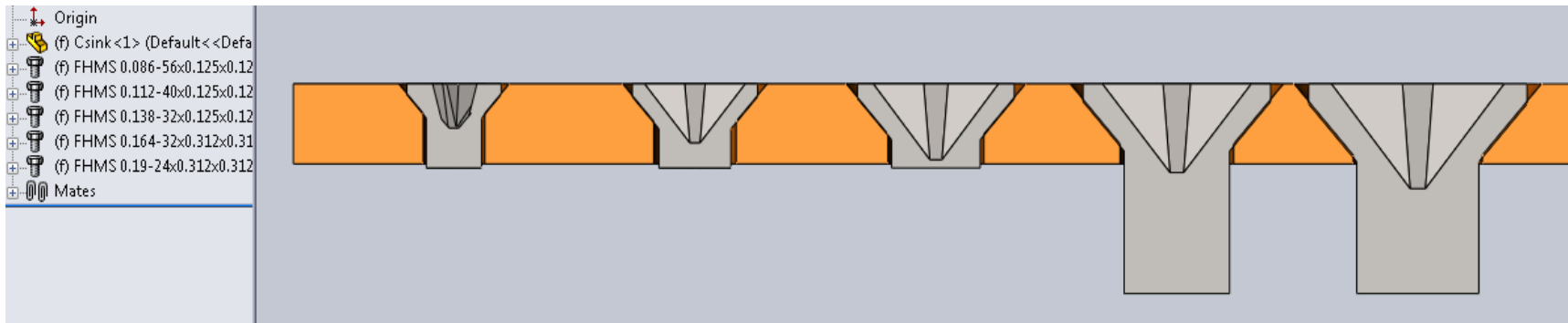


82° Counter Sink in .047" steel.

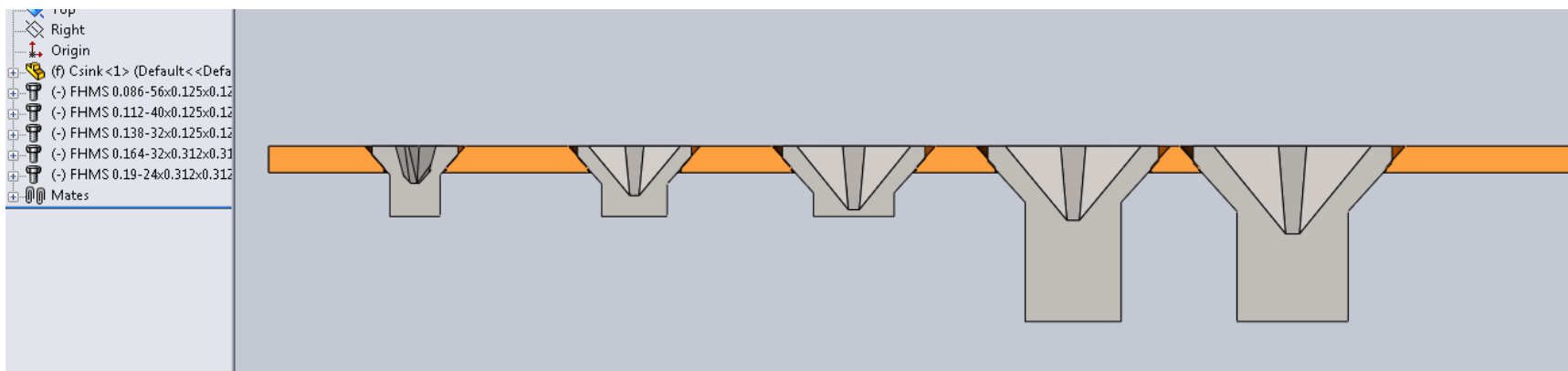


Counter Sinks

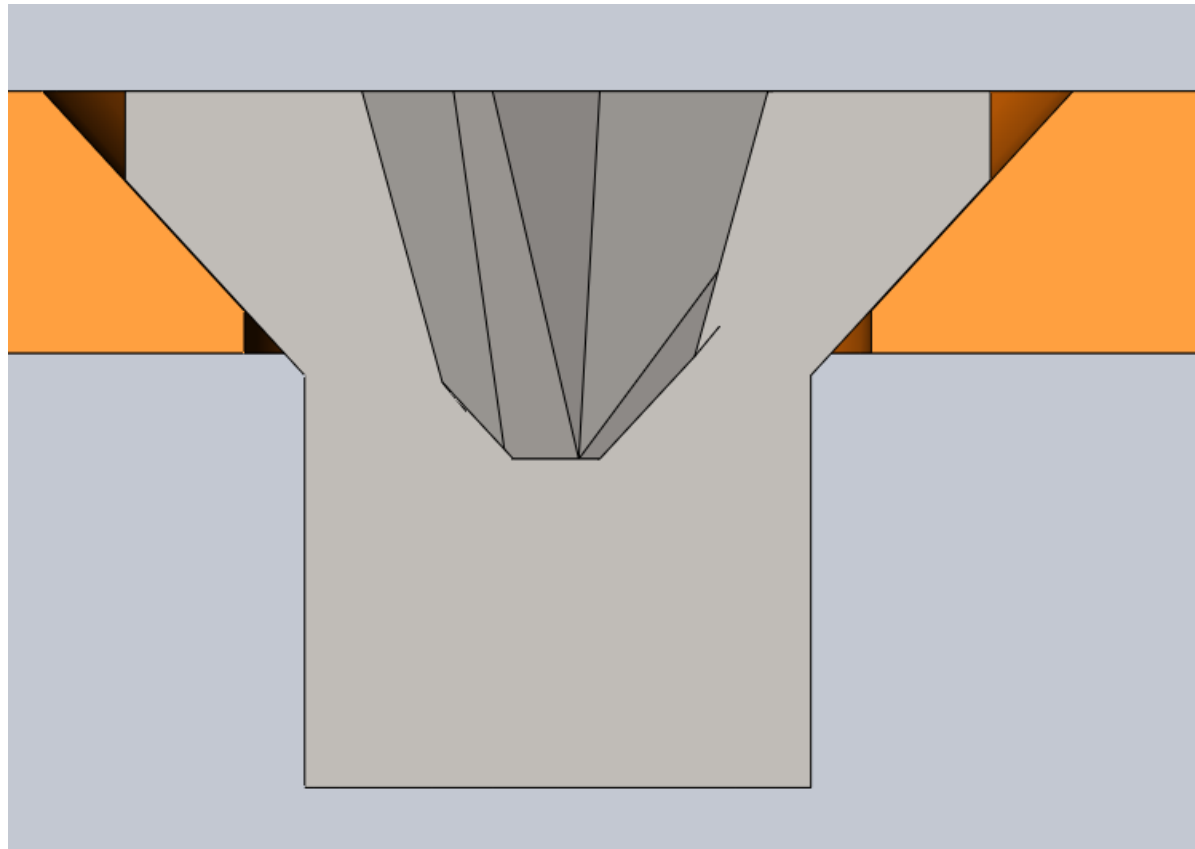
82° Counter Sink in .119" steel.



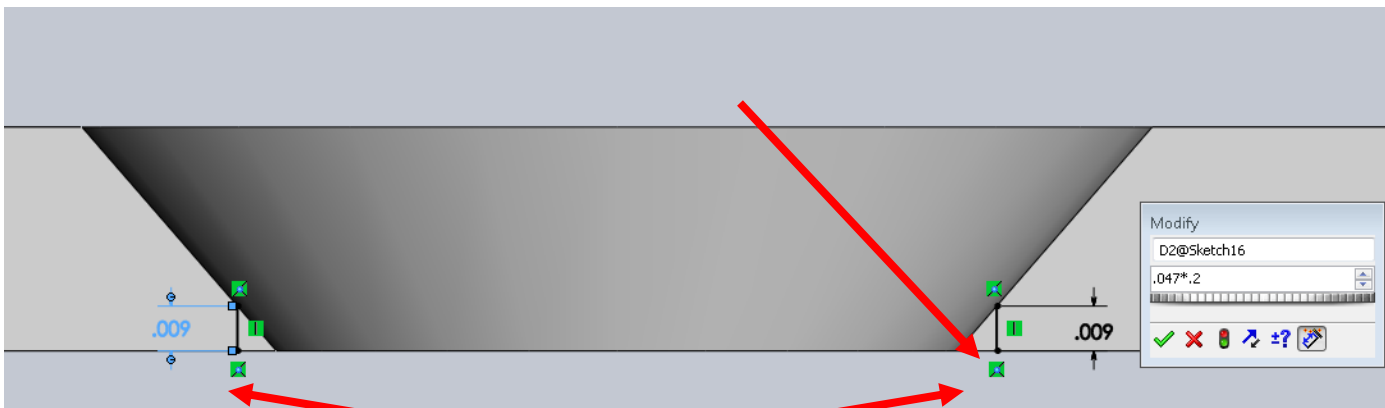
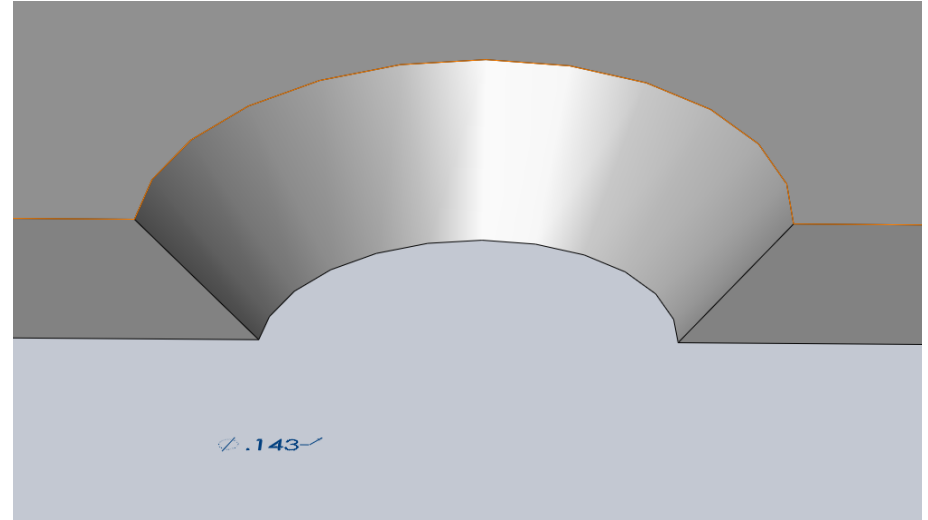
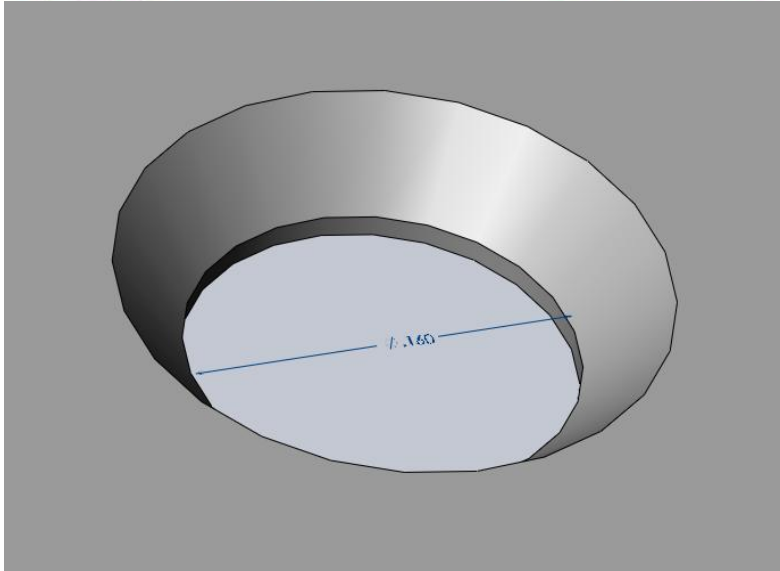
82° Counter Sink in .047" steel.



82° Counter Sink in .047" thick steel.



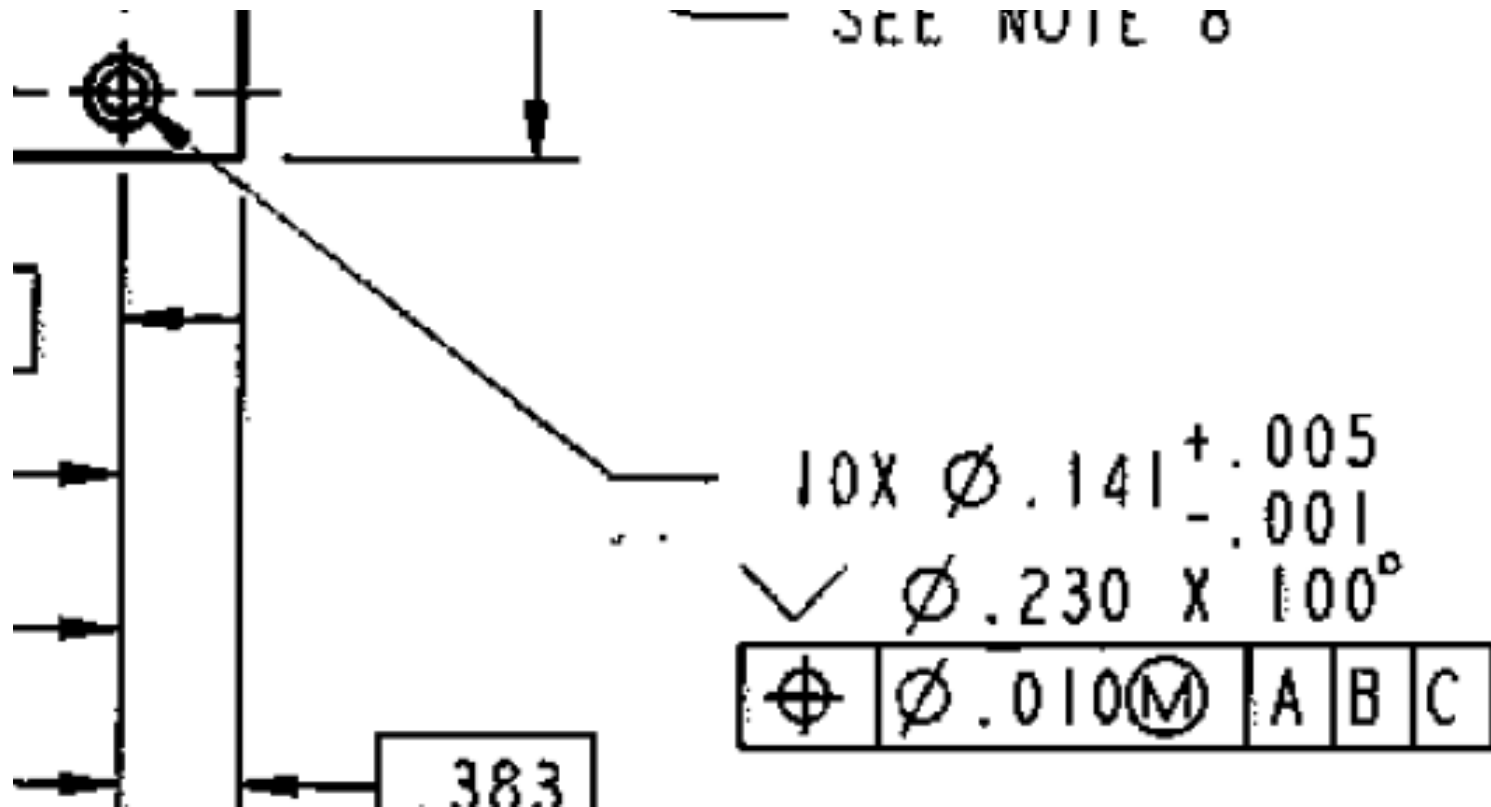
Counter Sinks



Ø.143 Before

Ø.160 After

Ø.017 Delta



It's better not dimensioning your through holes

Hardware – RSM Hardware table

<http://www.rapidsheetmetal.com/resources>



Rapid reference to Hardware data

Material Thickness Vs. Shank Numbers

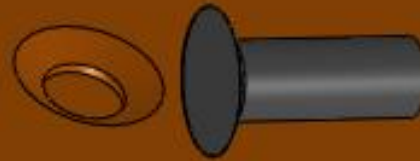
Hardware Type	Thread Code	Minimum Sheet Thickness	Shank
S, SS, CLS, SP, SCLA	AC, CLS, CLSS, F, FHS, SOS, BSOS,	0.03	0
		0.04	1
		0.056	2
	632, 832, 024, 032	.091	3
S, SS, CLS, SP, SCLA	0420, 0428, 0518	0.056	1
		0.091	2
	M6, M8	0.125	3

Hardware Lengths

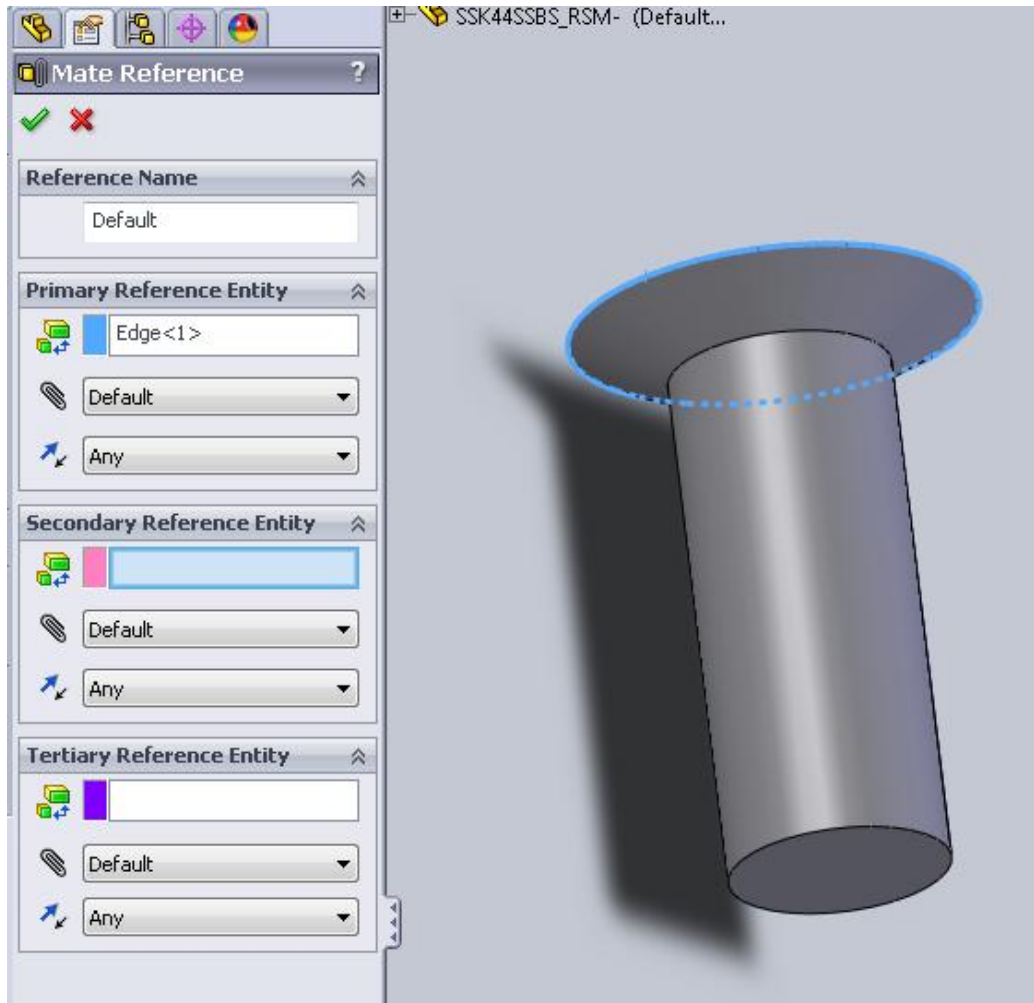
Hardware Type	Length Code + - .015" (Length code is in 16ths of an inch)									
	0.25	0.312	0.375	0.5	0.625	0.75	0.875	1	1.25	1.5
FH, FHS, FH4, FHL, FHLS, TFH, TFHS, HFH, HFHS	4	5	6	8	10	12	14	16	20	24
ALL METRIC LENGTHS ARE IN MILLIMETERS (EX. DASH 10 IS 10MM LONG)										

Hardware – Mate Reference

Problem Rivets and hardware with countersunk edges are hard to auto mate

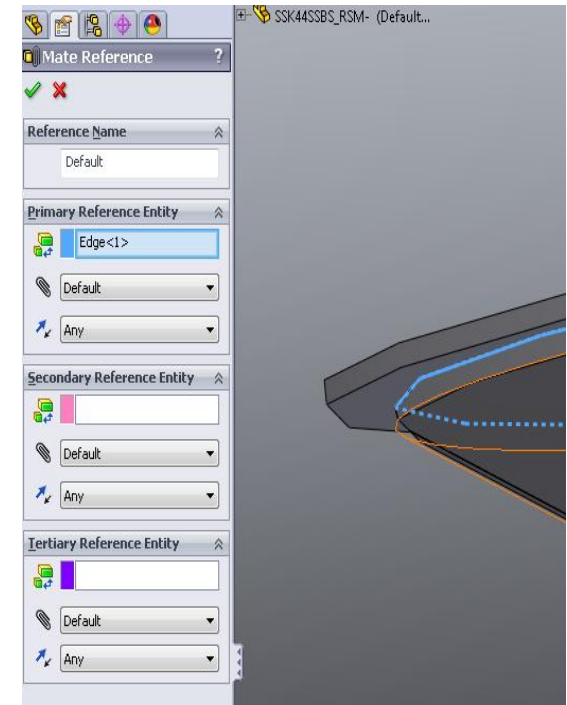
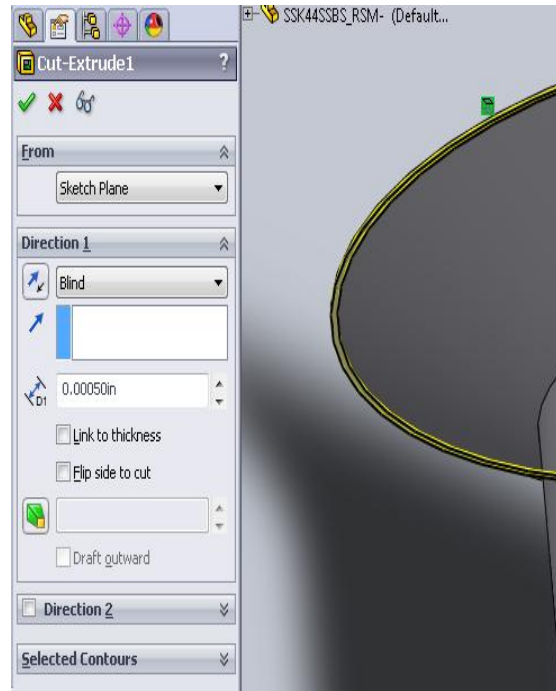
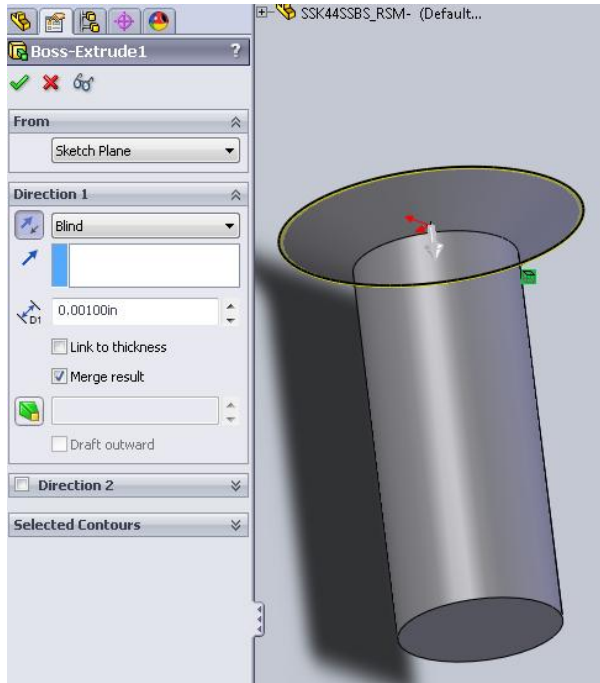


Hardware – Mate Reference



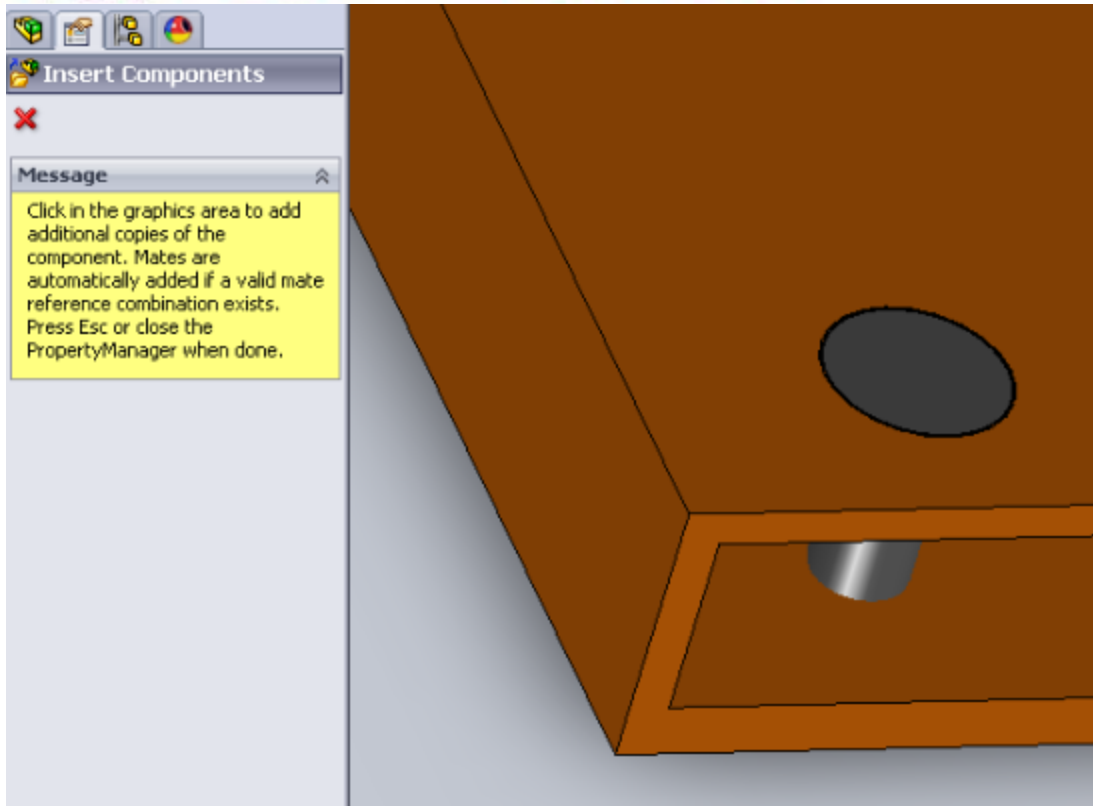
We have noticed it is common to select this top edge as the default Mate reference.

Hardware – Mate Reference



We suggest adding a .001" extrude then a .0005" cut to the top face to create a 90° plane intersection to be used as the default mate reference

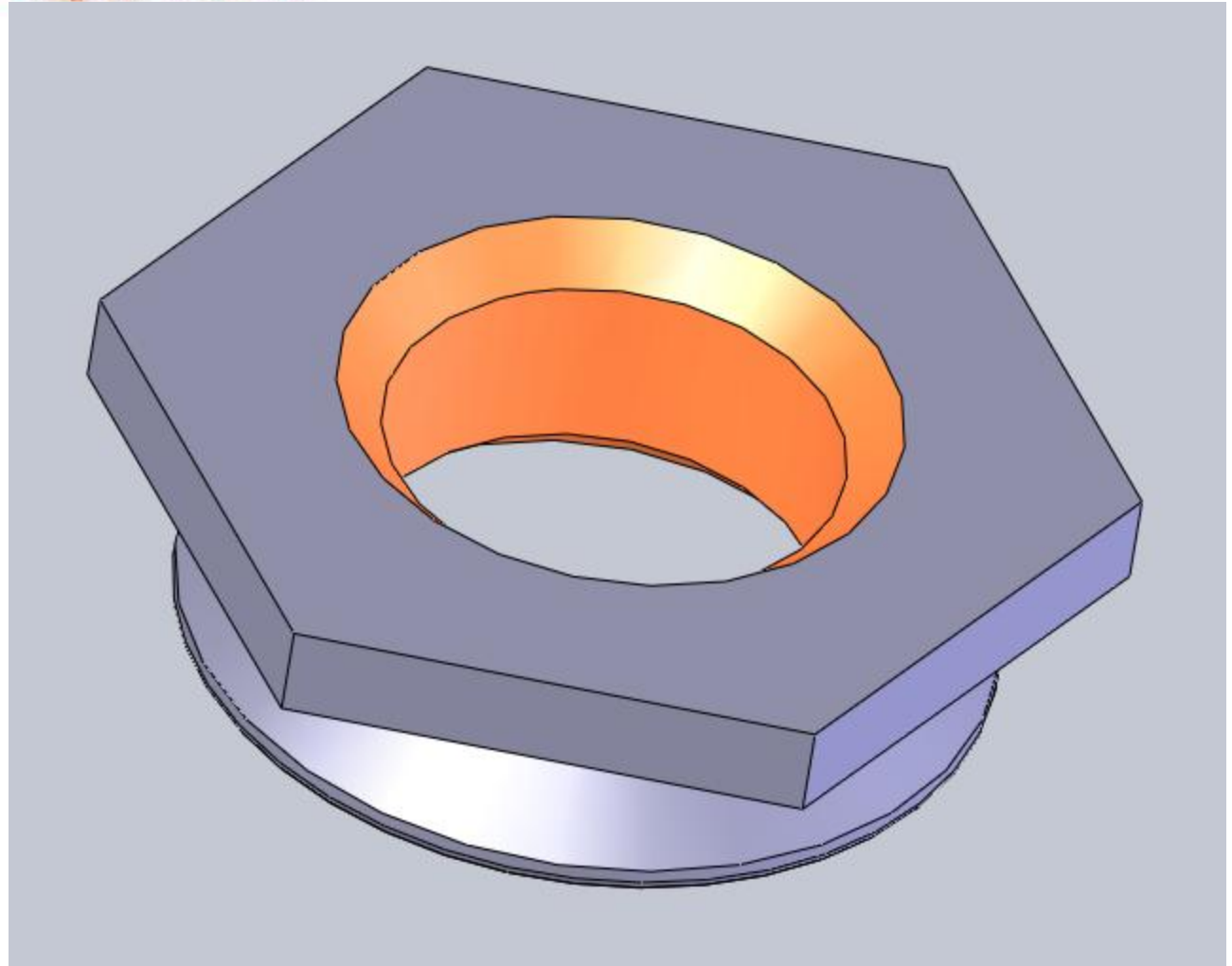
Hardware – Mate Reference



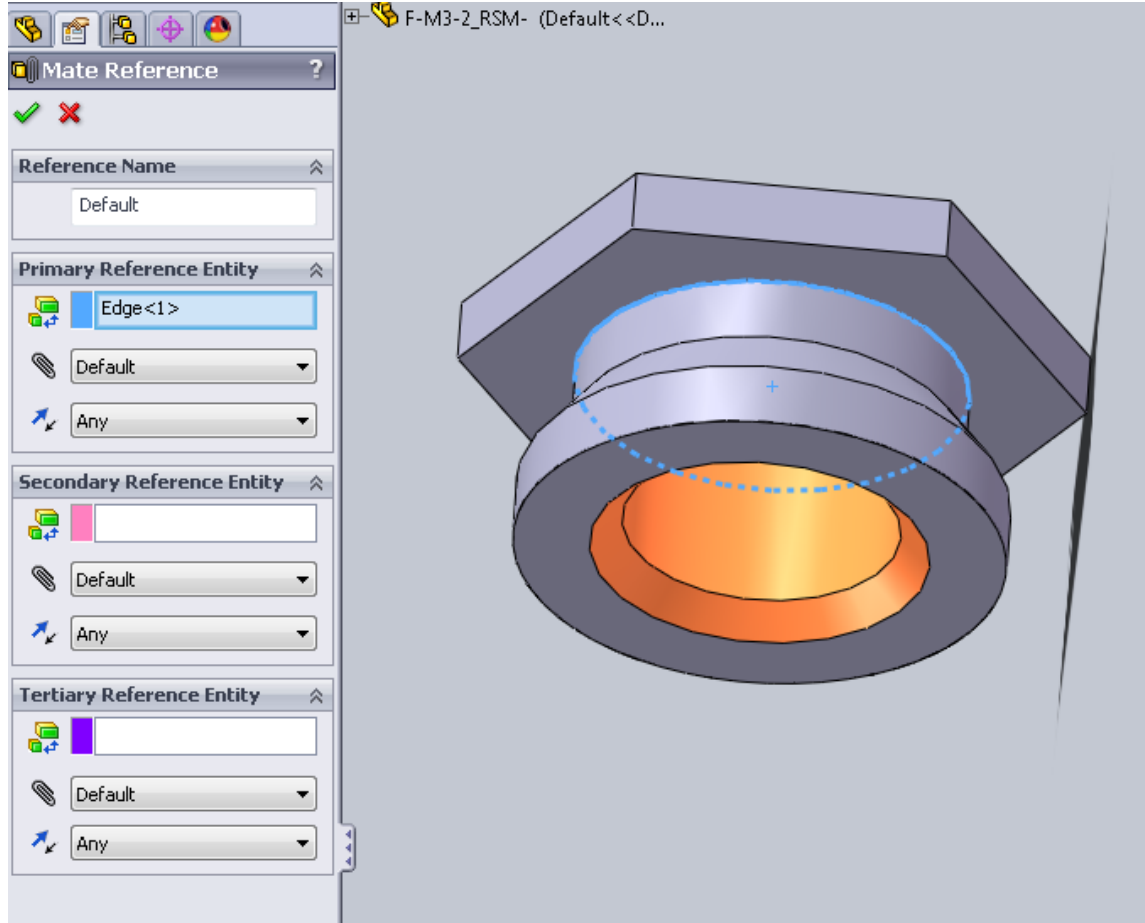
Now as you drag this part from your library it will snap into place every time.

Hardware – Mate Reference

Problem Flush
style hardware
does not auto
mate and sit
flush

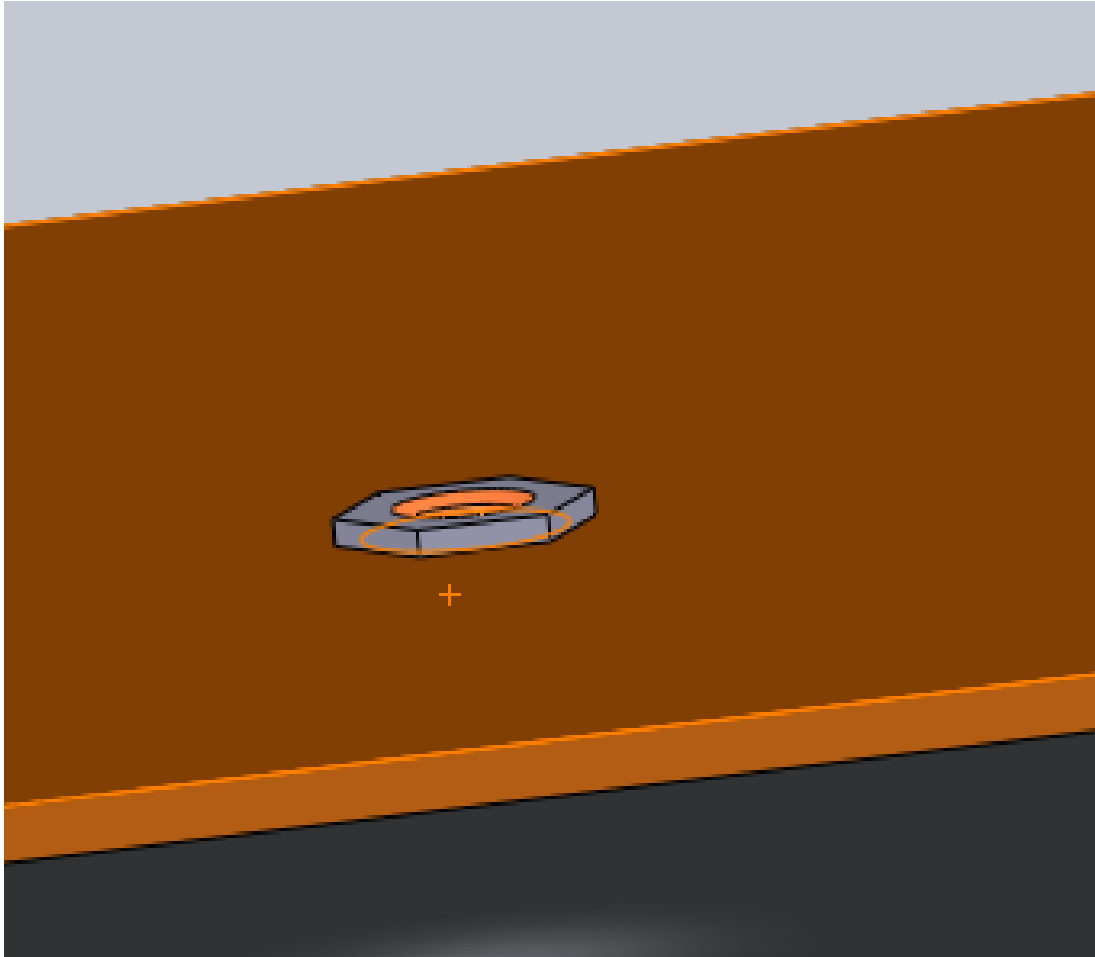


Hardware – Mate Reference

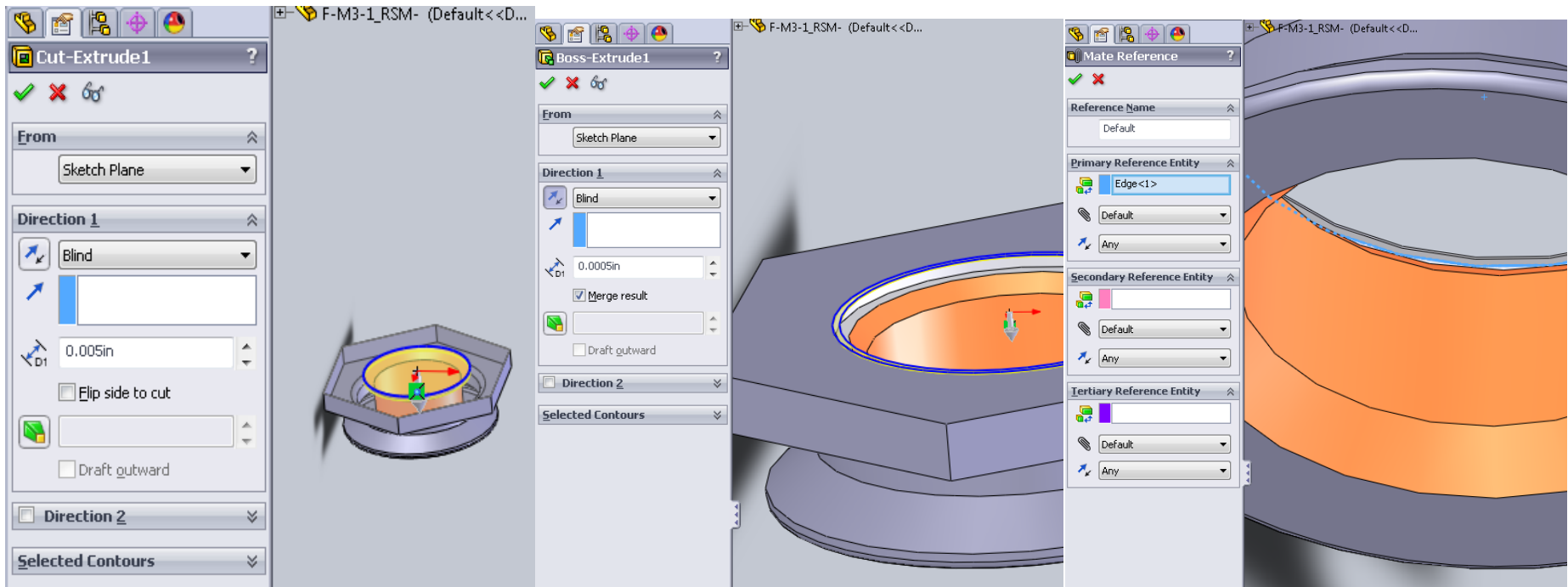


We have noticed it is common to select this top edge as the default Mate reference.

Hardware – Mate Reference



This results in the hardware not sitting flush. Or a multiple mates are added.



We suggest cutting .005 then extrude a .0005 from the top face to create a 90° plane intersection to be used as the default mate reference.

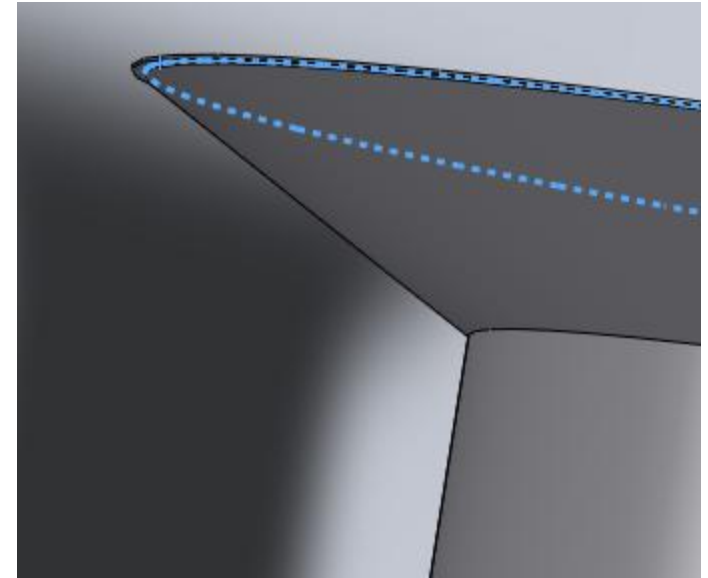
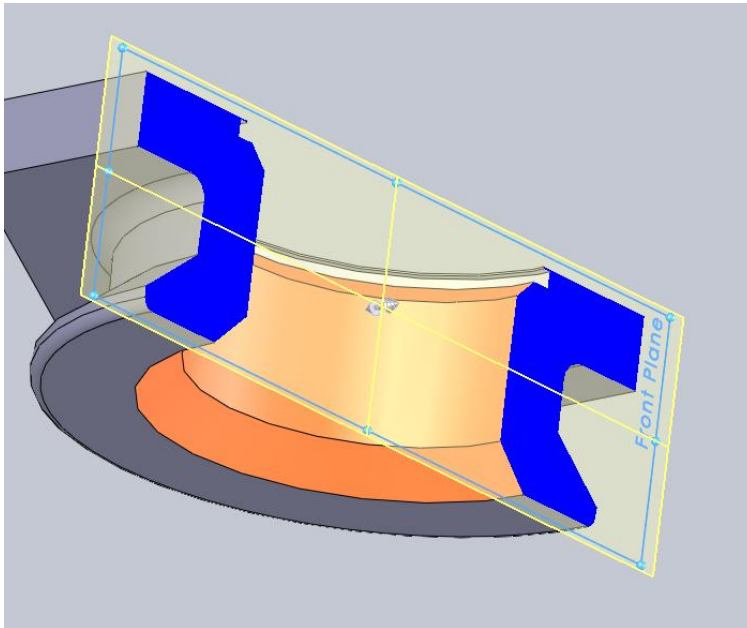
Hardware – Mate Reference



Now as you drag this part from your library it will snap into place every time.

Hardware – Mate Reference

When adding Mate References
Try and use just one line. This
line should intersect two
 90° faces. Less is more!

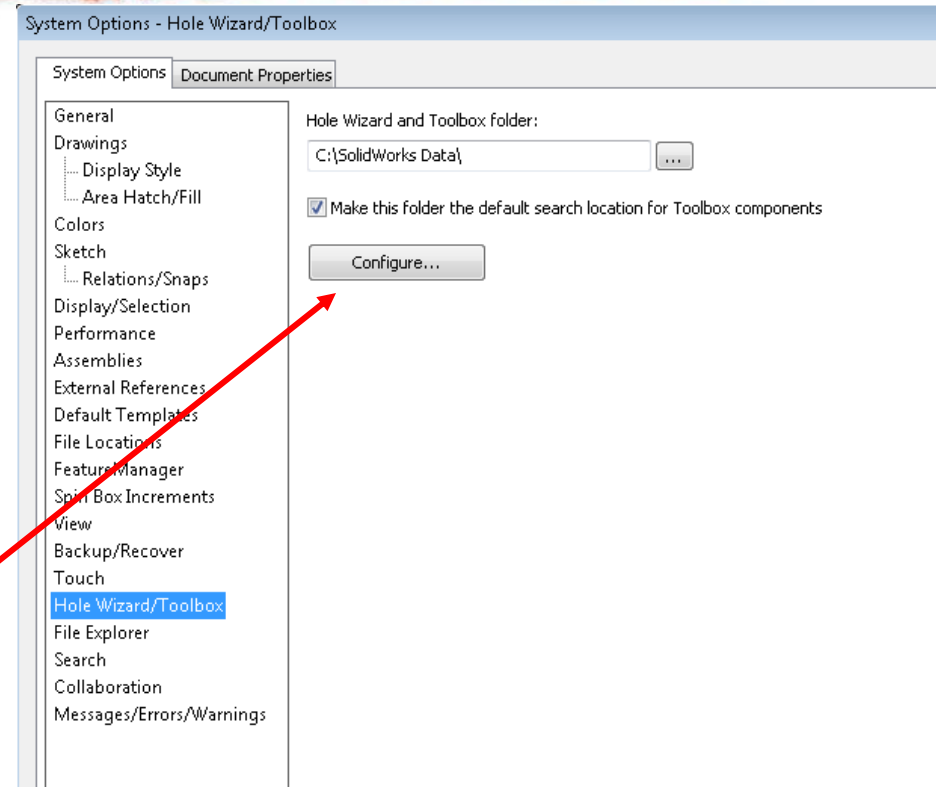


Modifying the Hole Wizard

Correcting Hardware hole sizes is the most common edit we need to make to customers models.

Step 1

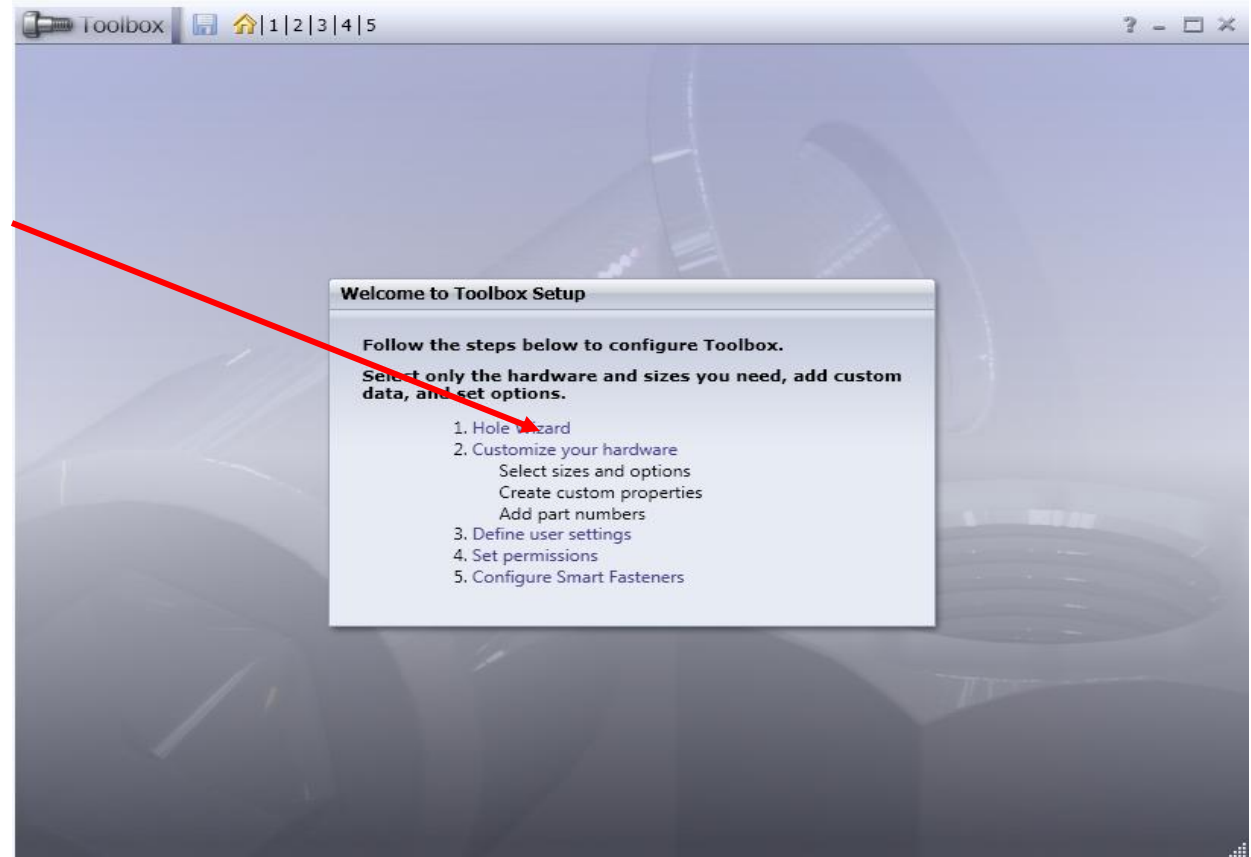
Select Configure



Modifying the Hole Wizard

Step 2

Select Hole Wizard

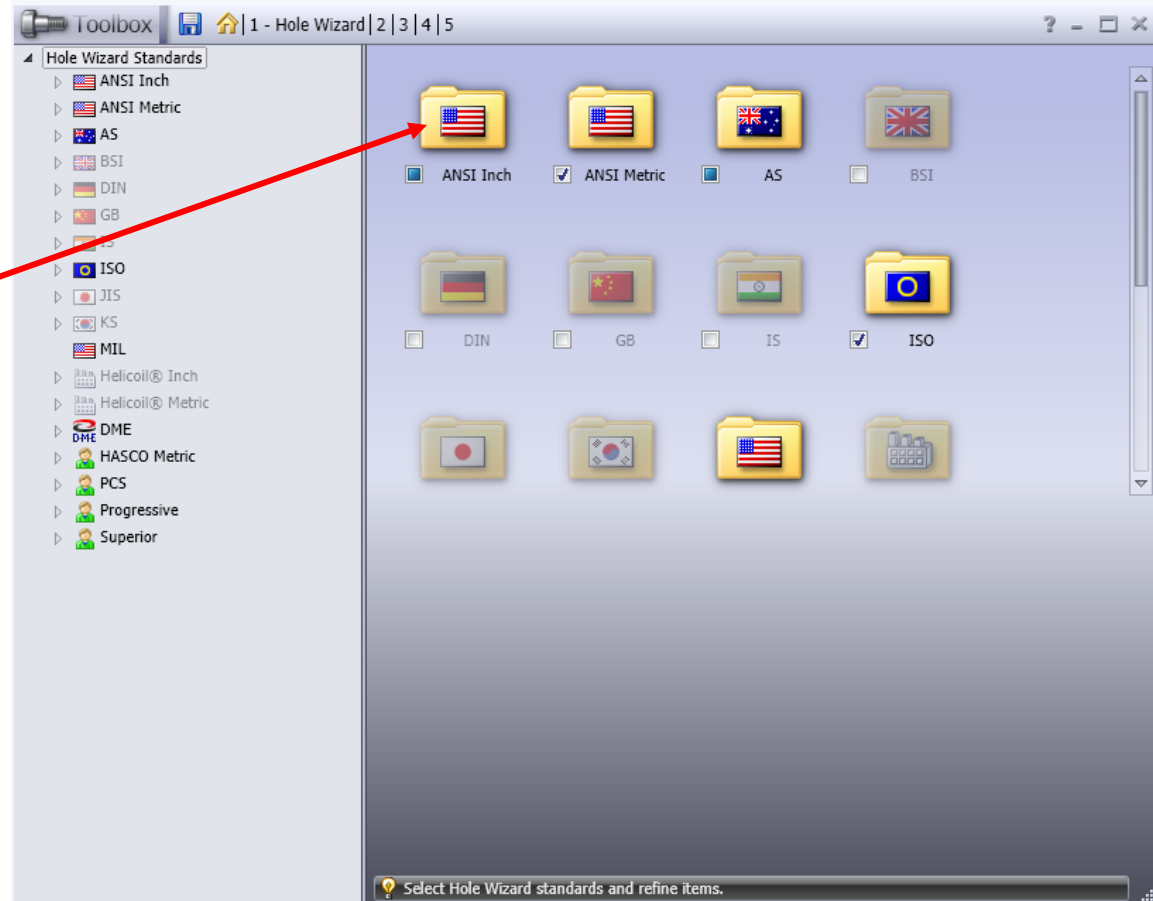


Modifying the Hole Wizard

Step 3

Select

ANSI INCH



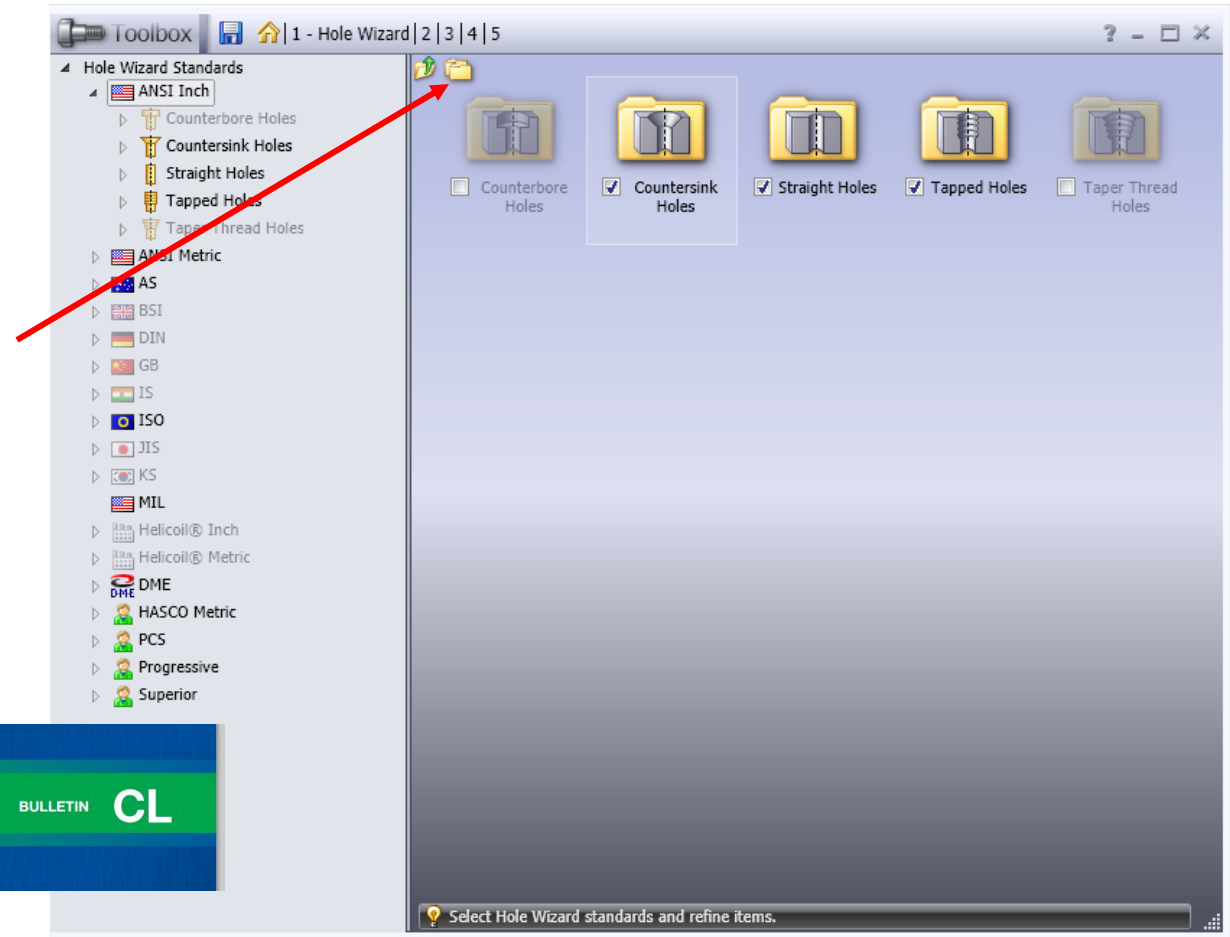
Modifying the Hole Wizard

Step 4

Press Copy

Enter New Name

(I used "Pem CL UNI")



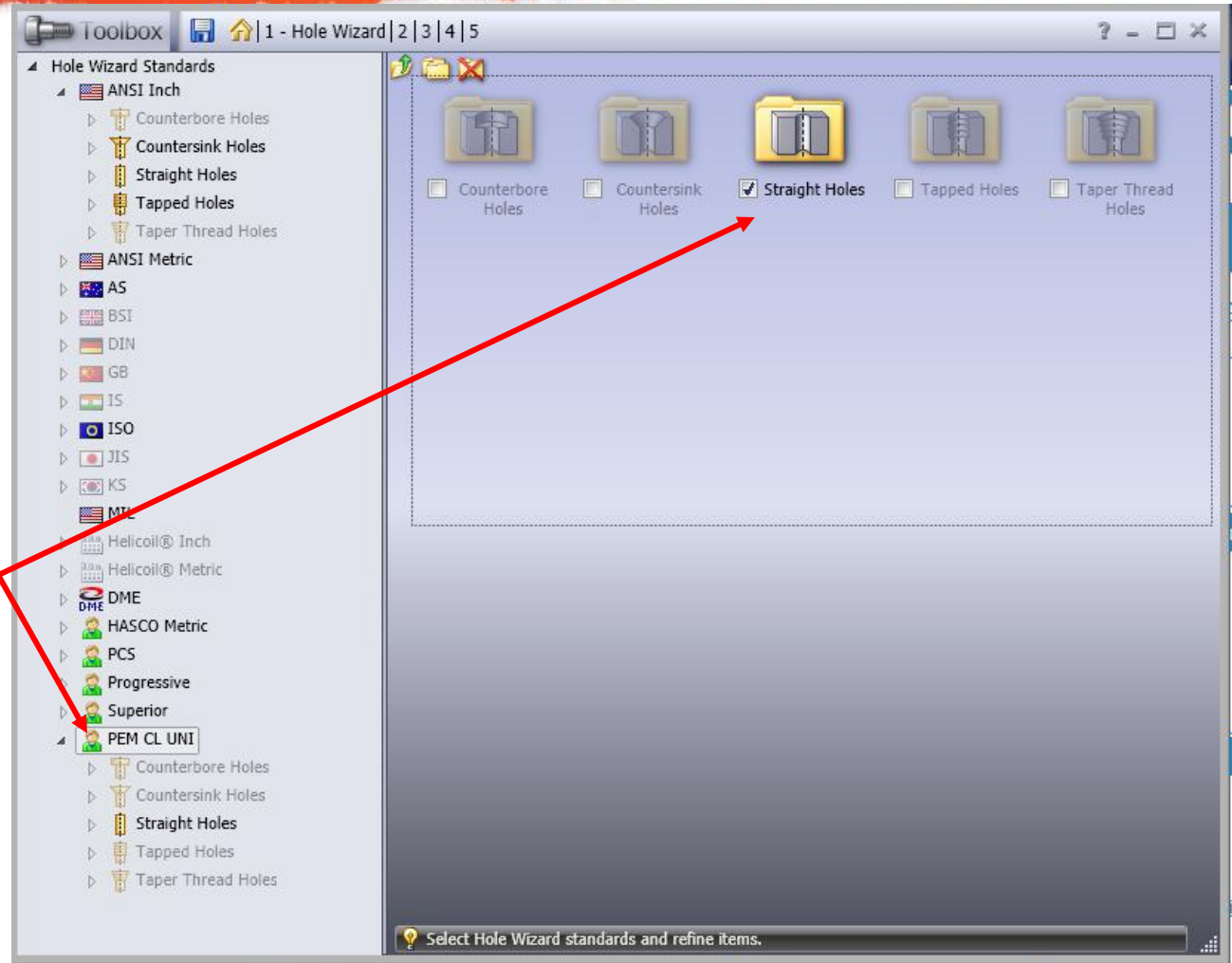
Modifying the Hole Wizard

Step 5

Choose

Step 6

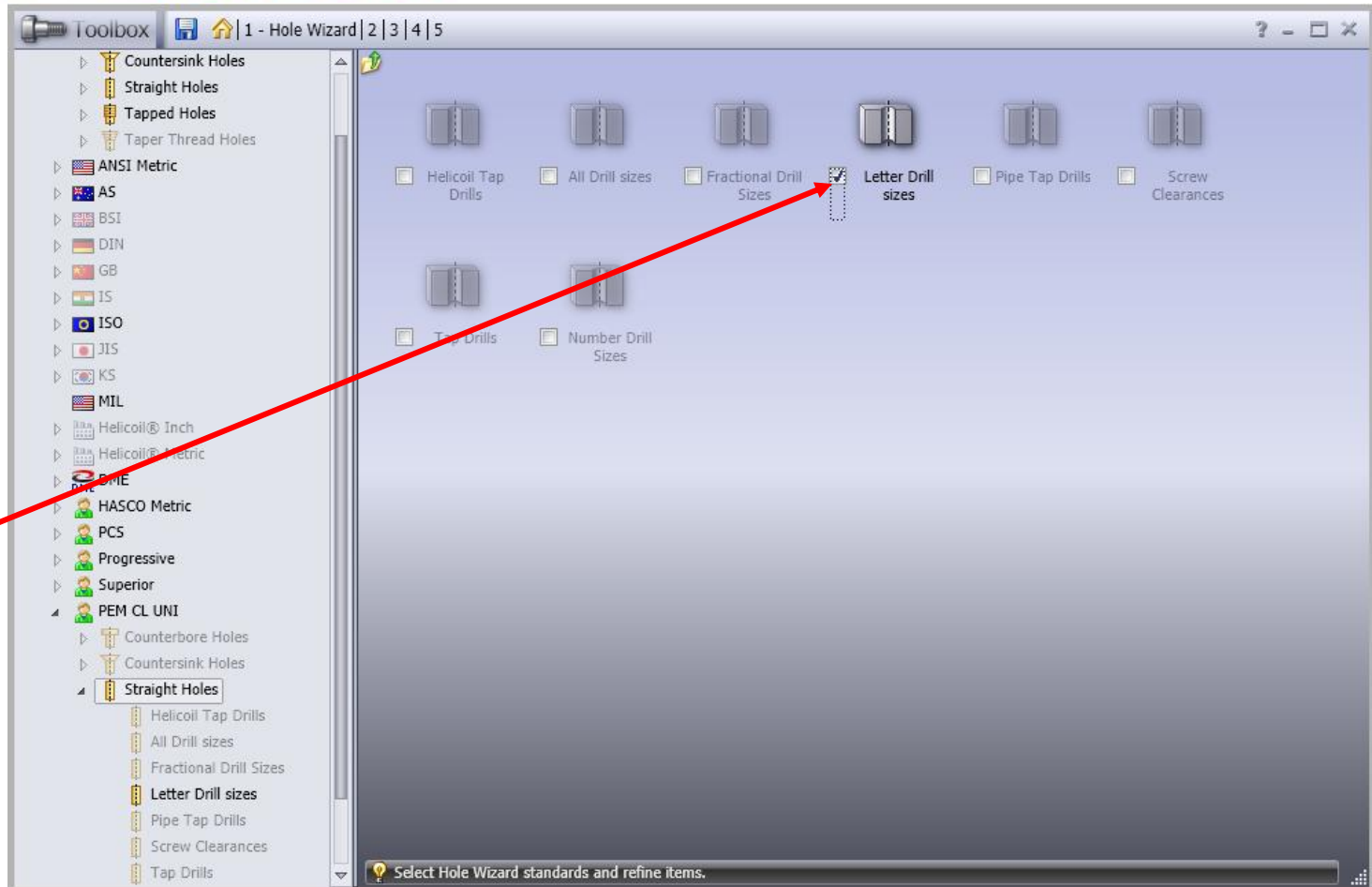
Uncheck everything but Straight Holes



Modifying the Hole Wizard

Step 7

Uncheck
Everything
But **Letter
Drill Holes**
Then
Select

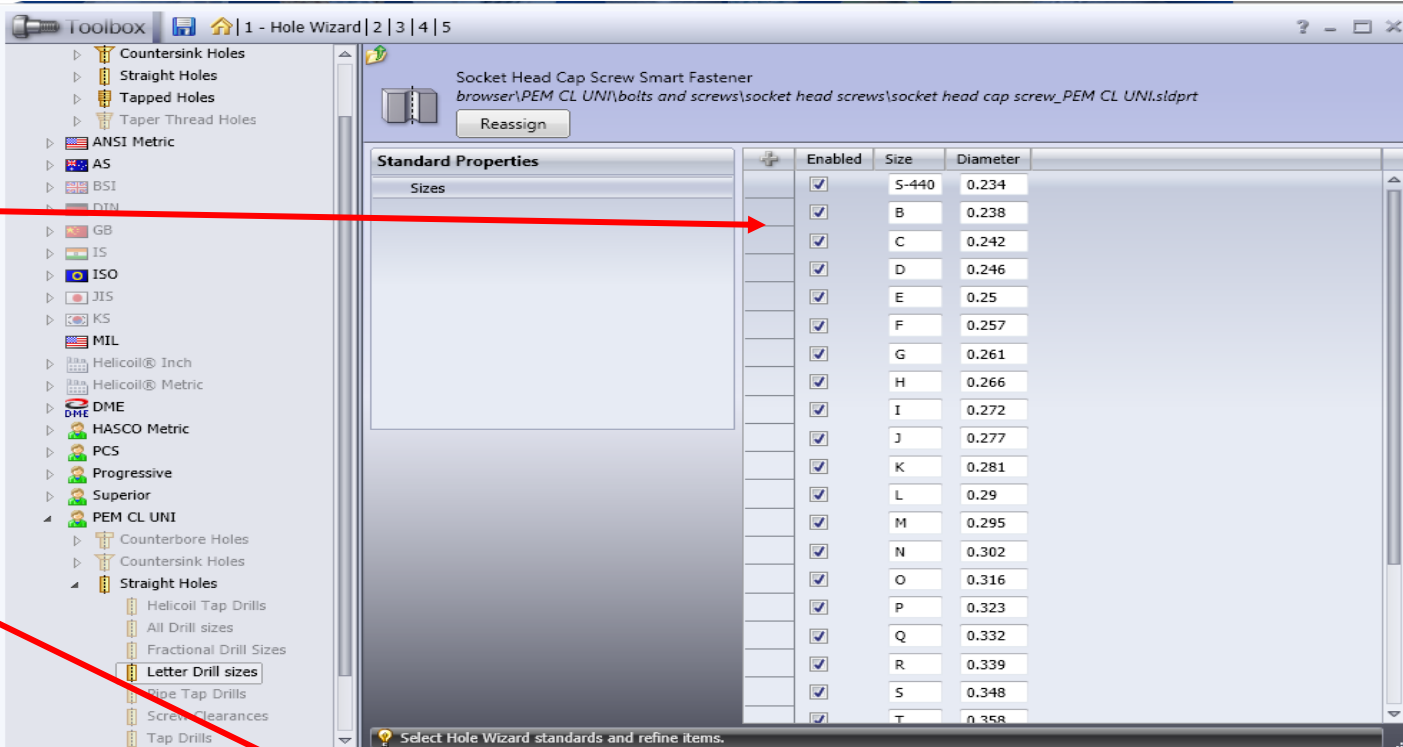


Modifying the Hole Wizard

Step 8
Now add
Your data

Get the data from
PEM & split the
tolerances.

Add .001



TYPES S, SS, CLS, CLSS, AN

All dimensions are in inches.

Thread Size	Type			Thread Code	Shank Code	A (Shank) Max.	Rec. Min. Sheet Thickness (1)	Hole Size In Sheet +.003 -.000	C Max.	E ±.010	T ±.010	Min. Dist. Hole To Edge (2)
	Fastener Material											
	Carbon Steel	Stainless Steel	Hardened Stainless Steel									
.086-56 (#2-56)	S	CLS	NA	256	0	.030	.030	.166	.165	.250	.070	.19
					1	.038	.040					
					2	.054	.056					
					0	.030	.030					
.099-48 (#3-48)	S	CLS	NA	348	1	.038	.040	.166	.165	.250	.070	.19
					2	.054	.056					
					0	.030	.030					
					0	.030	.030					



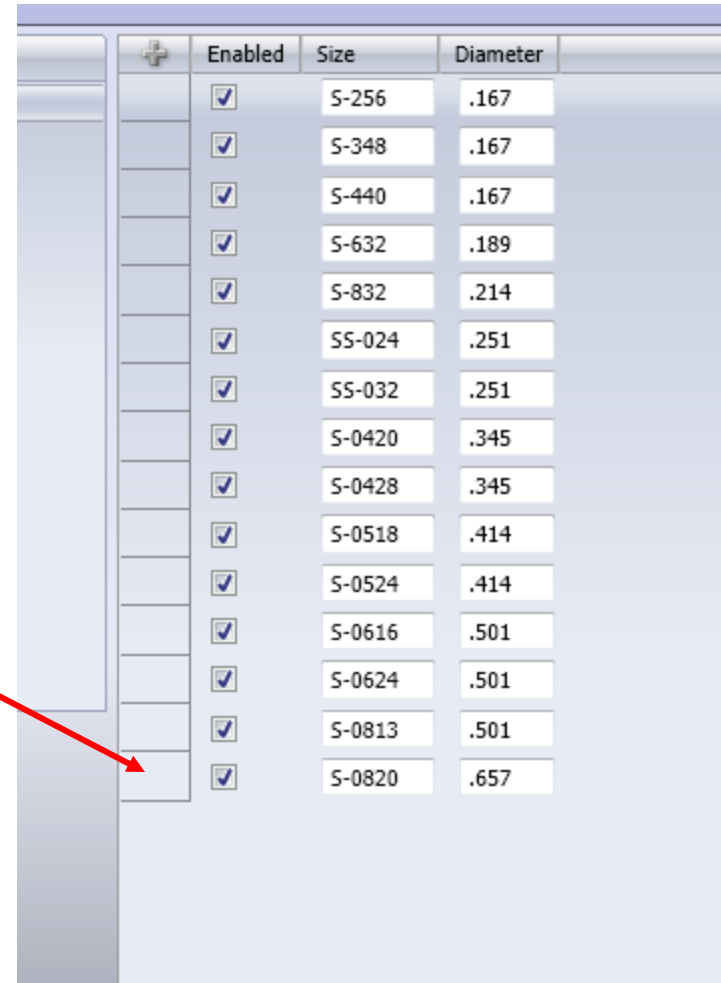
This is a way to modify your hole wizard which is ADVANCED and done at your own risk

Modifying the Hole Wizard

Step 9

By mouse selecting the Row you can press the delete key to remove extra rows

Get the data from PEM

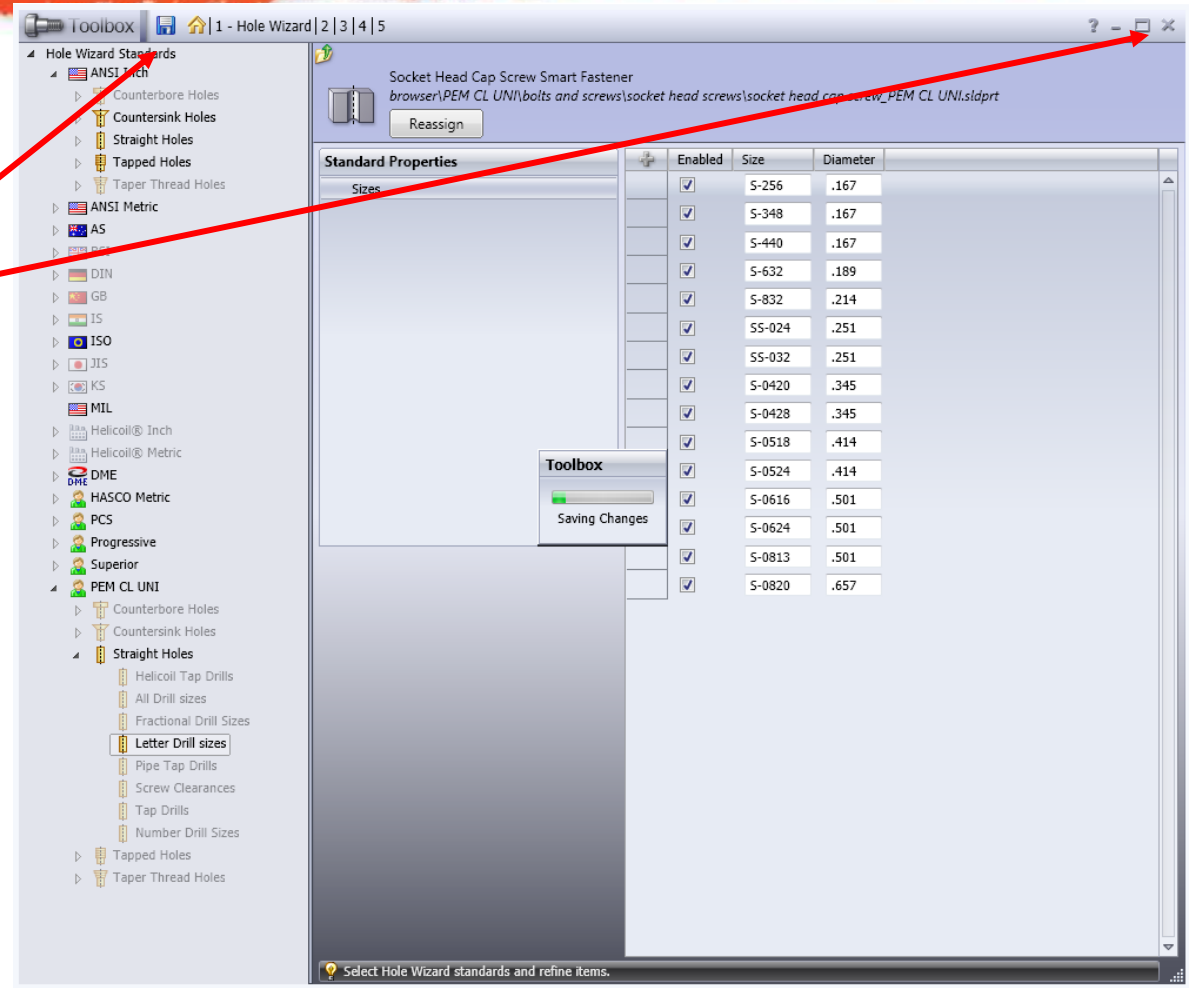


+	Enabled	Size	Diameter
<input checked="" type="checkbox"/>		S-256	.167
<input checked="" type="checkbox"/>		S-348	.167
<input checked="" type="checkbox"/>		S-440	.167
<input checked="" type="checkbox"/>		S-632	.189
<input checked="" type="checkbox"/>		S-832	.214
<input checked="" type="checkbox"/>		SS-024	.251
<input checked="" type="checkbox"/>		SS-032	.251
<input checked="" type="checkbox"/>		S-0420	.345
<input checked="" type="checkbox"/>		S-0428	.345
<input checked="" type="checkbox"/>		S-0518	.414
<input checked="" type="checkbox"/>		S-0524	.414
<input checked="" type="checkbox"/>		S-0616	.501
<input checked="" type="checkbox"/>		S-0624	.501
<input checked="" type="checkbox"/>		S-0813	.501
<input checked="" type="checkbox"/>		S-0820	.657

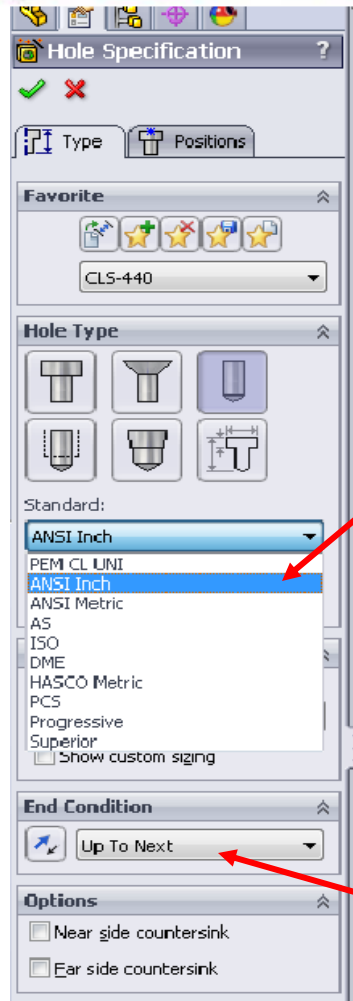
Modifying the Hole Wizard

Step 10

Save and close



Modifying the Hole Wizard



Step 11

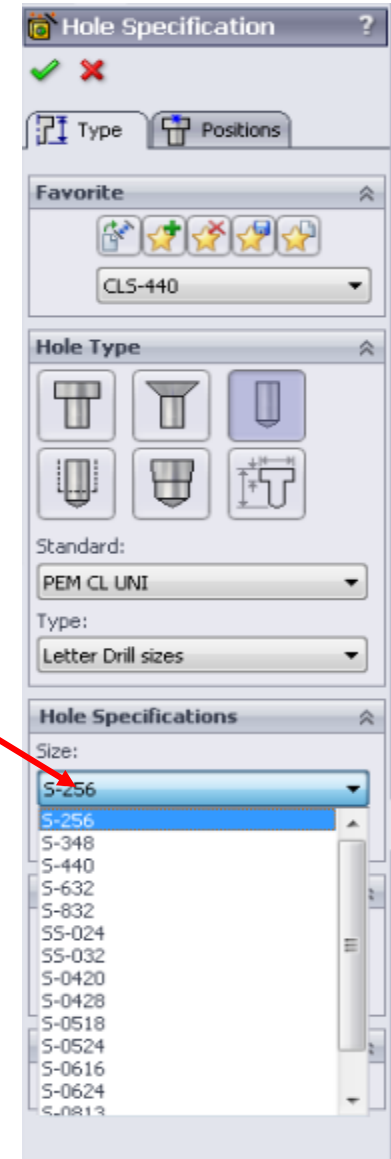
Add Hole wizard
to a part Select

“PEM CL UNI”

Step 12

Choose your
Hardware

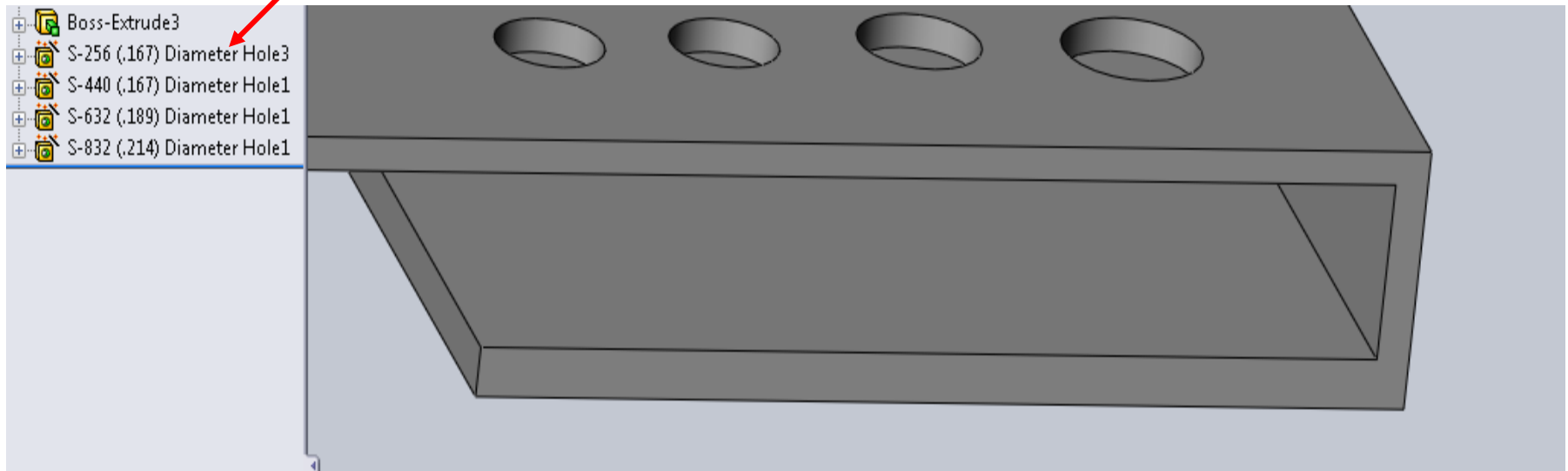
*For sheet metal
use up to next*



Modifying the Hole Wizard

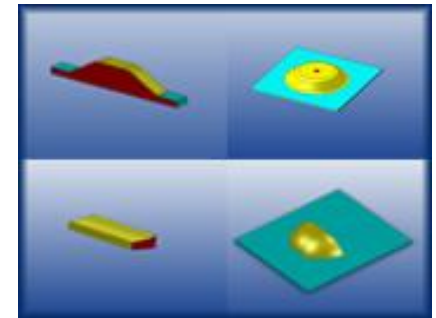
Step 12

Enjoy the benefits of A clean nice looking tree



Why use a form tool from the Rapid Tooling Library?

- Save Time!
- Save Money!



www.rapidsheetmetal.com/tooling

Rapid Sheet Metal online Form Tools

SOLIDWORKS
NESWUC 2012

Step 1 www.rapidsheetmetal.com

Step 2 Click Rapid tooling library

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Rapid Sheet Metal Inc is the sheet metal equivalent of a SLA service bureau. Fast. Quoting and fabricating precision sheet metal to your 3D CAD data (**no drawings required**). Quick. Simple brackets and covers to complex enclosures and housings. Quoted in hours, not days. Shipped in days, not weeks. Plated, Painted, Powder Coated, and/ or Silkscreened to your specs. Prototype Sheet Metal on Fast Forward.

Bottom line, Rapid Sheet Metal Inc understands you need high quality, precision metal fabrications fast, no excuses. In business since 2001, with over 80 employees, 2 high powered lasers and a 25,000 square foot facility, we always have the capacity to turn your sheet metal fabrication rapidly.

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Chat With a Rapid Project Engineer

What Our Customers Say
the speed in which you got those to our door, and we were

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SolidWorks Tooling Features

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Questions? Contact one of our engineers.

- Tutorial Video**
Latest Update: 5/1/2012
- Bridge Lances / Card Cages**
Latest Update: 5/1/2012
- Embossments**
Latest Update: 5/1/2012
- Louvers**
Latest Update: 5/1/2012
- Lance & Forms**
Latest Update: 5/1/2012
- Form Tools**
Latest Update: 9/19/2012
- STEP File Package**
Latest Update: 9/19/2012
- SolidWorks Package**
Latest Update: 9/19/2012

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What Our Customers Say
You should change your name to ExceedYourExpectations SheetMetal. Yes it was fast, but the quality and craftsmanship were far better than I expected. Everyone in your organization is professional and wonderful to work with.
President

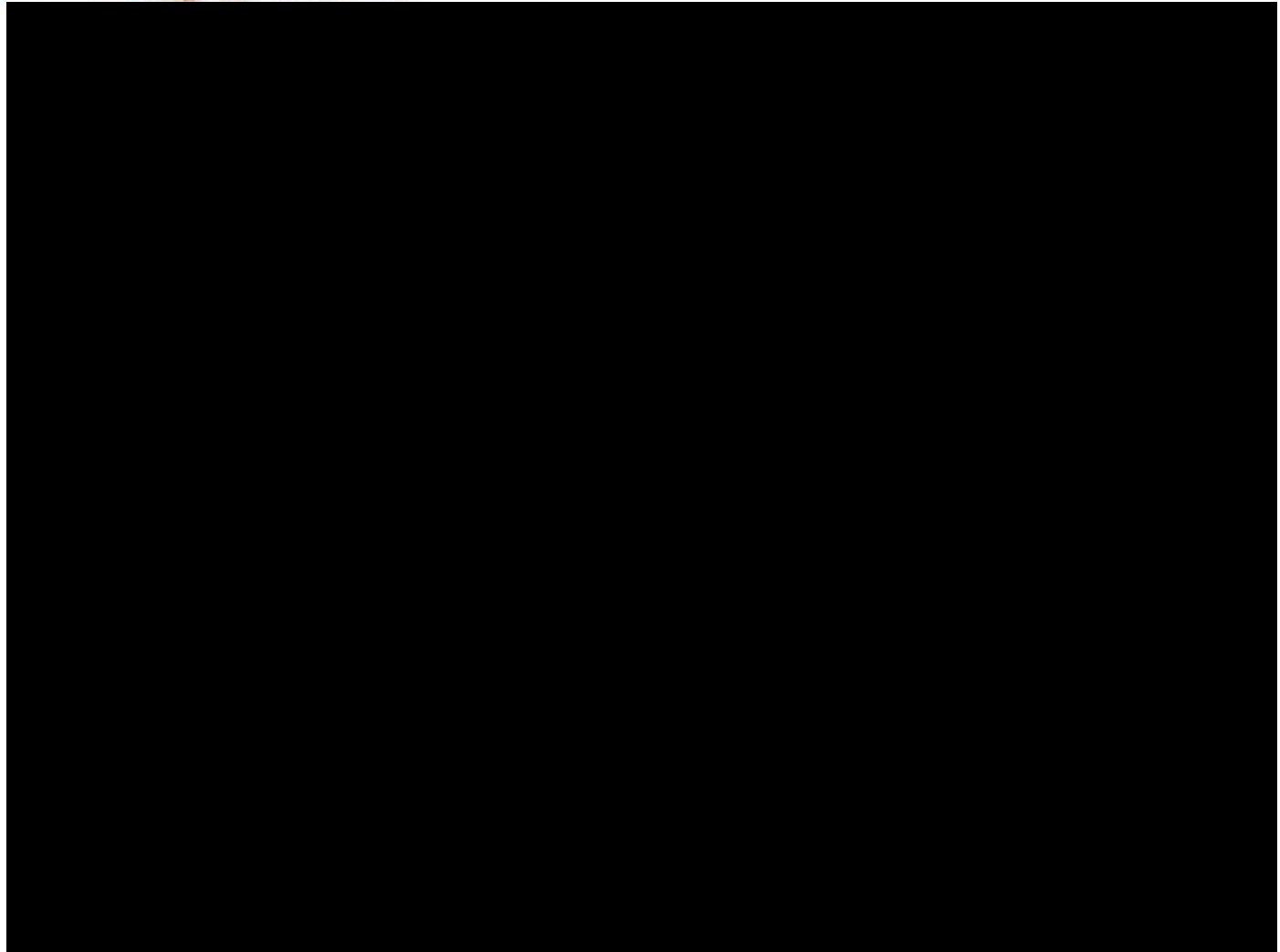
Refer a Friend

Step 3

Choose a
file

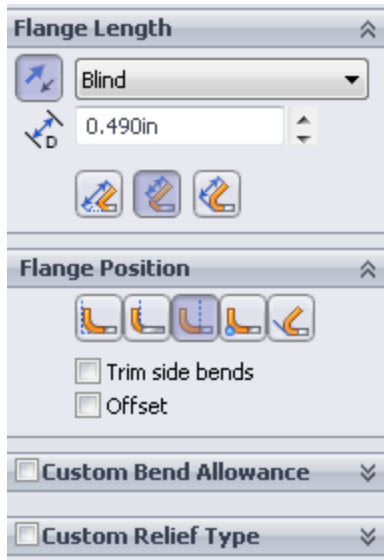
Step 4

Download
and drag
onto a sheet
metal part



Setting I wish could be set as default

NESWUC 2012

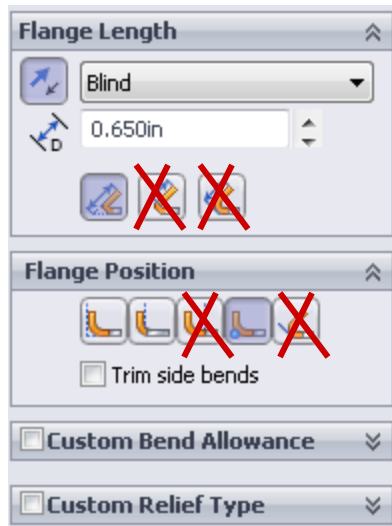


Problem: We have noticed the flange Length settings tend to be set as shown.

These settings prevent changing the inside bend radii without modifying the dimensions of the part.

Setting I wish could be set as default

NESWUC 2012



Solution: As long as only the settings shown are used. This will allow changing the inside bend radii without modifying the dimensions of the part.

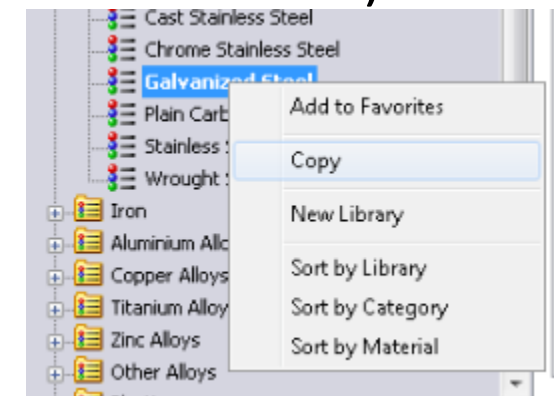
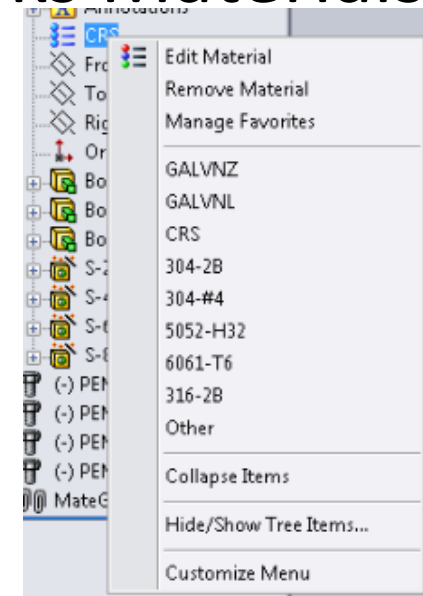
Show demonstration

Sheet Metal Material List

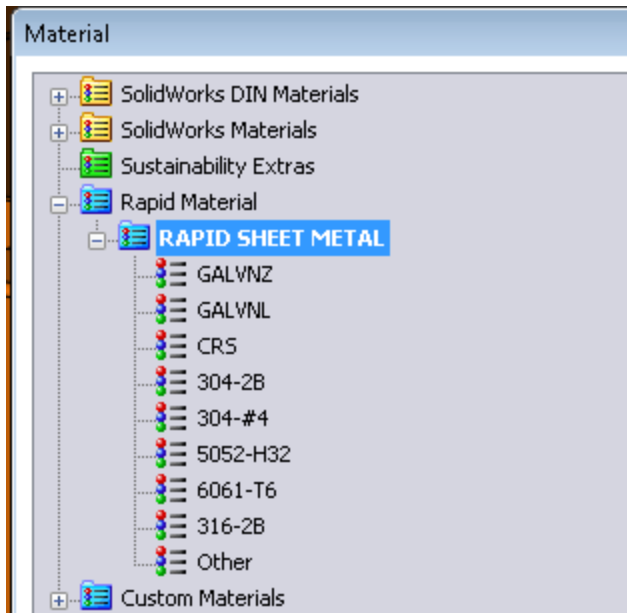
You can build this list from SolidWorks Materials

- AISI 304
- AISI 316
- 5052-H32
- 6061-T6
- Galvanized Steel
- Galvaneal (Not on the list Copy Galvanized Steel and rename)
- Plain Carbon Steel (1008 is not on the list)

Material	Category
GALVNZ	RAPID SHEET METAL
GALVNL	RAPID SHEET METAL
CRS	RAPID SHEET METAL
304-2B	RAPID SHEET METAL
304-#4	RAPID SHEET METAL
5052-H32	RAPID SHEET METAL
6061-T6	RAPID SHEET METAL
316-2B	RAPID SHEET METAL
Other	RAPID SHEET METAL



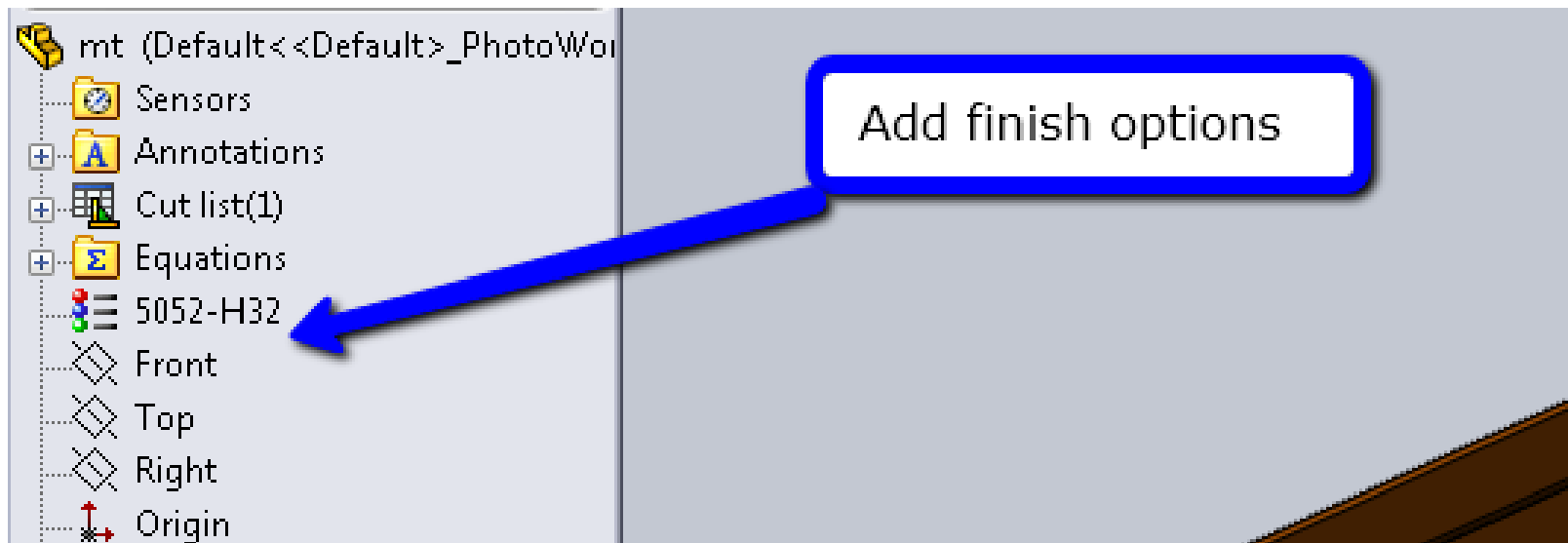
Setting I wish could be set as default

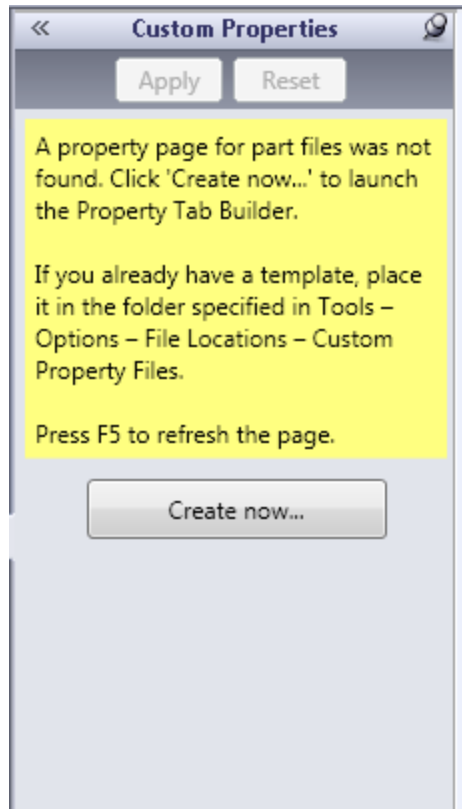


Please add these to your material list. This is an fast easy way to set your material type

Setting I wish could be set as default

SolidWorks... Why can't you add finish options directly to the model tree. This would be the best way to link to the drawings



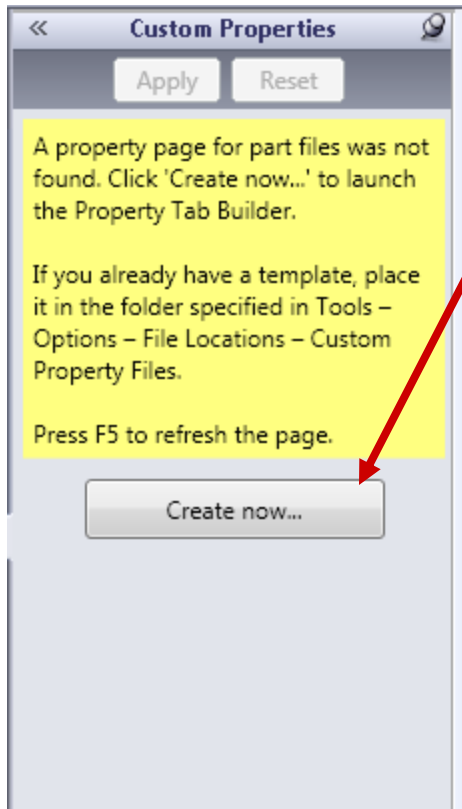


Problem: Adding finish and other information to parts require making prints. When making prints you have to type in and remember special plating codes and finishes.

We suggest using the custom properties tab to add, view, and store this information.

Custom Properties –

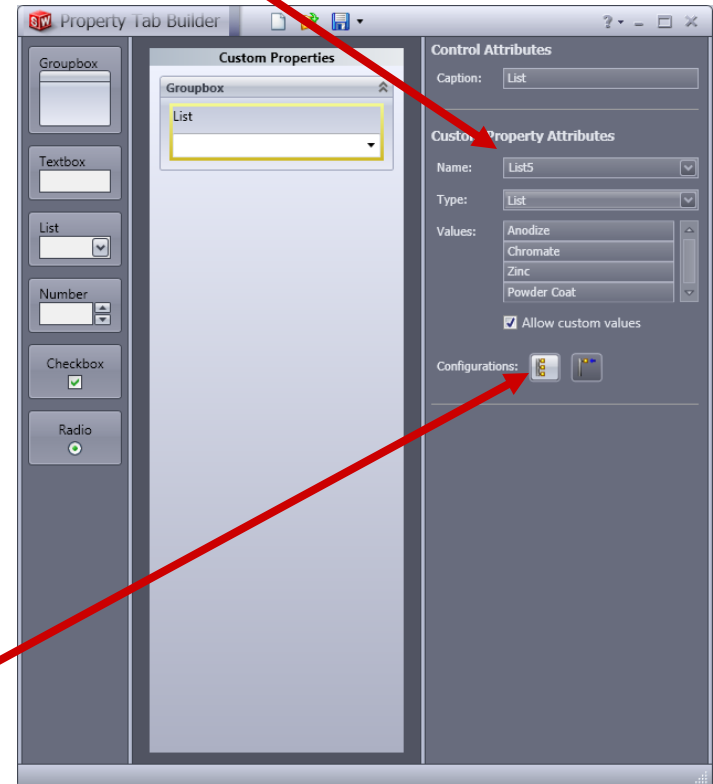
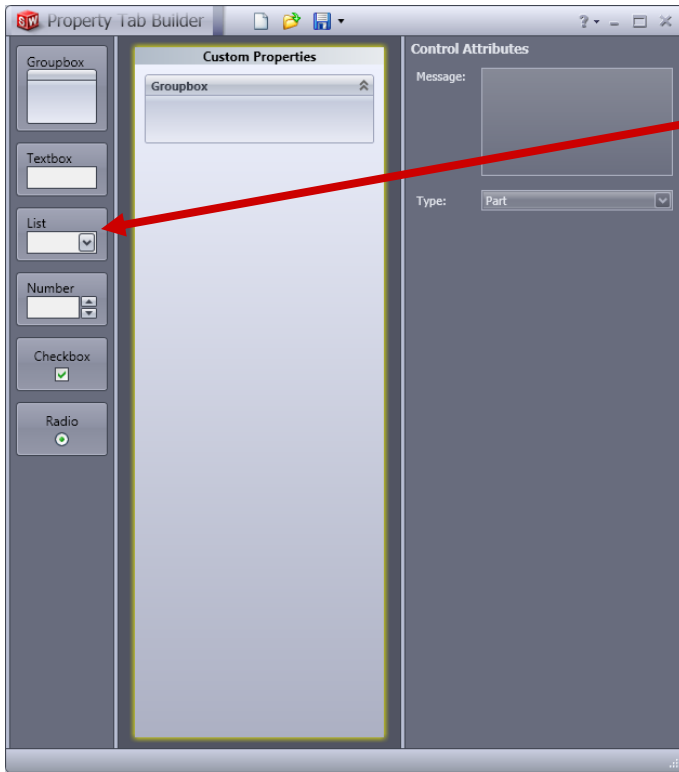
Step 1 Click “Create Now..”



Custom Properties –

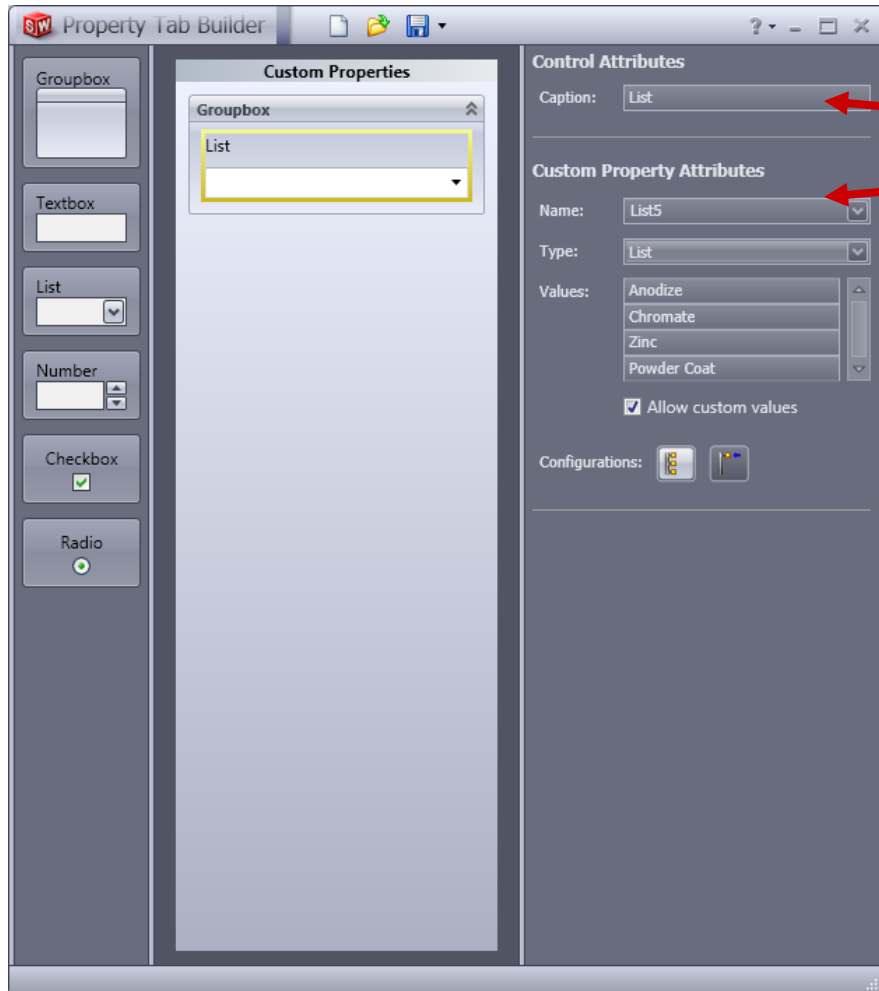
Step 2 Click “List”

Step 3 Add your values



Step 4 Set to Custom Tab

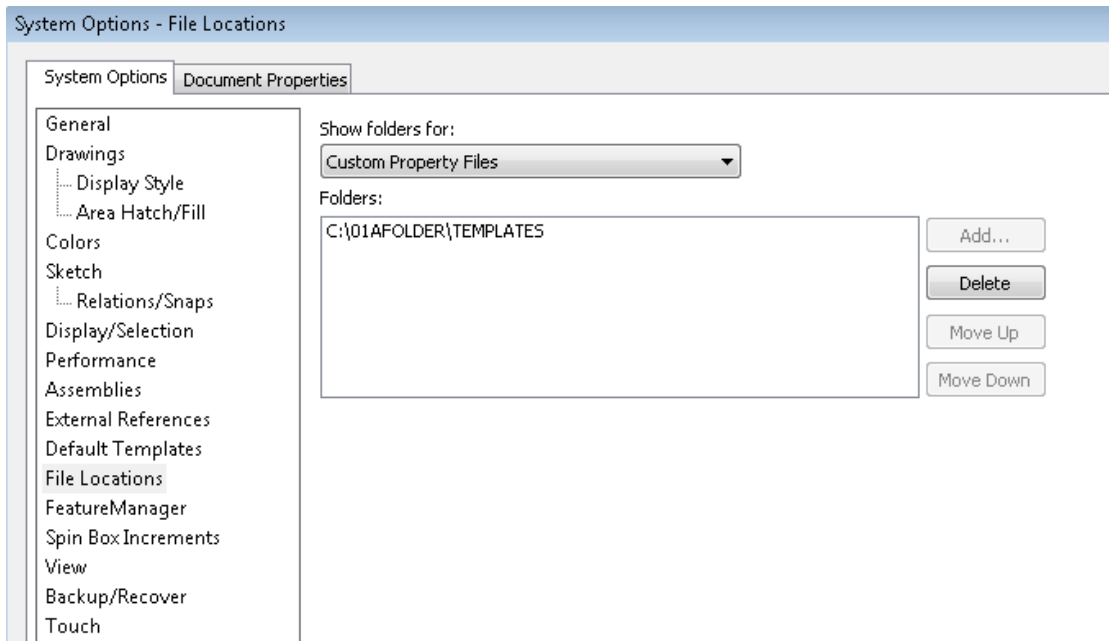
Custom Properties –



Step 5 Change These to
“Finish”

Step 6 Save to a place you
will reference in step 7

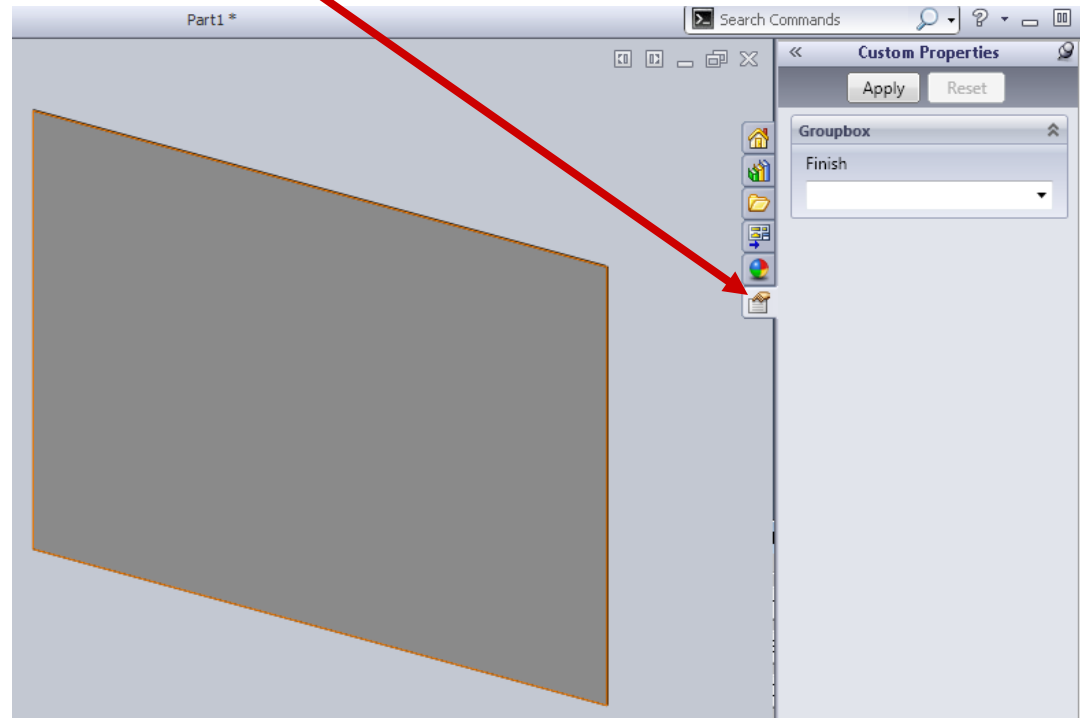
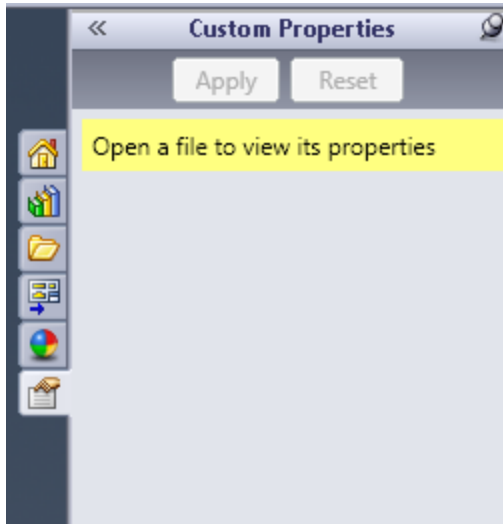
Custom Properties –



Step 7 add the folder you just saved to “Custom Property Files”

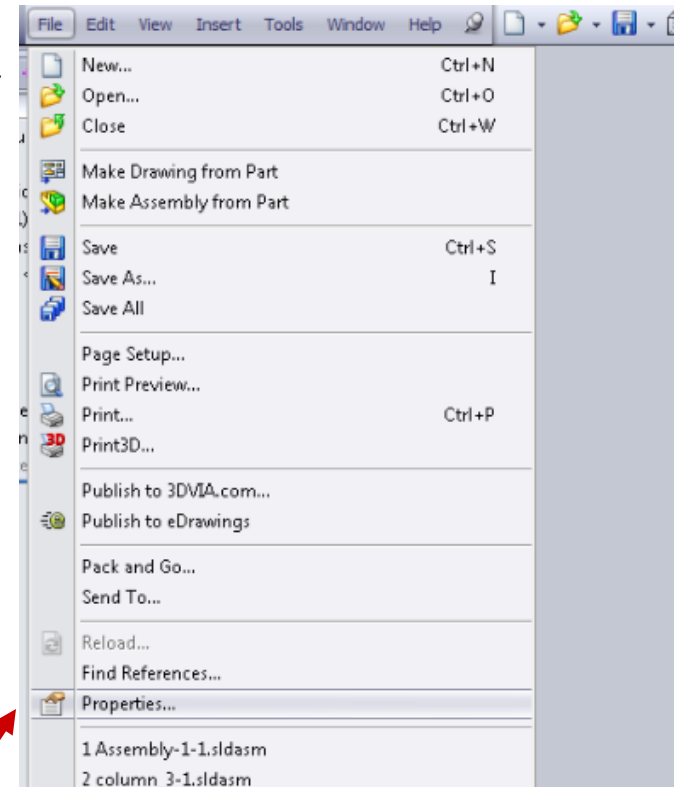
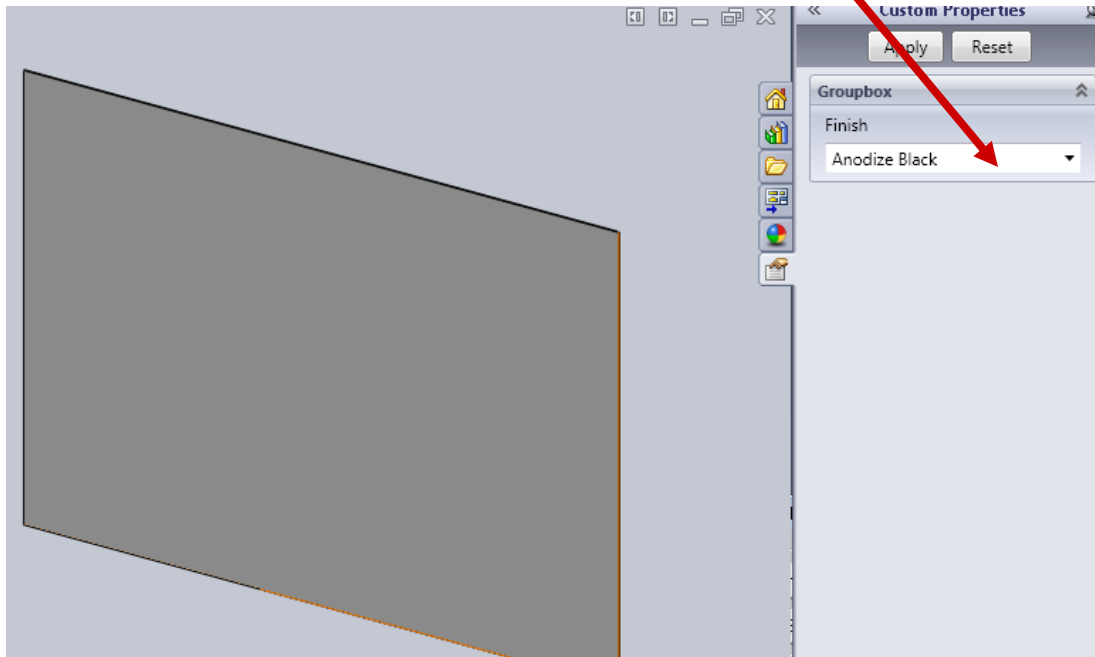
Custom Properties –

Open a part and click



Custom Properties –

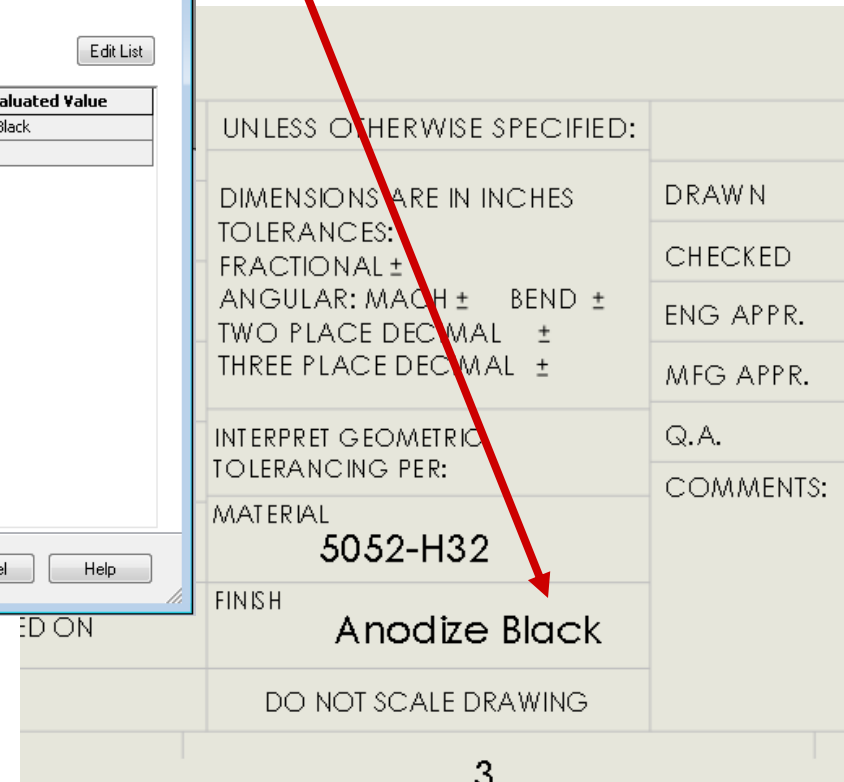
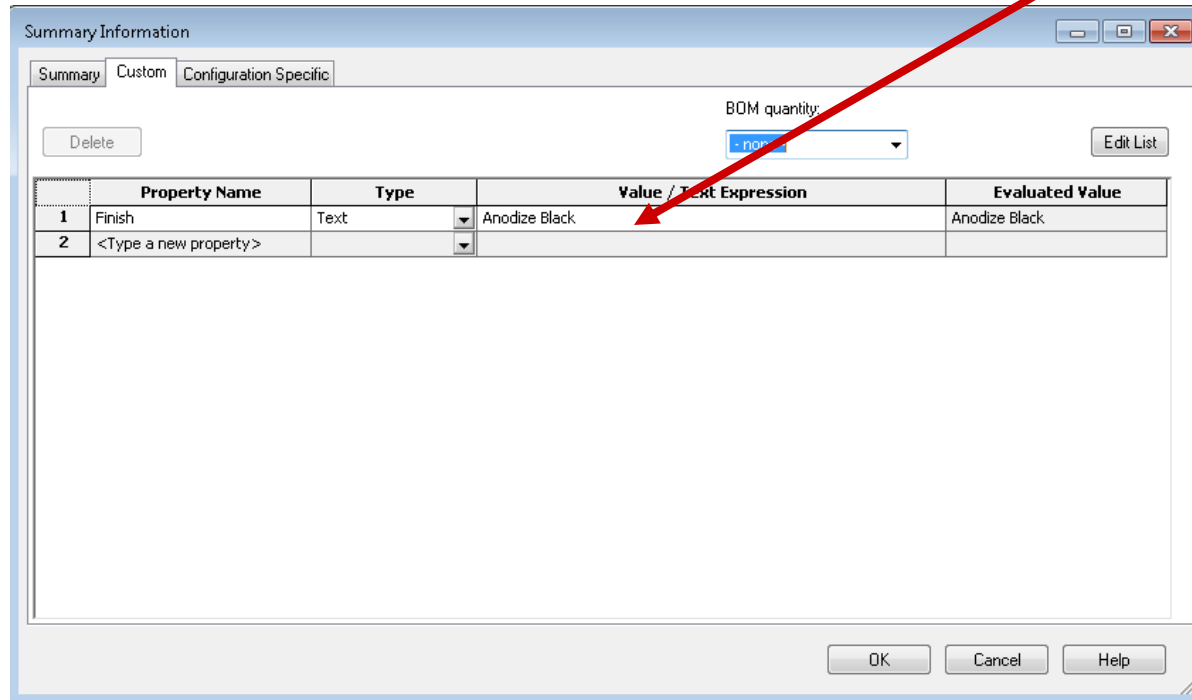
Now set your finish value and apply



This is now added to your part properties

Custom Properties –

This is saved to your part. It is also linked to your print if you are using a standard SolidWorks layout

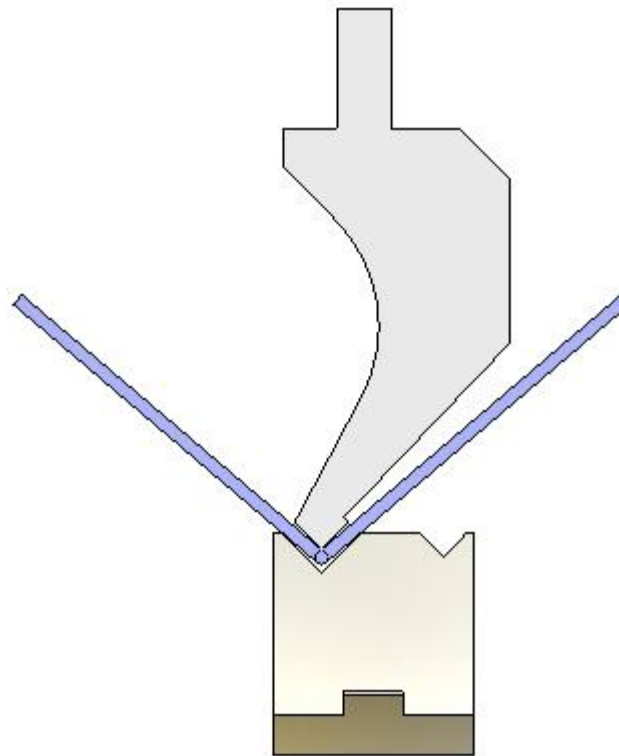


Please use Rapid Sheet Metal's web site for plating specifications <http://www.rapidsheetmetal.com/resources>

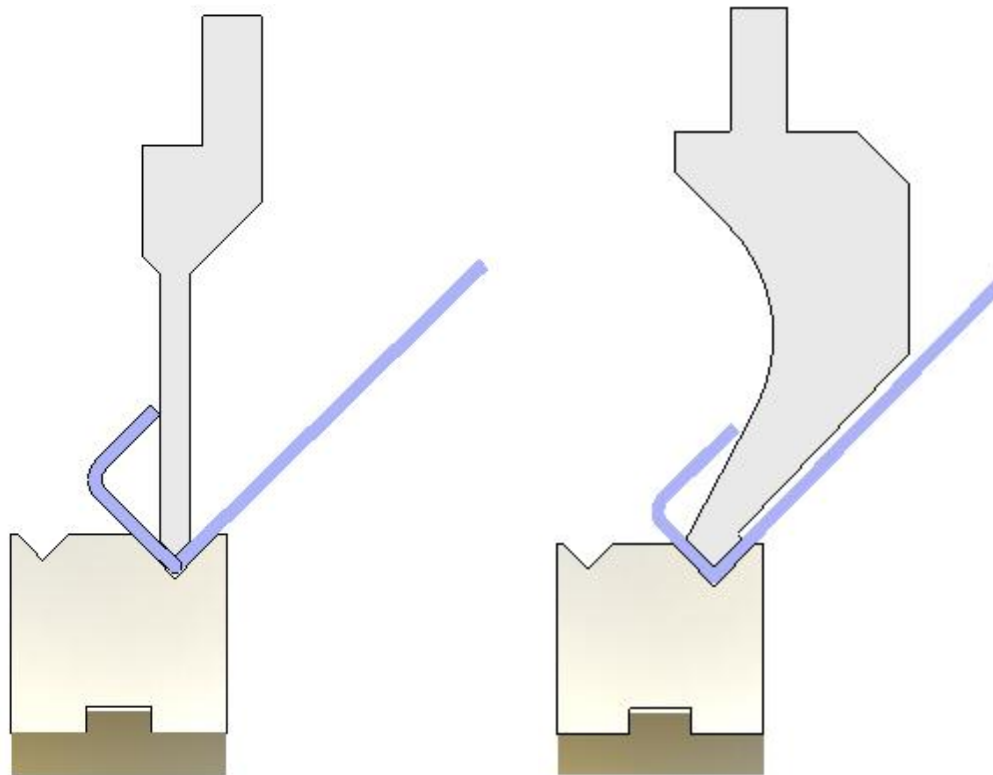
Plating

Plating	Type	Description	Class
Anodize			
MIL-A-8625	Type II	Sulphuric Acid Electrolyte Standard	Class I - Non Dyed Natural or Clear Class II - Dyed Specify Color: Black, Blue, Red etc.
MIL-A-8625	Type III	Hard Coat Specialty	Class I - Non Dyed Natural or Clear Class II - Dyed Specify Color: Black, Blue, Red etc.

- Standard tooling saves money.
- Short flanges can be expensive.

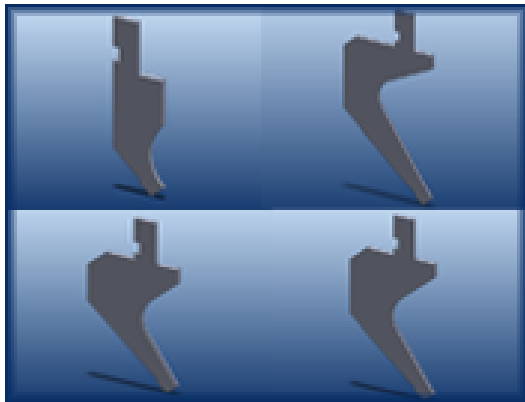


- Badly designed return flanges crash into the tooling

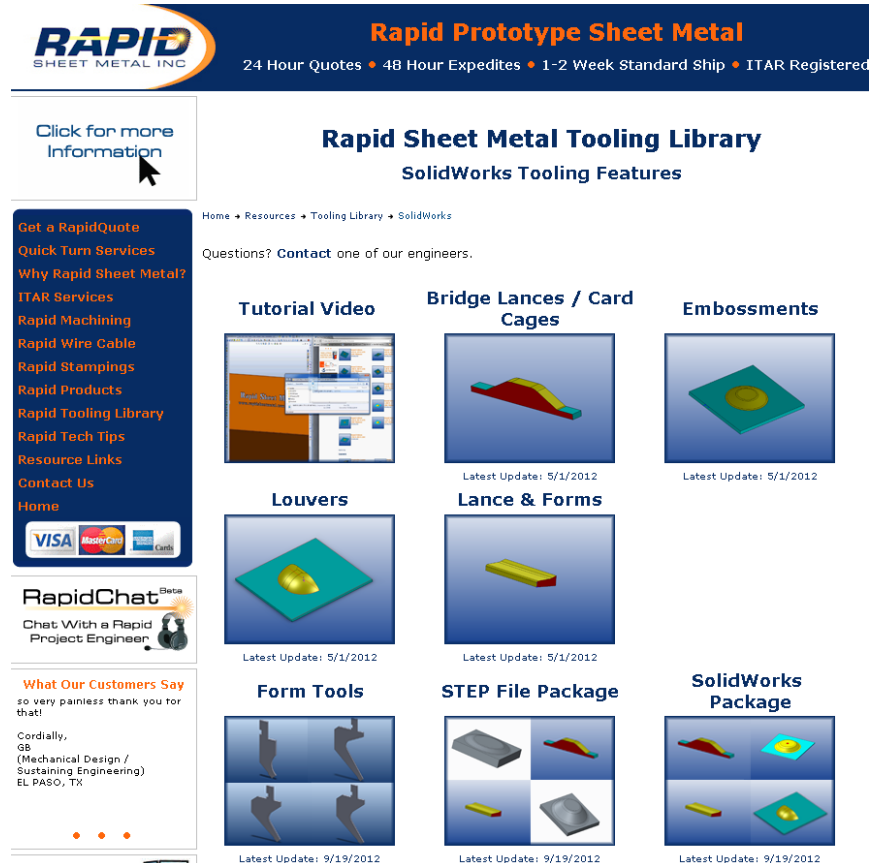


Rapid Sheet Metal's 3D Online Tooling Library Has Forming Tools!

Form Tools



Latest Update: 9/19/2012



RAPID SHEET METAL INC
Rapid Prototype Sheet Metal
24 Hour Quotes • 48 Hour Expedites • 1-2 Week Standard Ship • ITAR Registered

Click for more Information

Rapid Sheet Metal Tooling Library

SolidWorks Tooling Features

Home • Resources • Tooling Library • SolidWorks

Questions? Contact one of our engineers.

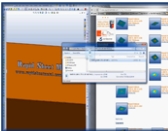
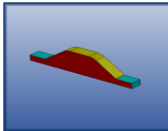
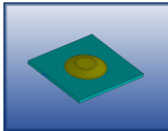
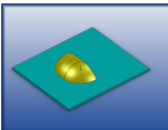
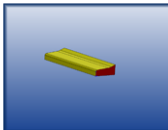

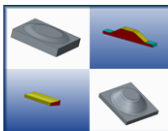
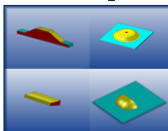
- Get a RapidQuote
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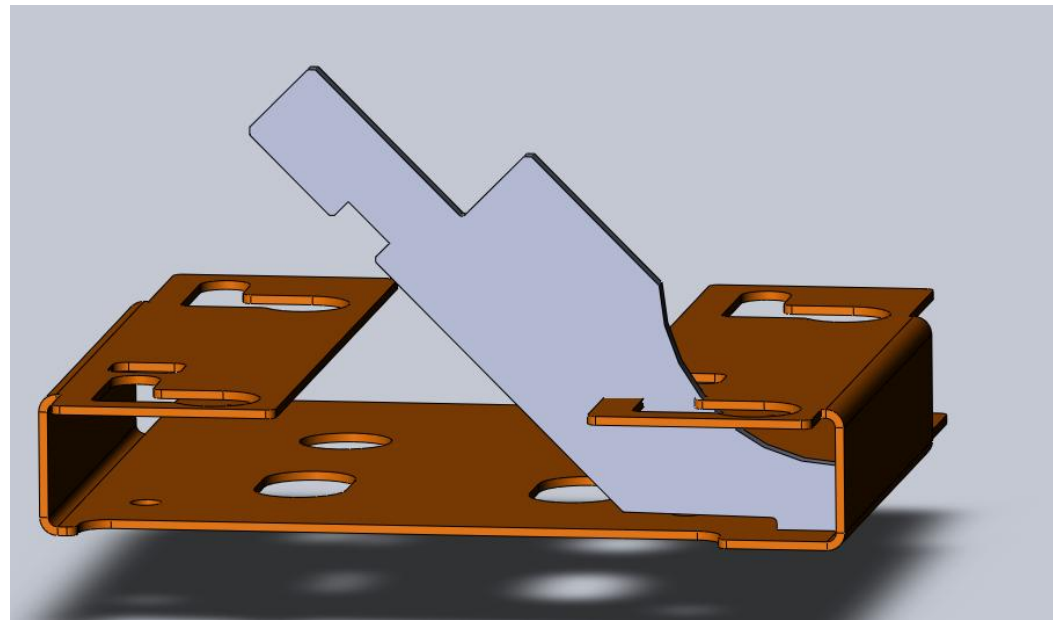
RapidChat^{Beta}
Chat With a Rapid Project Engineer

What Our Customers Say
so very painless thank you for that!

Cordially,
GB
(Mechanical Design / Sustaining Engineering)
EL PASO, TX

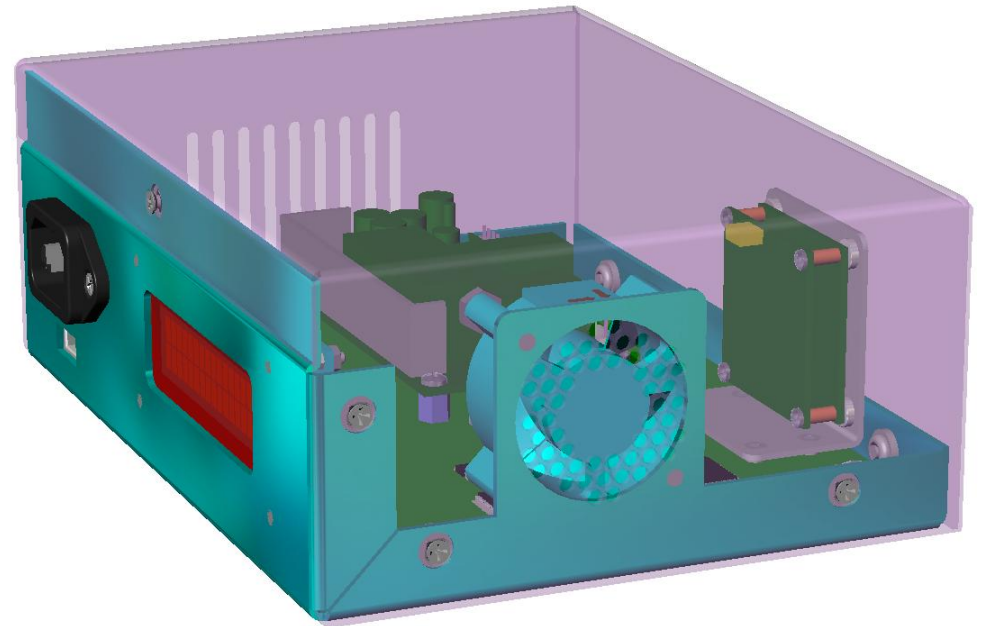
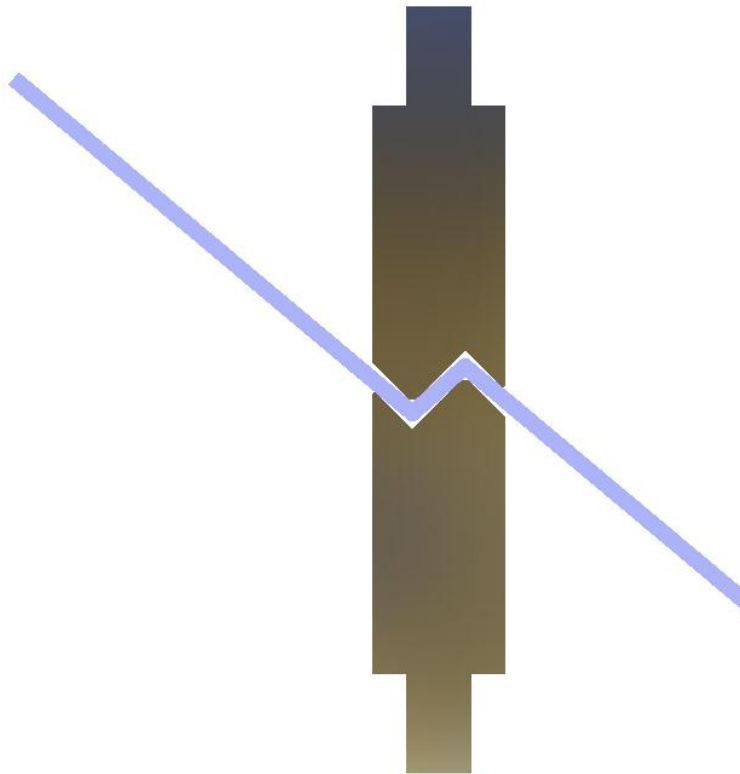
Tutorial Video  Latest Update: 5/1/2012	Bridge Lances / Card Cages  Latest Update: 5/1/2012	Embossments  Latest Update: 5/1/2012
Louvers  Latest Update: 5/1/2012	Lance & Forms  Latest Update: 5/1/2012	
Form Tools  Latest Update: 9/19/2012	STEP File Package  Latest Update: 9/19/2012	SolidWorks Package  Latest Update: 9/19/2012

After downloading the punch tooling add a punch tool to your assembly. This will show how much room you will have.



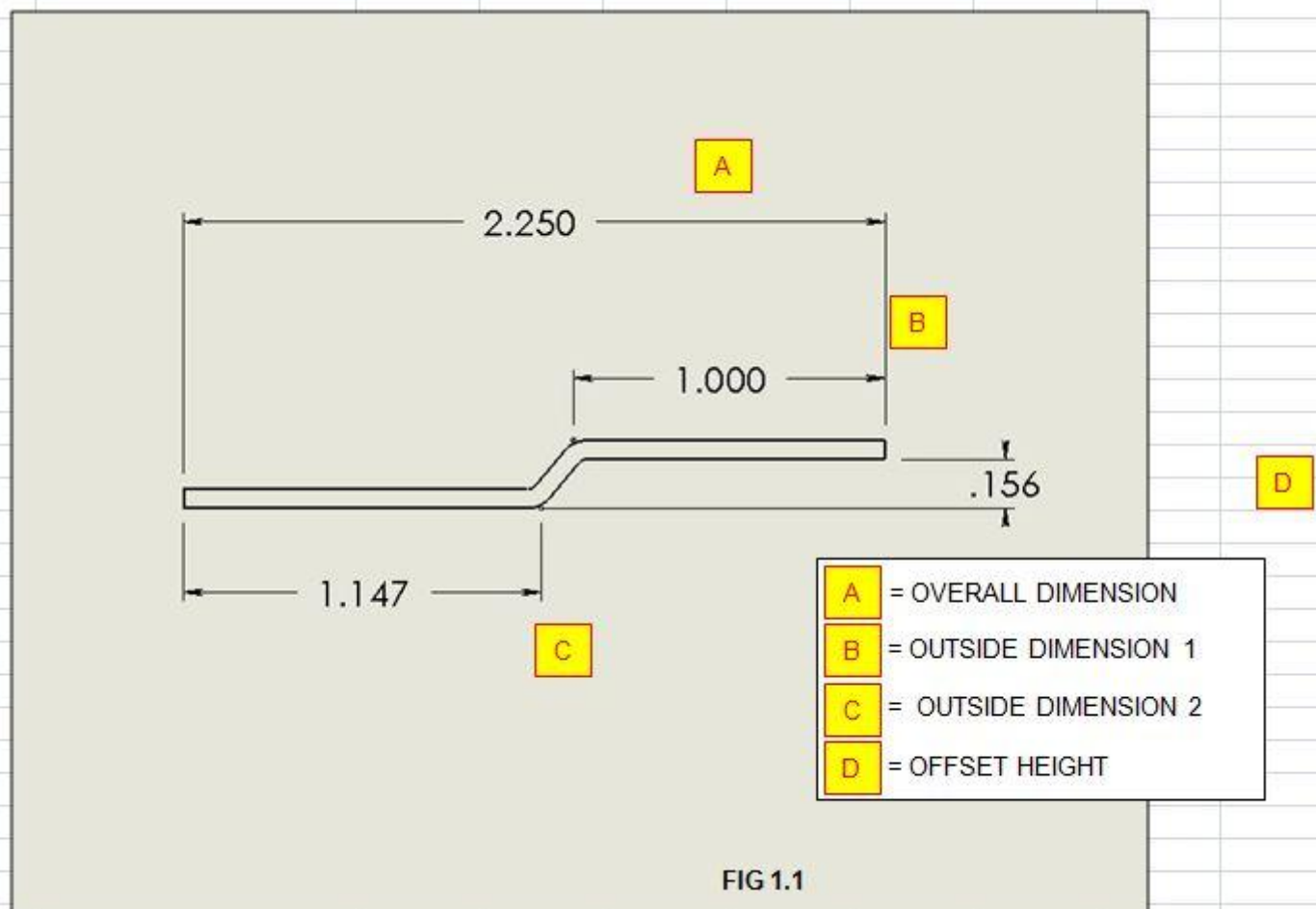
Forming tools

- Jogs are useful for stiffening and creating flush mounted overlapping surfaces.



- How to measure Offset – (JOG)

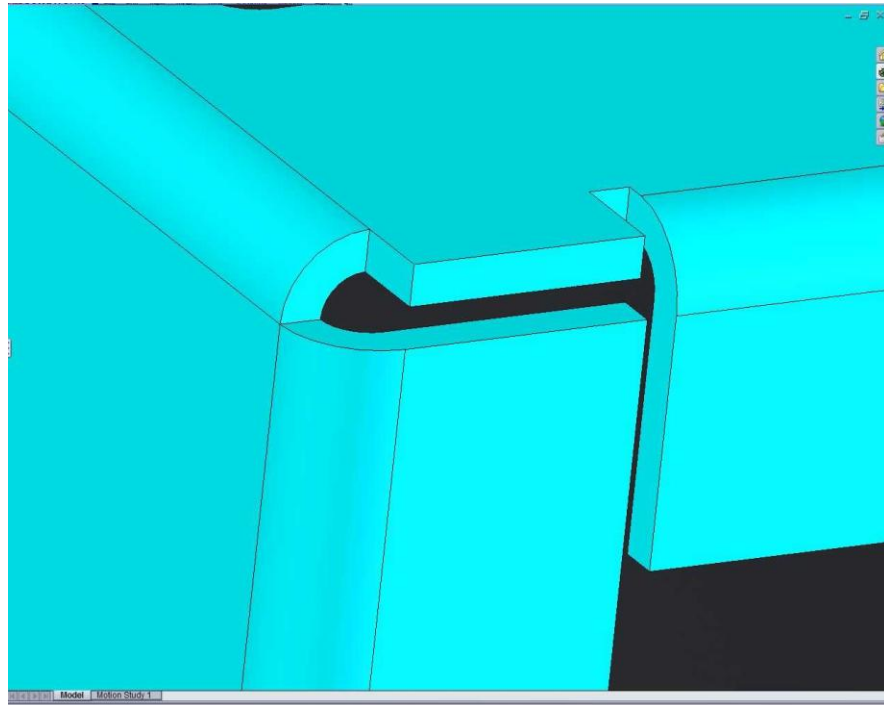
Standard Sizes



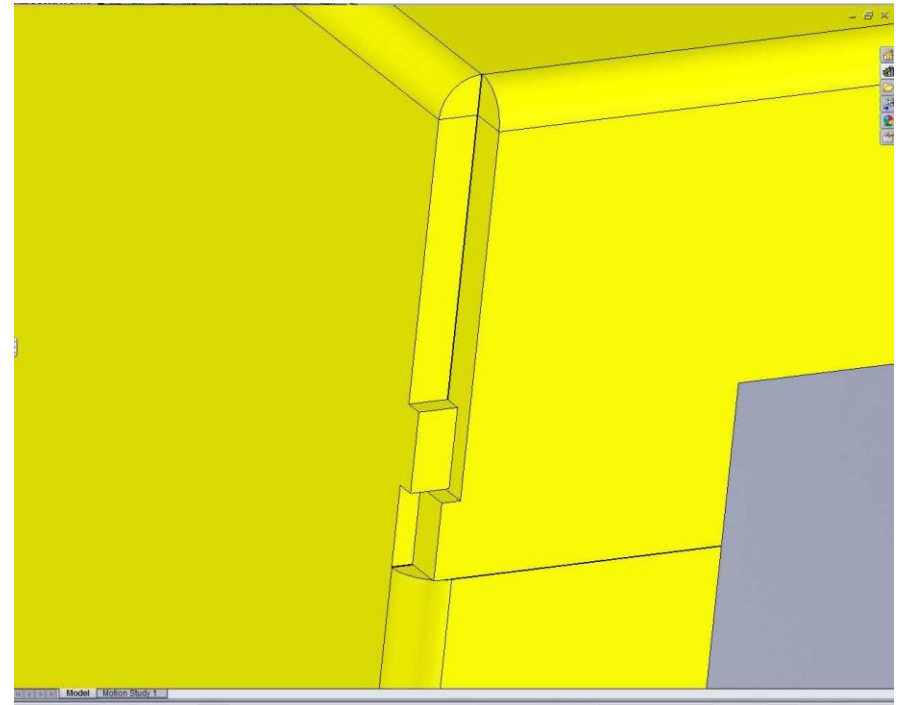
Before and after

SOLIDWORKS
NESWUC 2012

Before



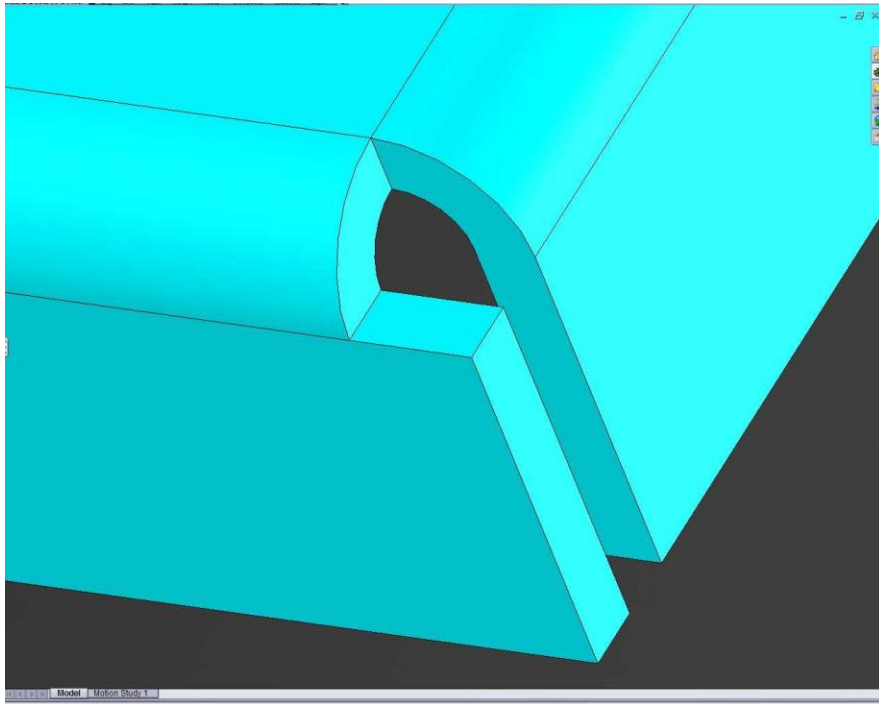
After



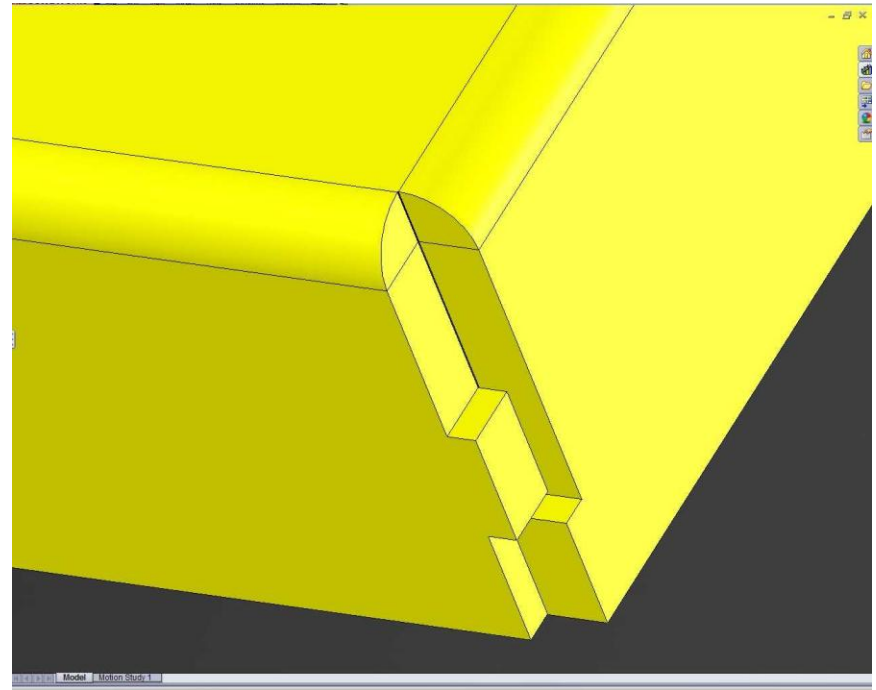
Before and after

SOLIDWORKS
NESWUC 2012

Before



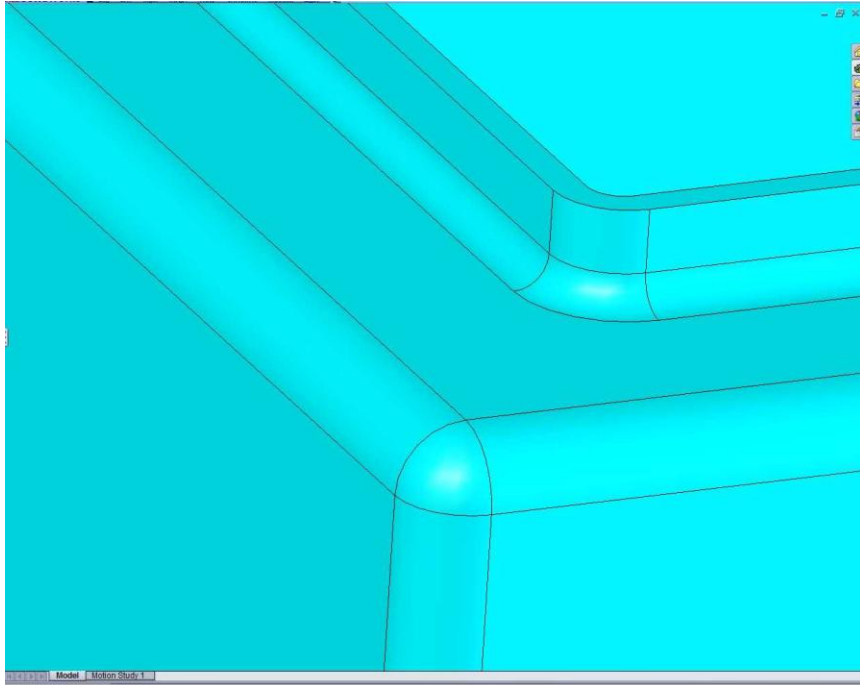
After



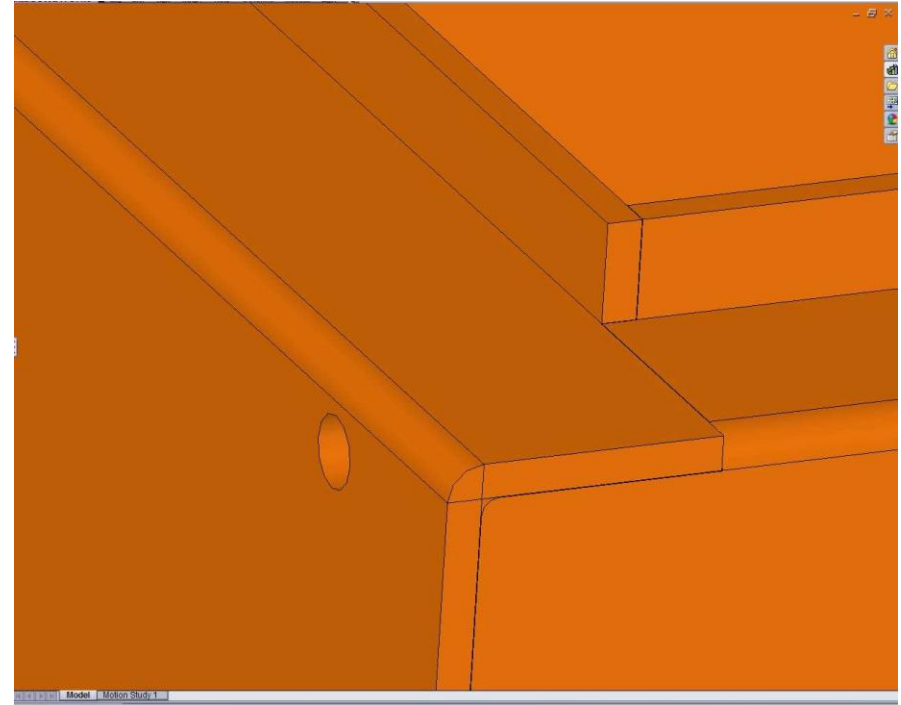
Before and after

SOLIDWORKS
NESWUC 2012

Before



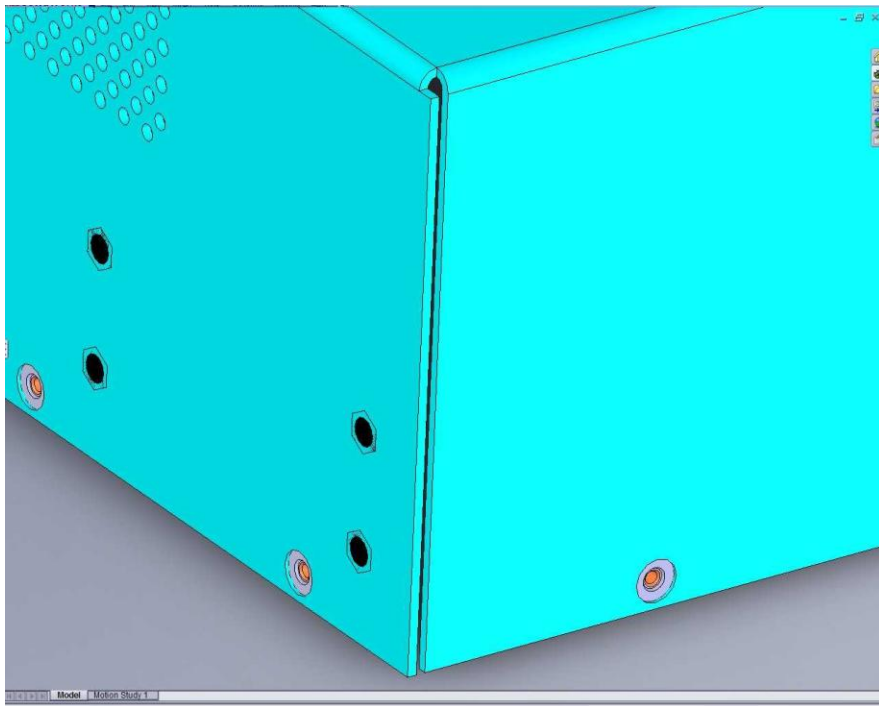
After



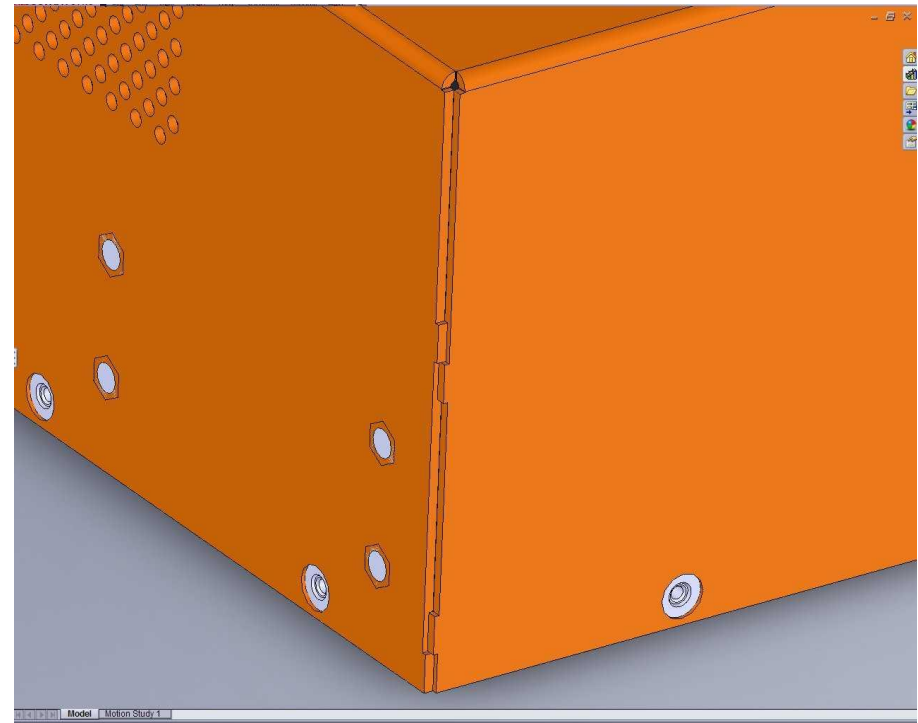
Before and after

SOLIDWORKS
NESWUC 2012

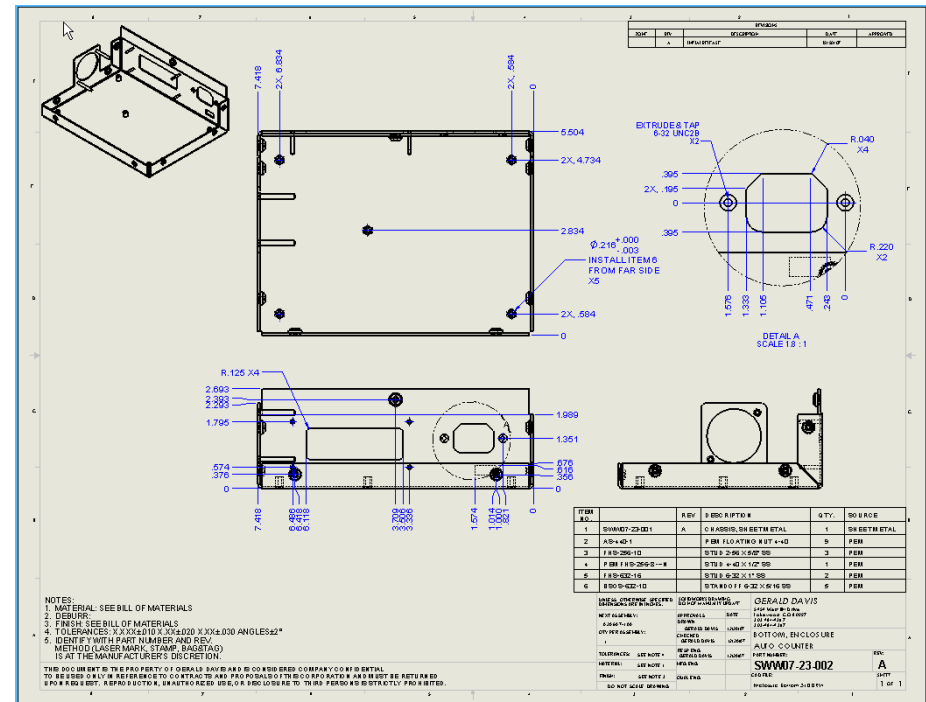
Before



After

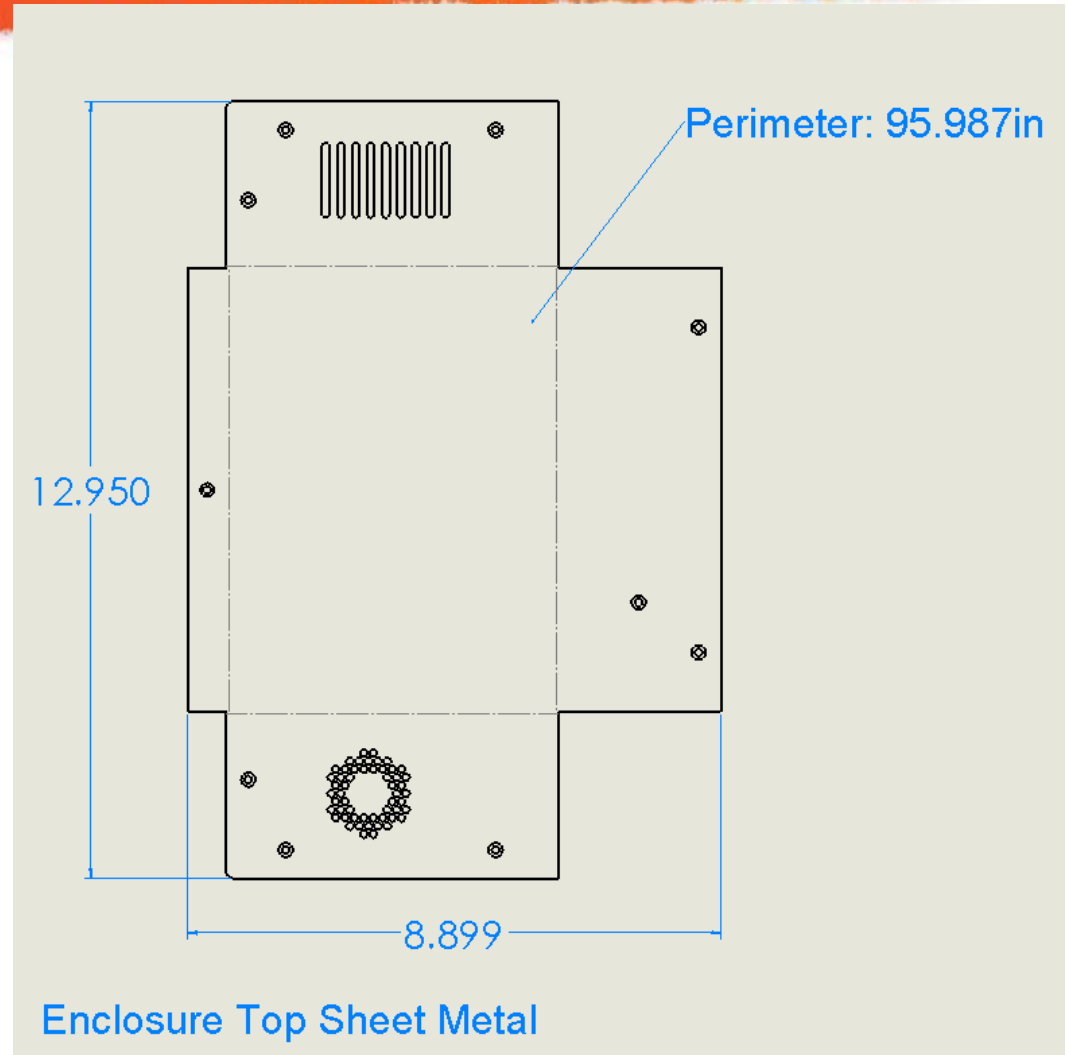


- Paper size – B size is standard in manufacturing
- Pretty views— easy to read
- Hidden lines / tangent lines – avoid busy confusion
- Revision notes – keep it brief
- Always provide a BOM
- Welding Notes
- Grain Direction
- Material Type - Finish



Simple Flat

- Flat layouts
 - Overall X length
 - Overall Y length
 - Simple Hole Chart
 - Grain direction
- Extra Credit
- Perimeter
 - Side View Dim Thickness



Manufacturer wish list

NESWUC 2012

- Don't use +.030 -.000 Dimensions
- Add some space between covers and boxes Min .003
- Don't dimension everything
- Make documentation that a manufacturer can read quickly
- Inside bend radii .030 unless Alum and over .090 thick.
- Min flange length is 4*material thickness
- Keep holes 4*material thickness away from bends
- Closed hems are easier to manufacture and this more cost effective than Open hems:
 - Closed hem length should be at least 8X the material thickness;
 - The angle on an Embossed feature should be less than 45 degrees and the embossment depth should be less than 4X the material thickness;
- When using hardware, be aware of any manufacturing requirements such as:
 - Minimum material thicknesses;
 - Center Line to the edge
 - Stainless Steel

- Welding
 - Use a material thickness of .040" or greater;
 - Aluminum is the most difficult material to weld. Stainless Steel is the next most difficult material to weld:
 - Cold-rolled steel is easiest and thus least expensive material to weld;
 - Spot weld flanges should be a minimum of .50" long;
 - Stitch welding produces less warping than seam welding
- Rapid Sheet Metal Standard Internal Bend Radius Tooling List

.008	.188
.010	.250
.030	.375
.060	.500
.090	.750
.125	1.00

More information available

Rapid Sheet Metal's web site can help!

<http://www.rapidsheetmetal.com>

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Department * Rapid Engineering Online!
 Customer Service Offline [Send a Message](#)



Get a RapidQuote

8 Hour Quote
3D Model Only
Upload

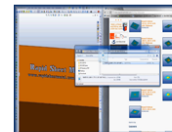
16 Hour Quote
3D Model & Print
Upload

24 Hour Quote
Print Only
Upload

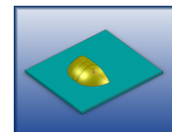
24 Hour Quote
Via E-Mail
Submission

3D Online Tooling Library	Tech Tips	Capabilities
PowderCoat	Plating	PEM Hardware Specifications
Registrations/Certificates	Web Links	

Tutorial Video

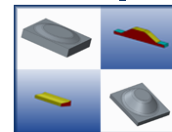


Louvers



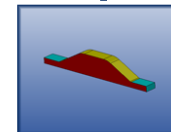
Latest Update: 5/1/2012

STEP File Package



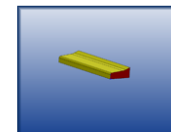
Latest Update: 2/29/2012

Bridge Lances / Card Cages



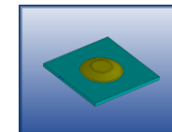
Latest Update: 5/1/2012

Lance & Forms



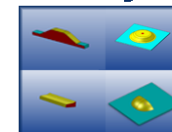
Latest Update: 5/1/2012

Embossments



Latest Update: 5/1/2012

SolidWorks Package



Latest Update: 5/1/2012