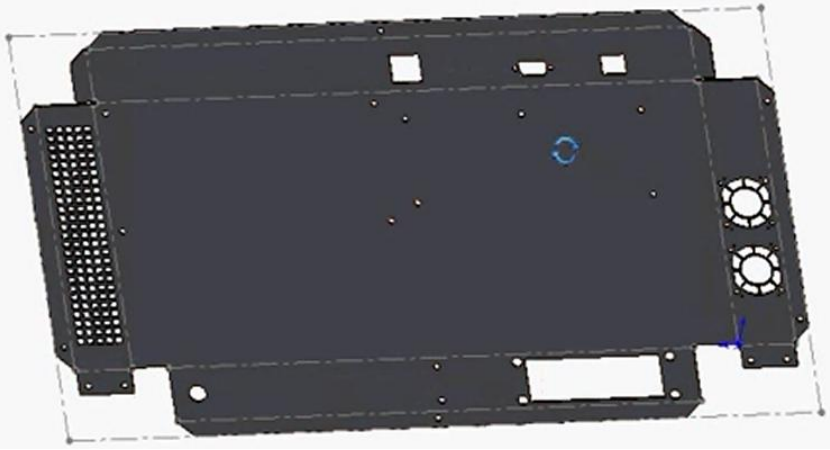
# Advanced Sheet Metal – Design Faster



Steve Lynch
Rapid Sheet Metal

# 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 montl on average
- Quoting & Manufacturing from 3D CAD Data

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# Overview



- **Counter Sinks**
  - How to find through hole size
- **Hardware**
  - RSM web site table
  - Mate references
  - Hole Sizes +.003 -.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


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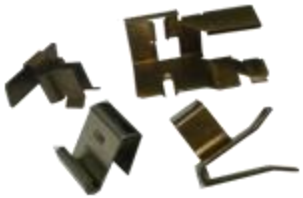
# Overview Cont.

- **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



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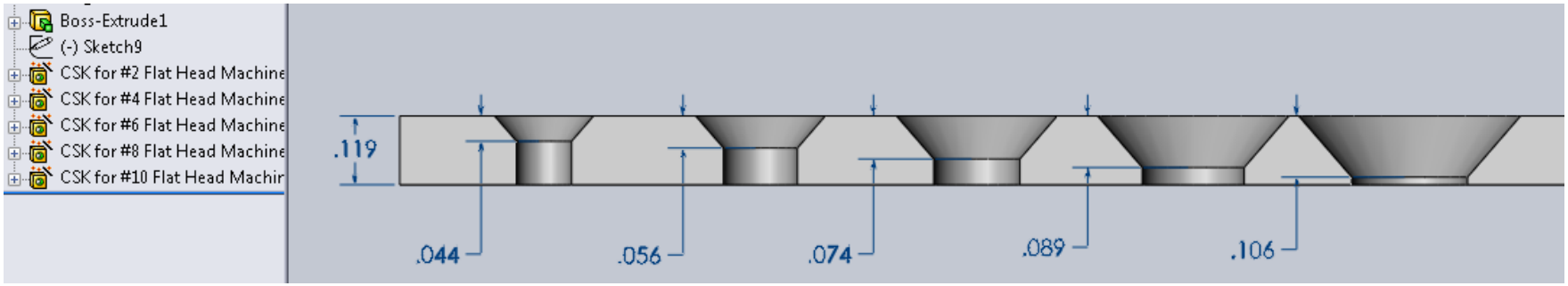
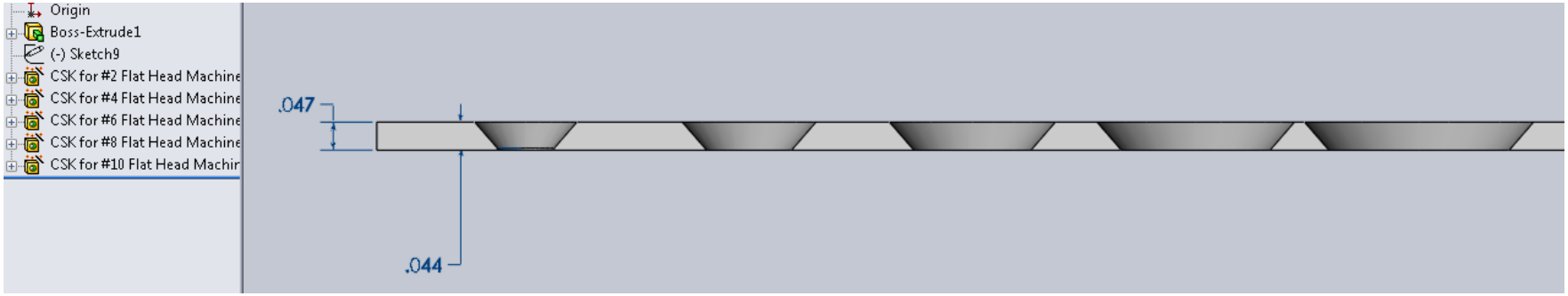
# Counter Sinks



82° Counter Sink in .119” steel.




82° Counter Sink in .047” steel.

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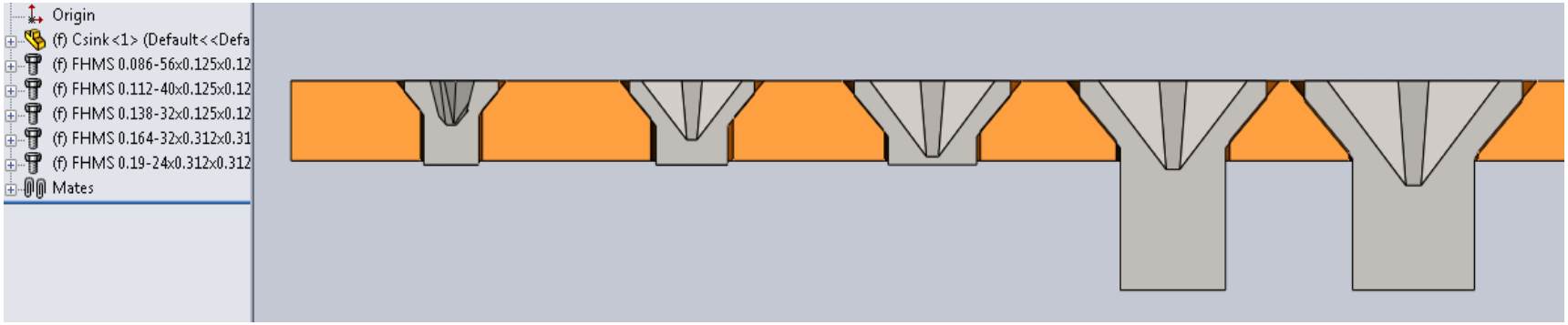
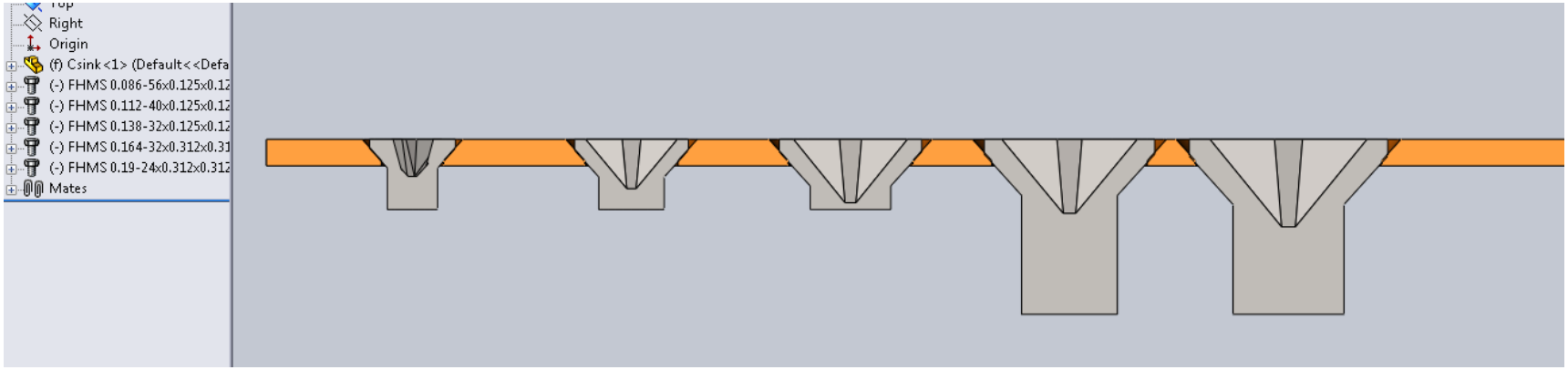
# Counter Sinks



## 82° Counter Sink in .119” steel.




## 82° Counter Sink in .047” steel.

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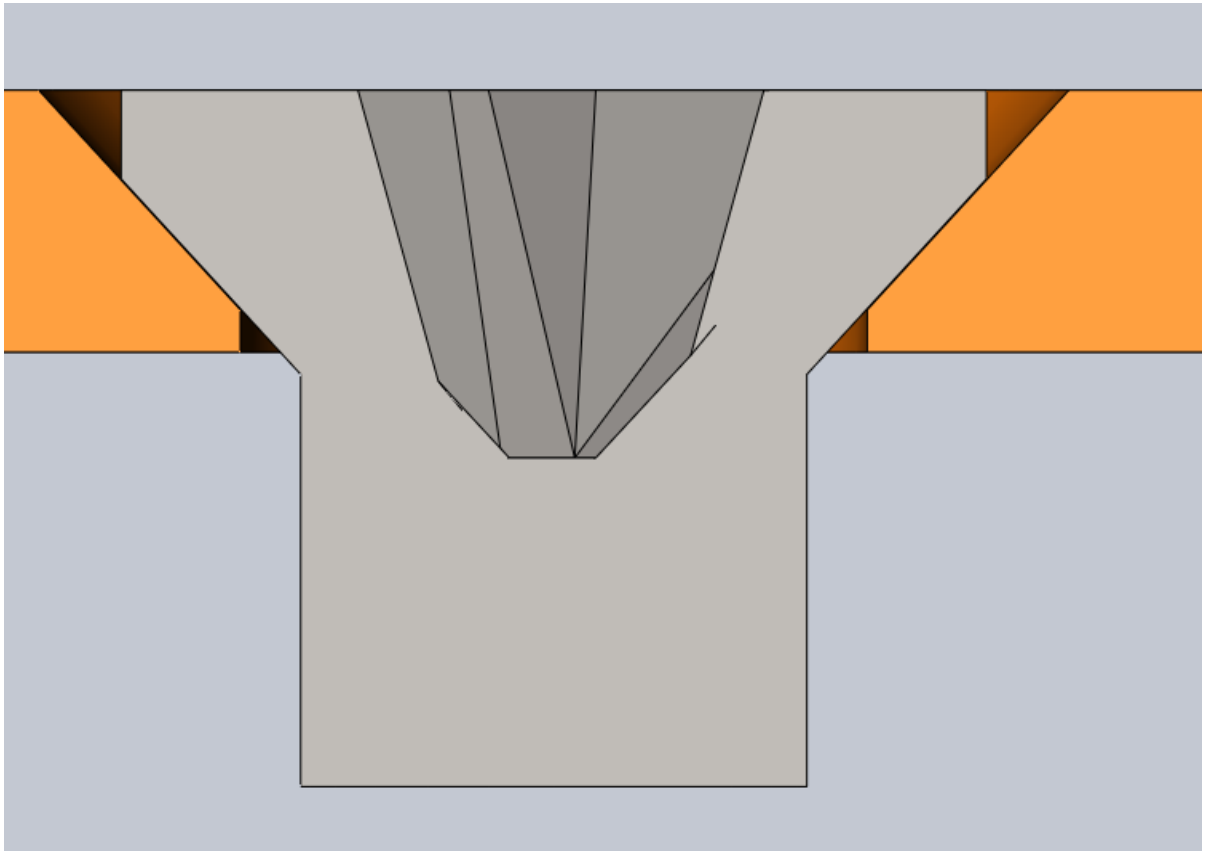
# Counter Sinks

82° Counter Sink in .047” thick steel.



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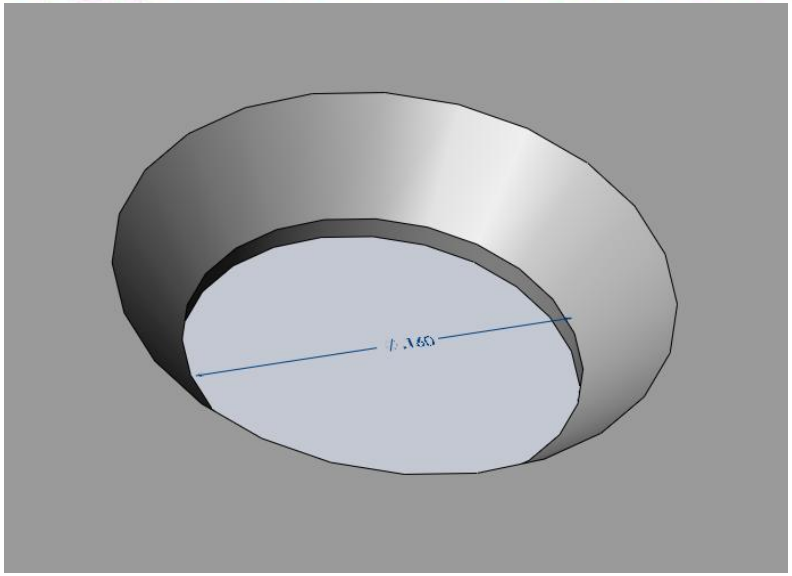
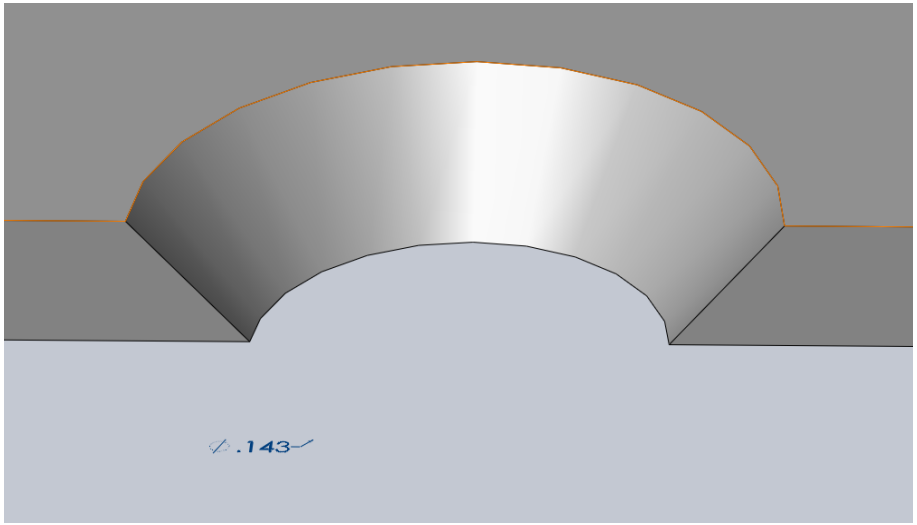
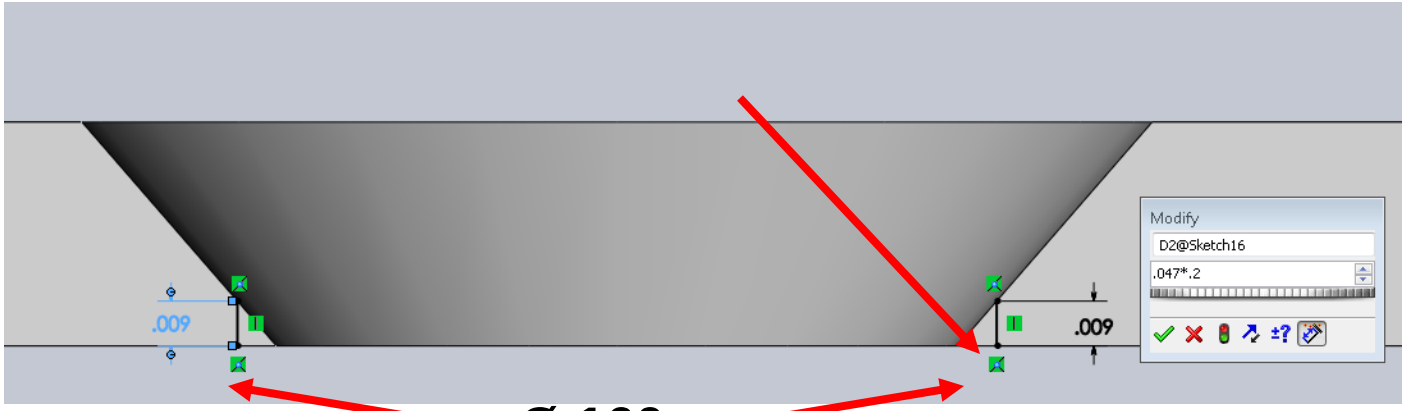
# Counter Sinks






**Ø.143 Before**

**Ø.160 After**

**Ø.017 Delta**

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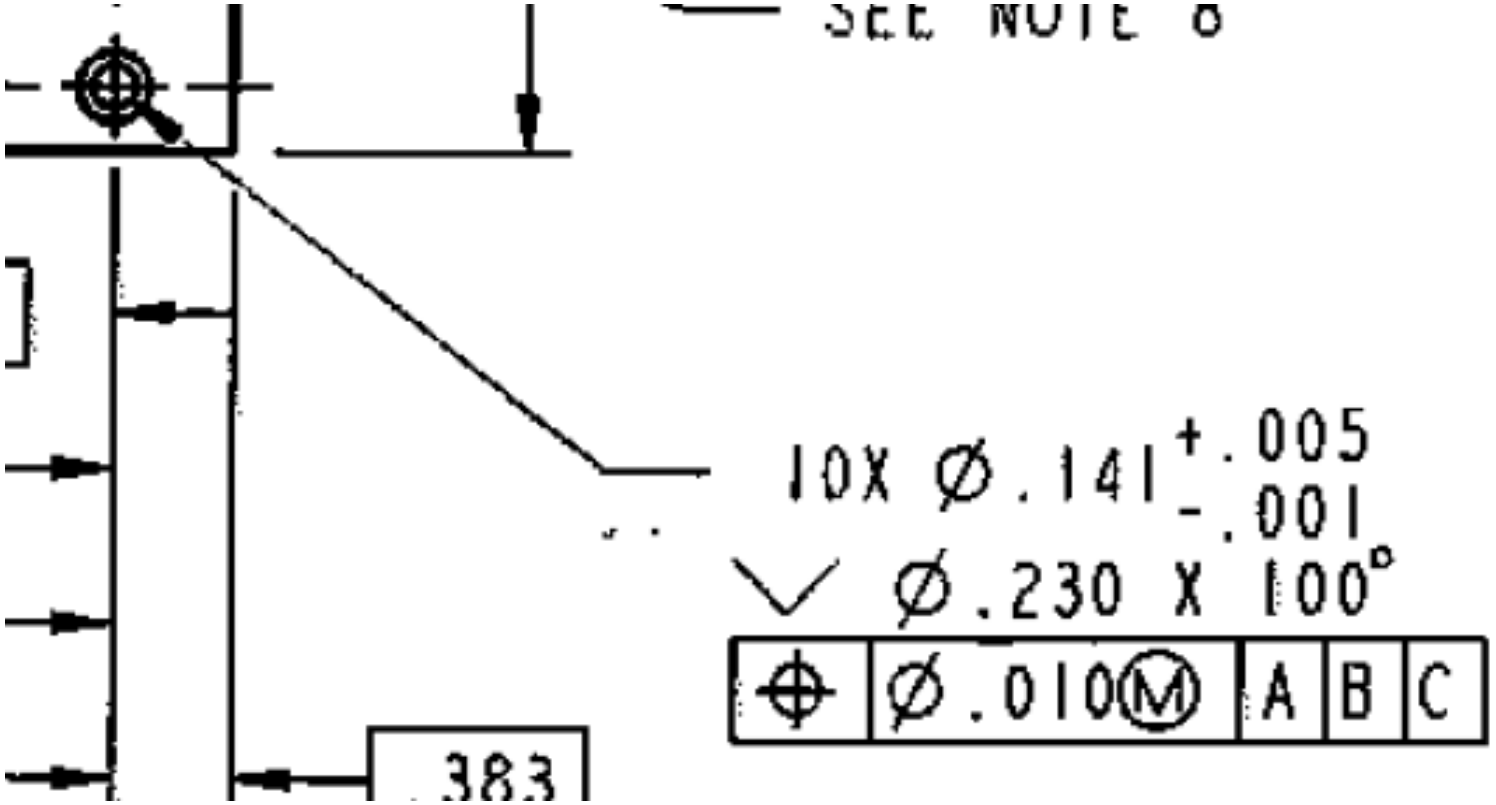
# Counter Sinks




It’s better not dimensioning your through holes

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# Hardware – RSM Hardware table



http://www.rapidsheetmetal.com/resources

PEM Hardware Specifications

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) | | | | | | | | | |

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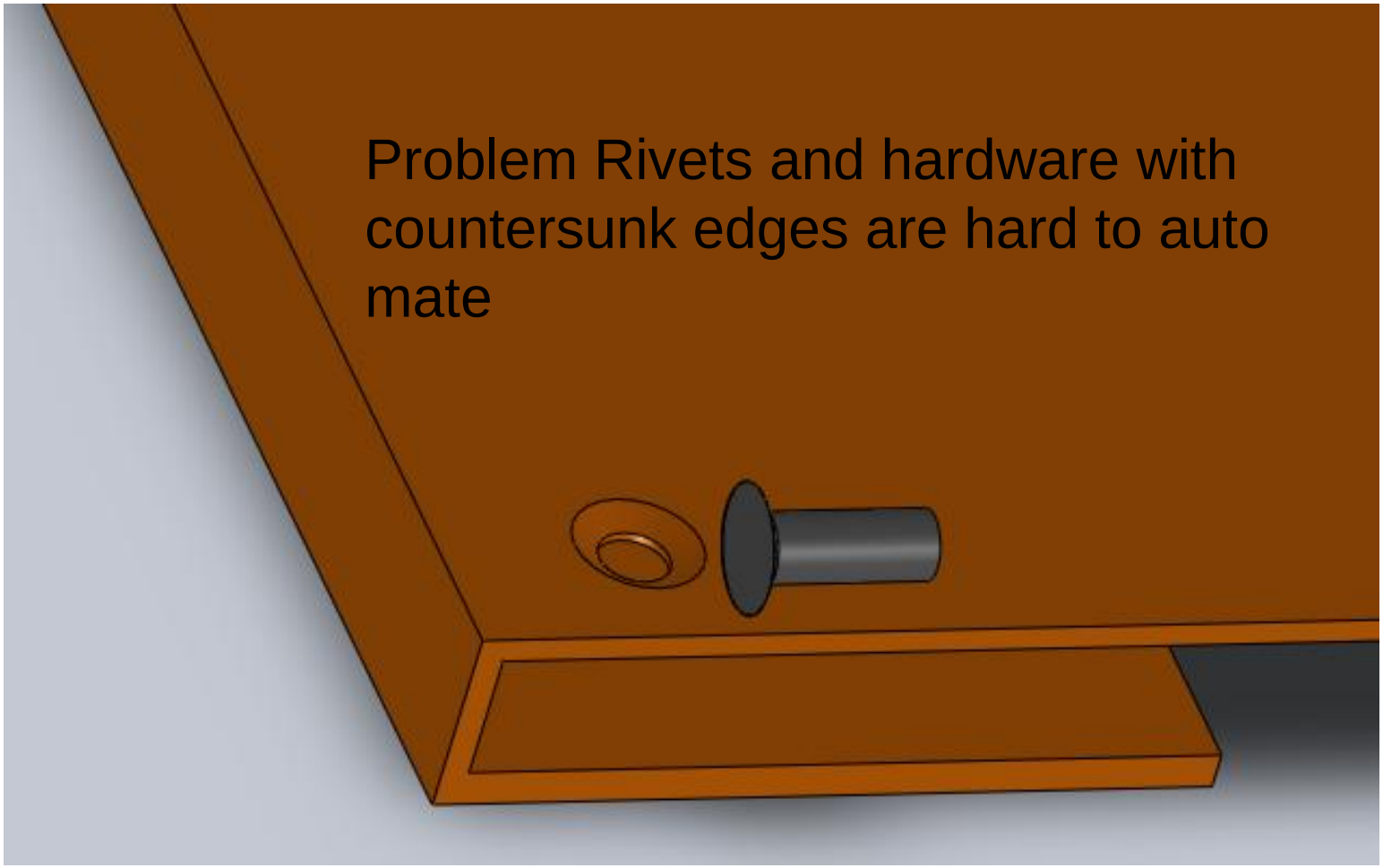
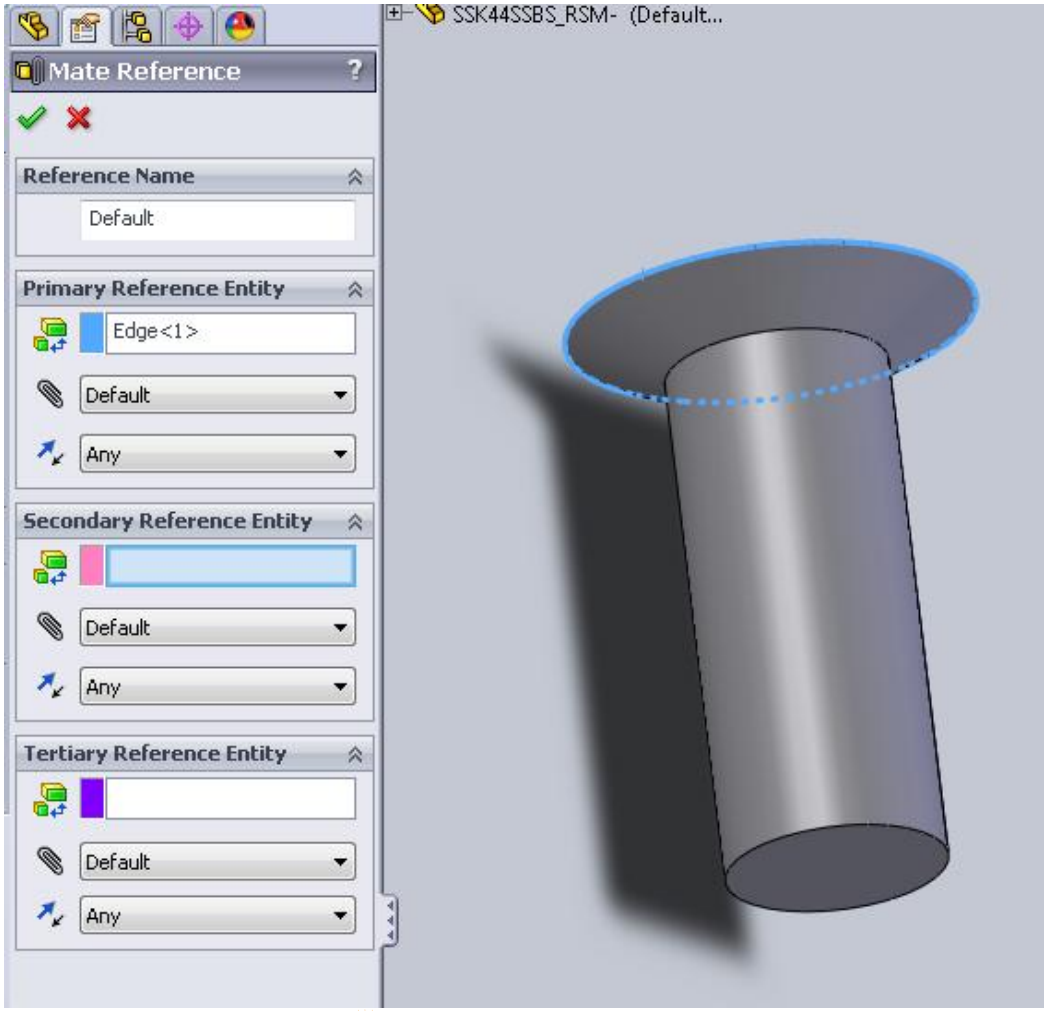
# Hardware – Mate Reference



# Hardware – Mate Reference






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

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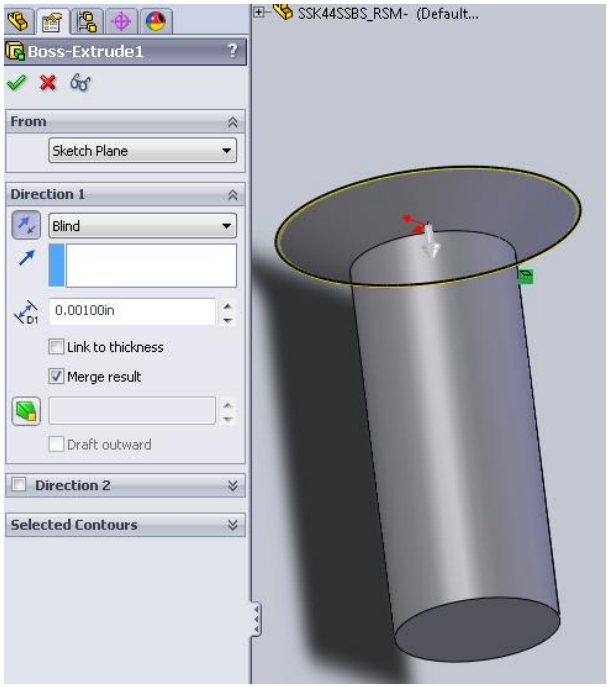
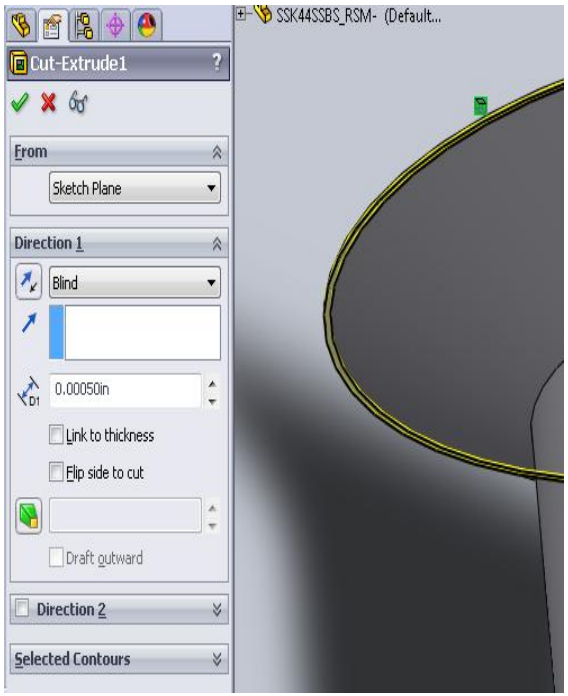
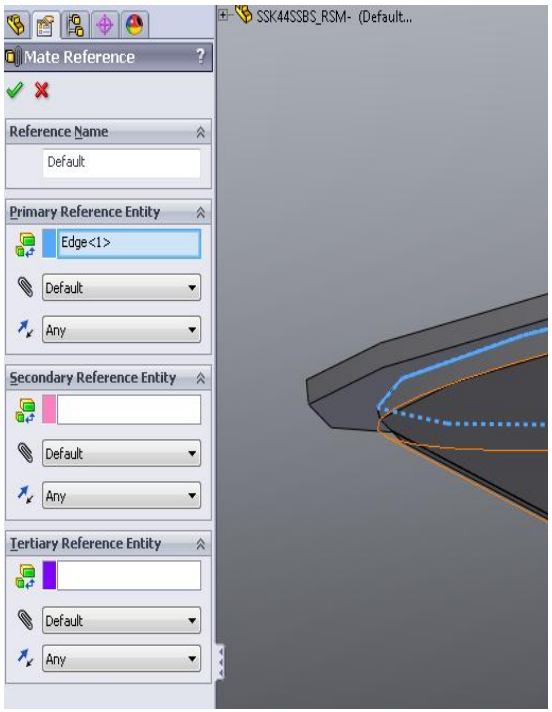
# Hardware – Mate Reference






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

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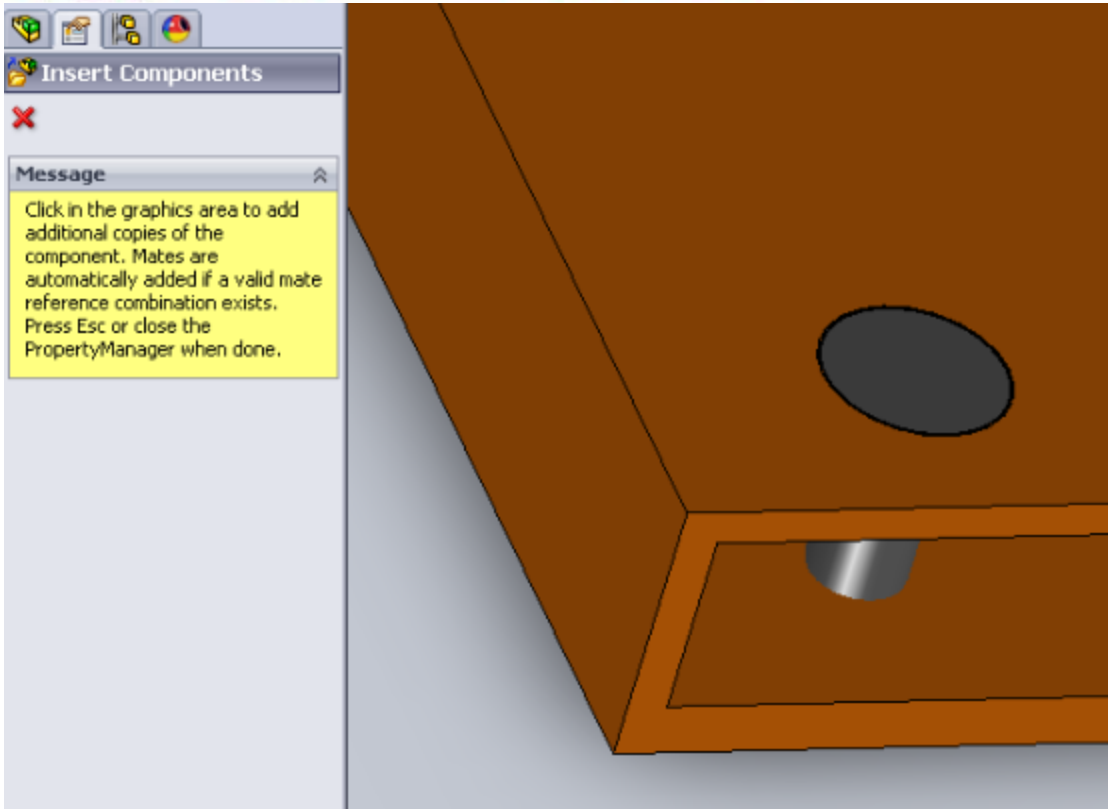
# Hardware – Mate Reference






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

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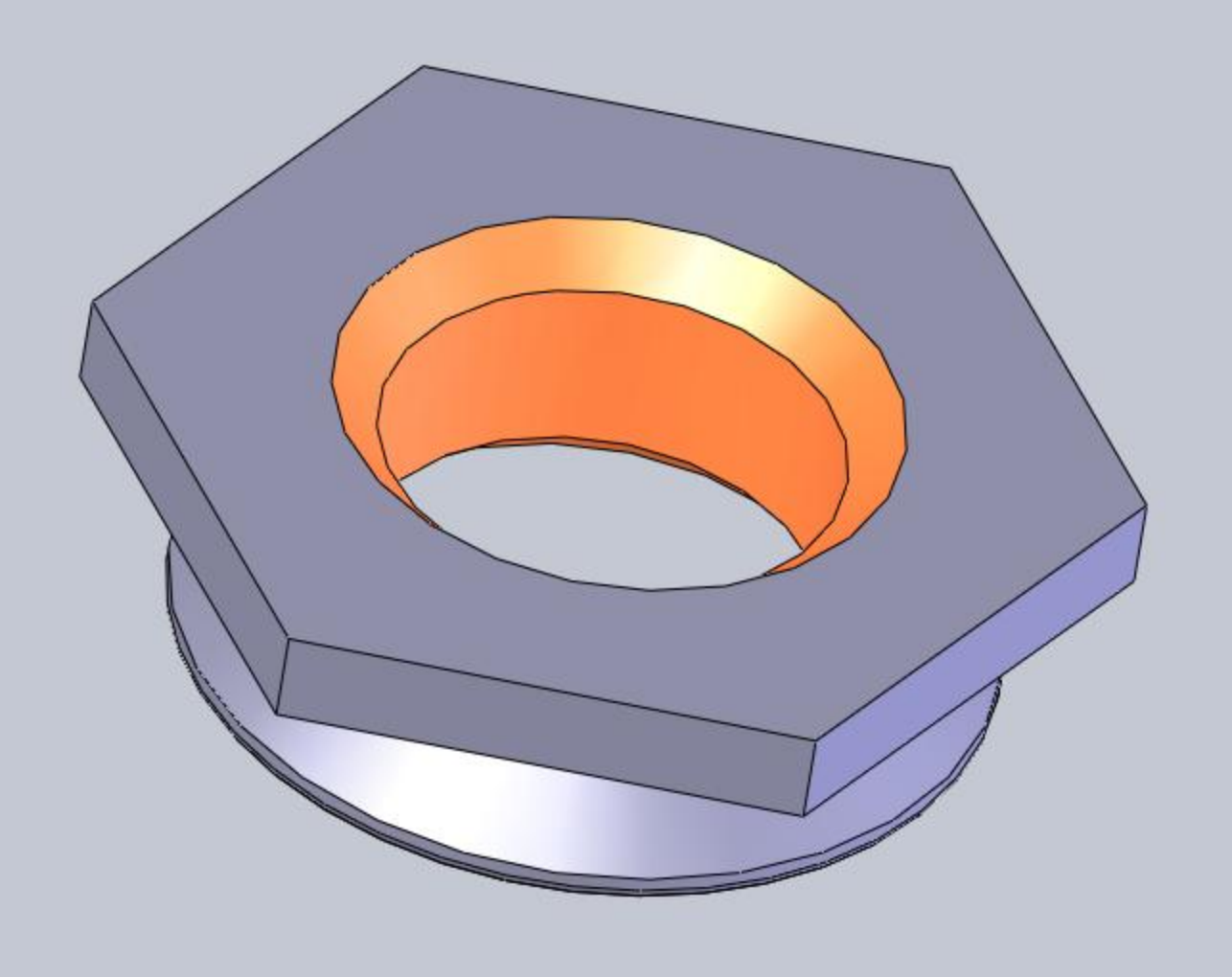
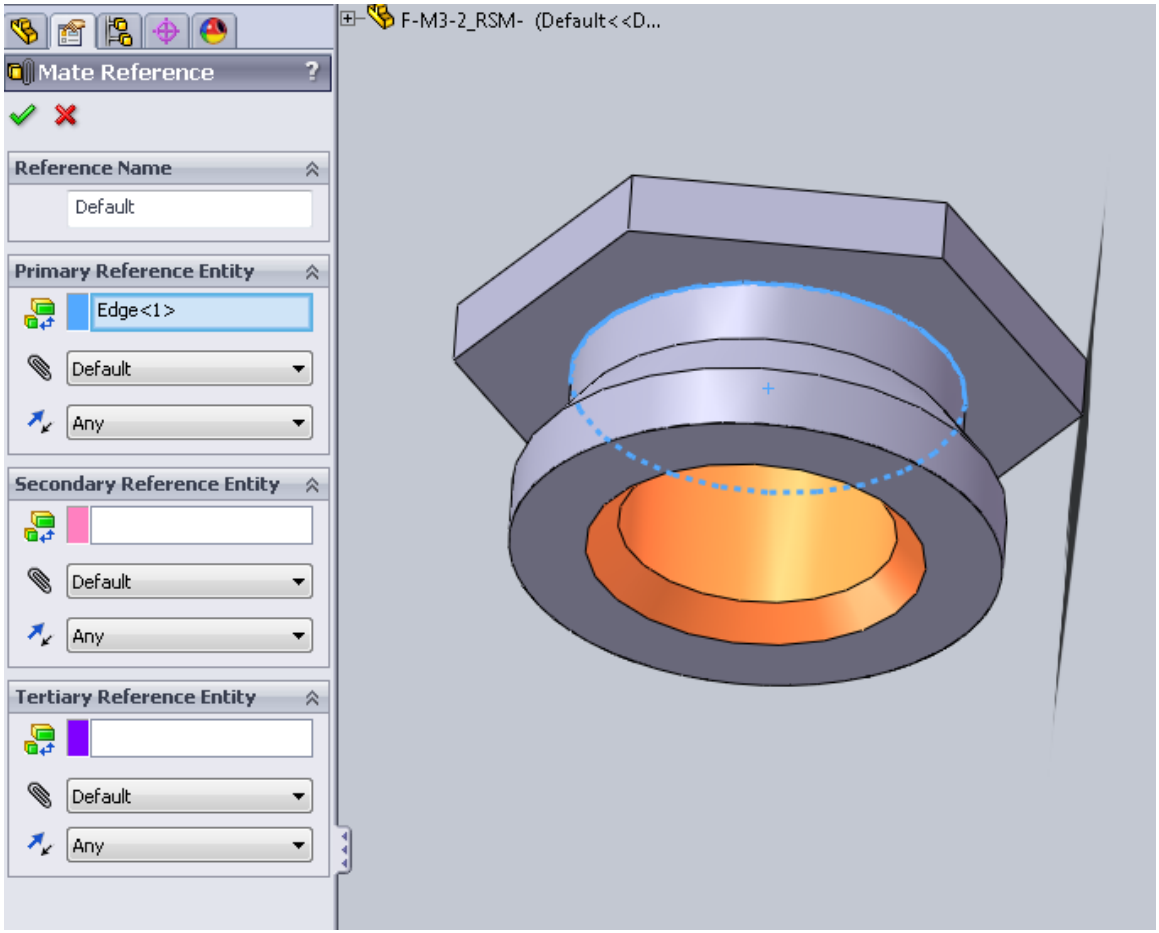
# Hardware – Mate Reference

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.

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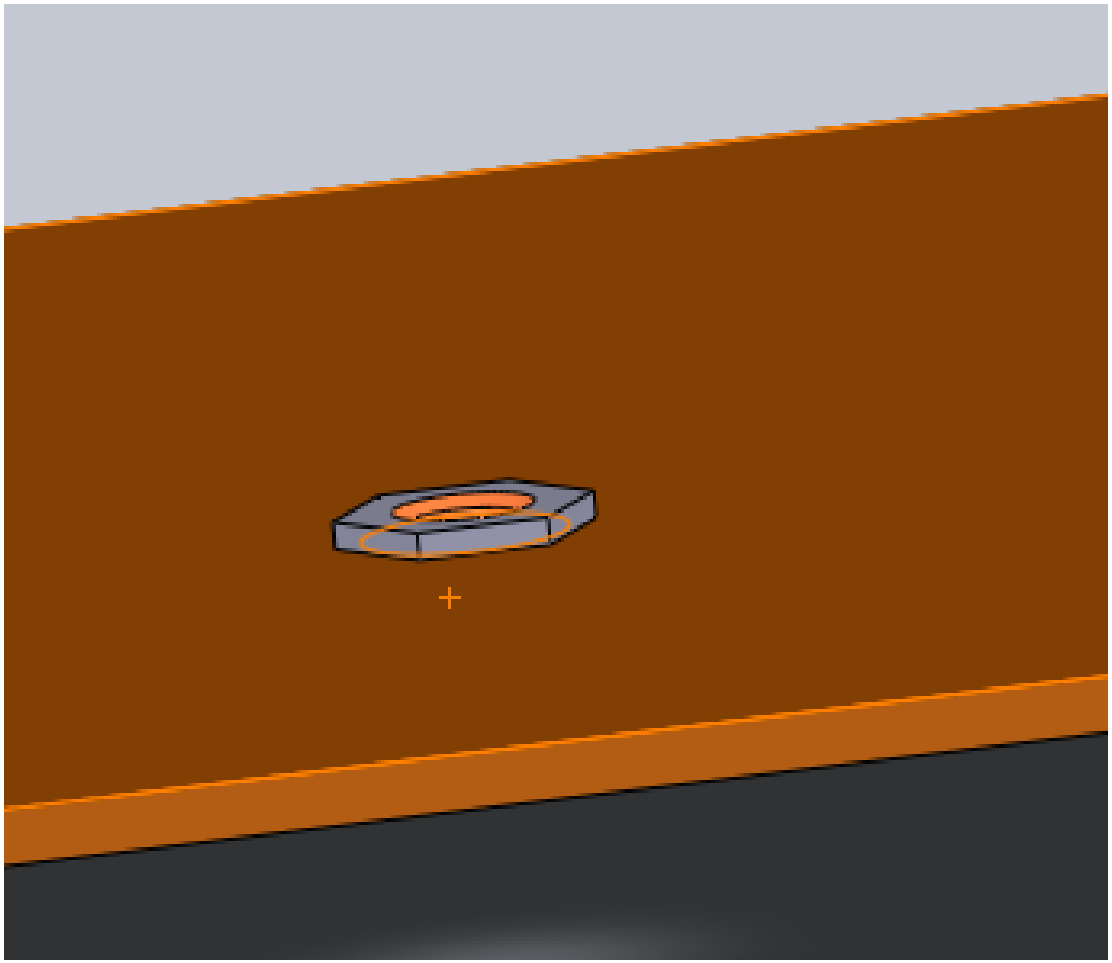
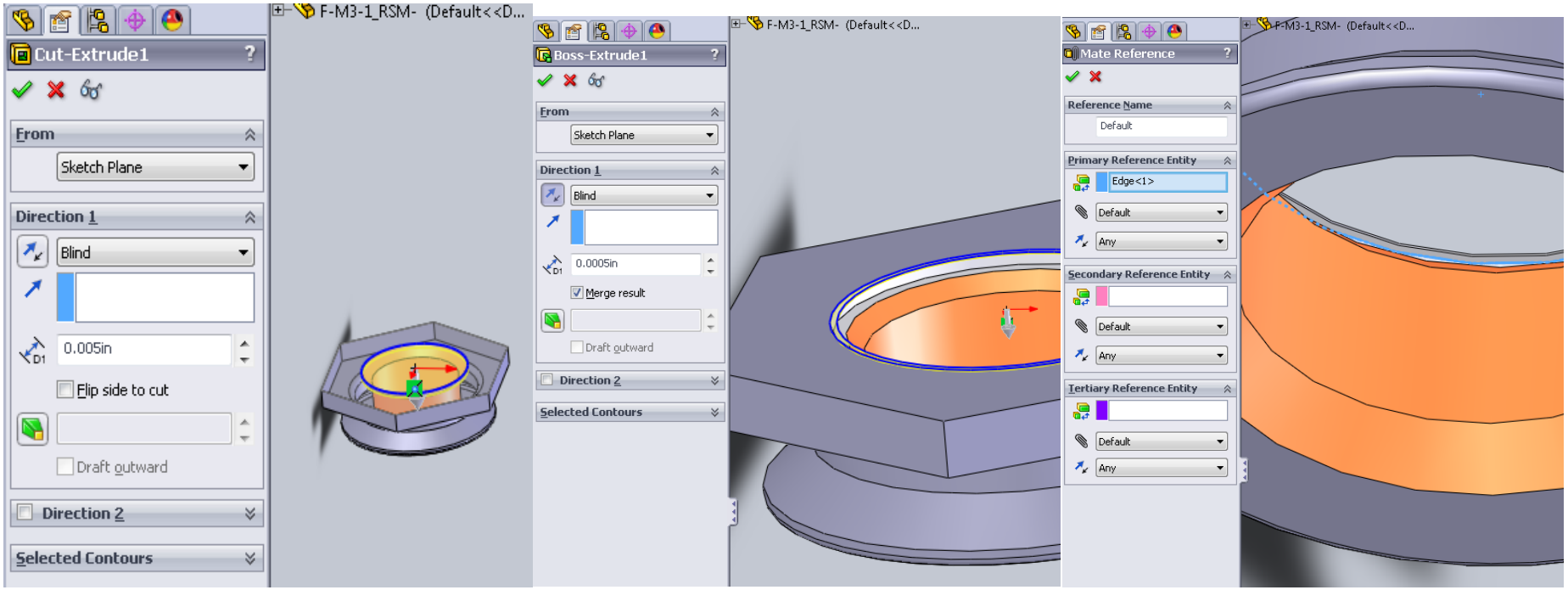
# Hardware – Mate Reference



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

# Hardware – Mate Reference






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.

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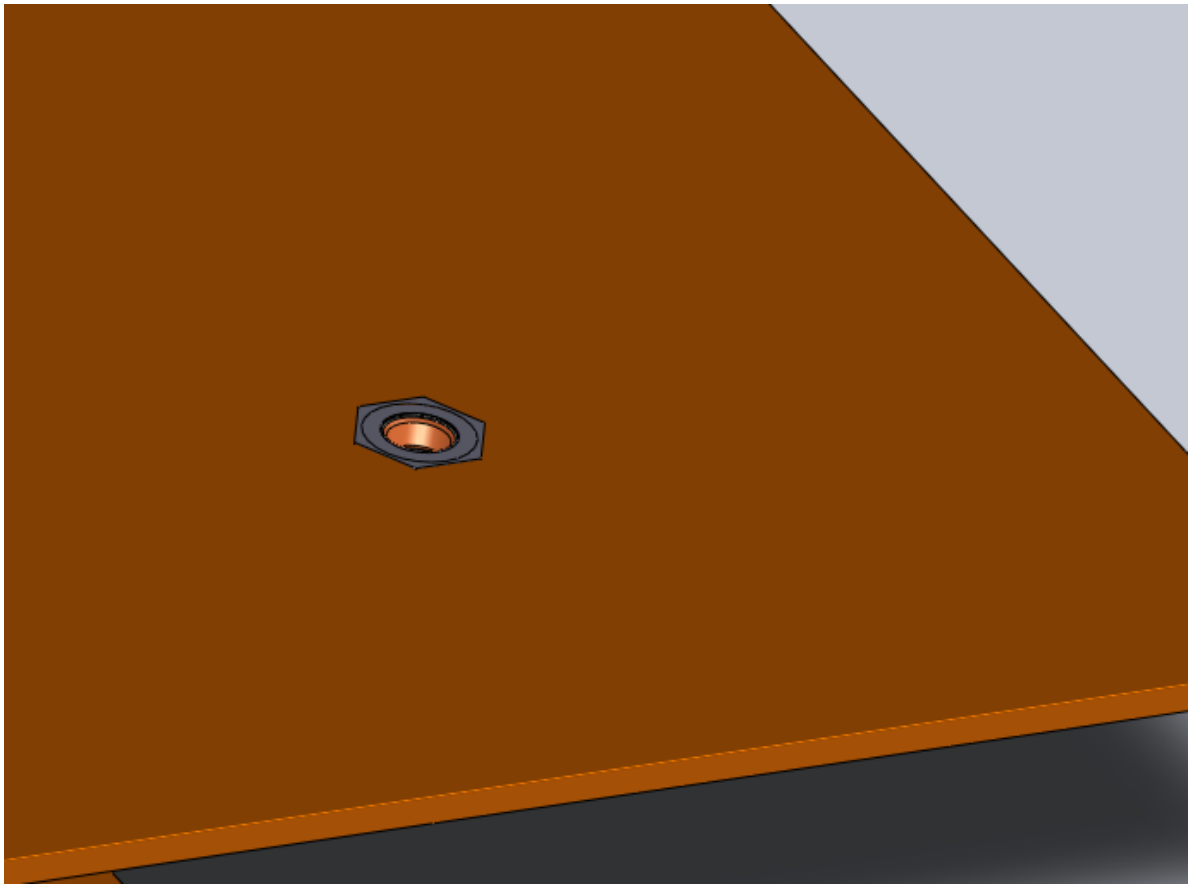
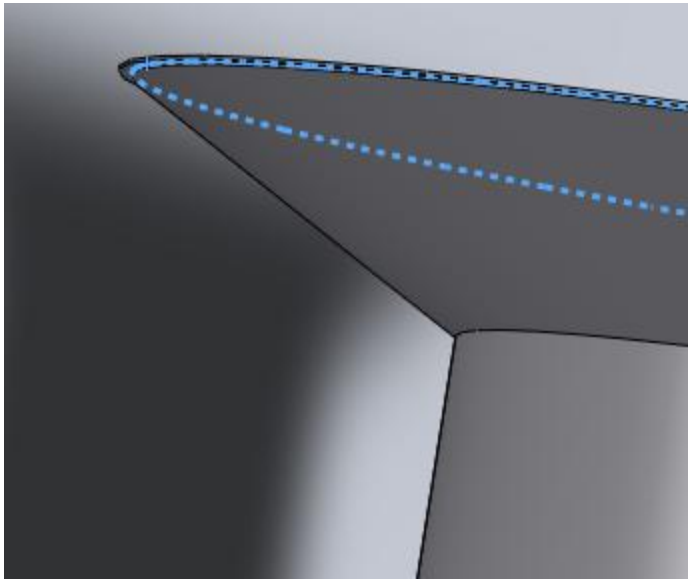
# Hardware – Mate Reference

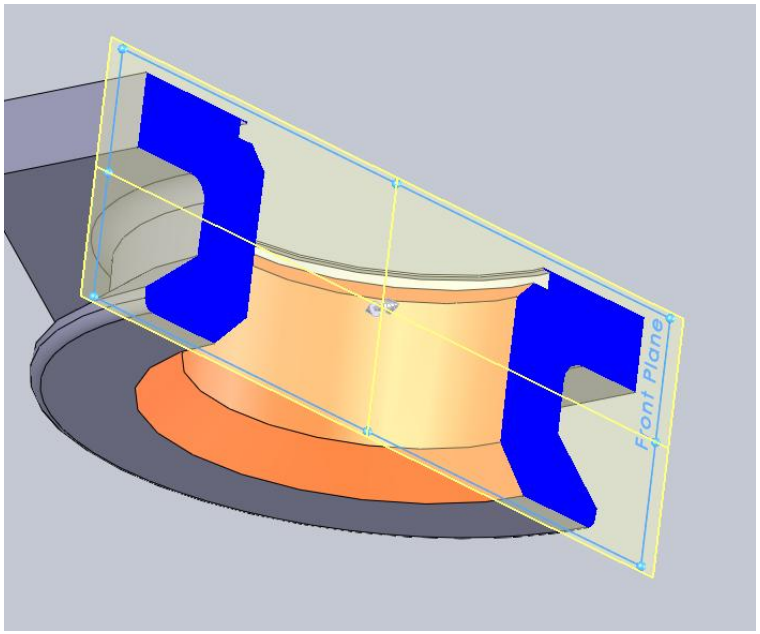


Now as you drag this part from your library it will snap into place every time.

# Hardware – Mate Reference

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



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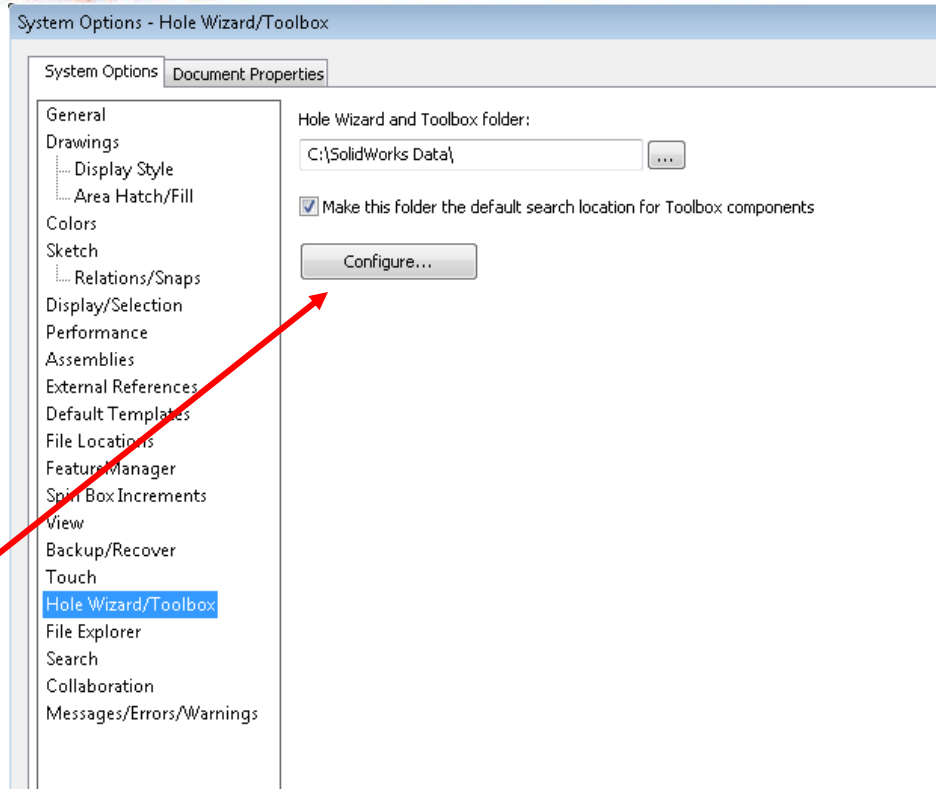
# Modifying the Hole Wizard



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

**Step 1**

Select Configure

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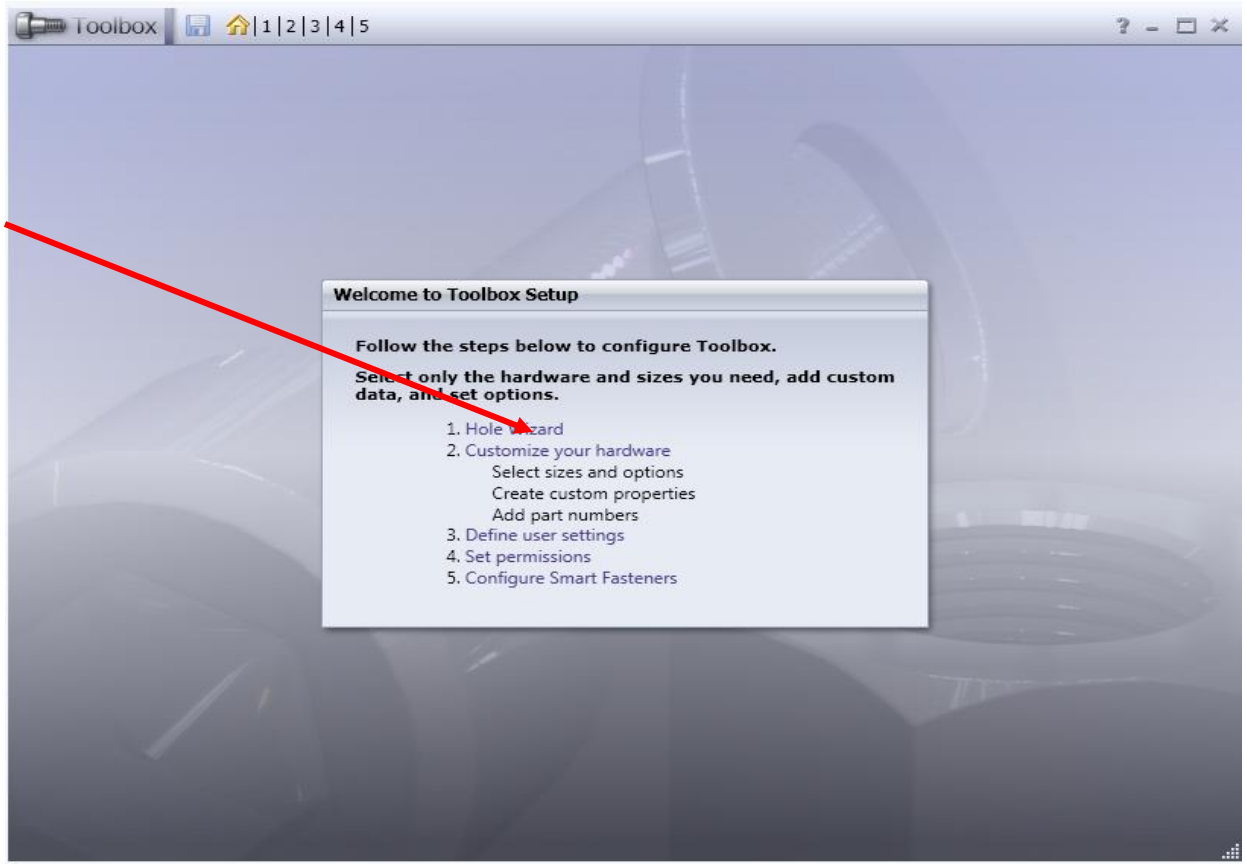
This is a way to modify your hole wizard which is ADVANCED and done at your own risk

# Modifying the Hole Wizard



## Step 2

Select Hole Wizard




RAPID SHEET METAL INC

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

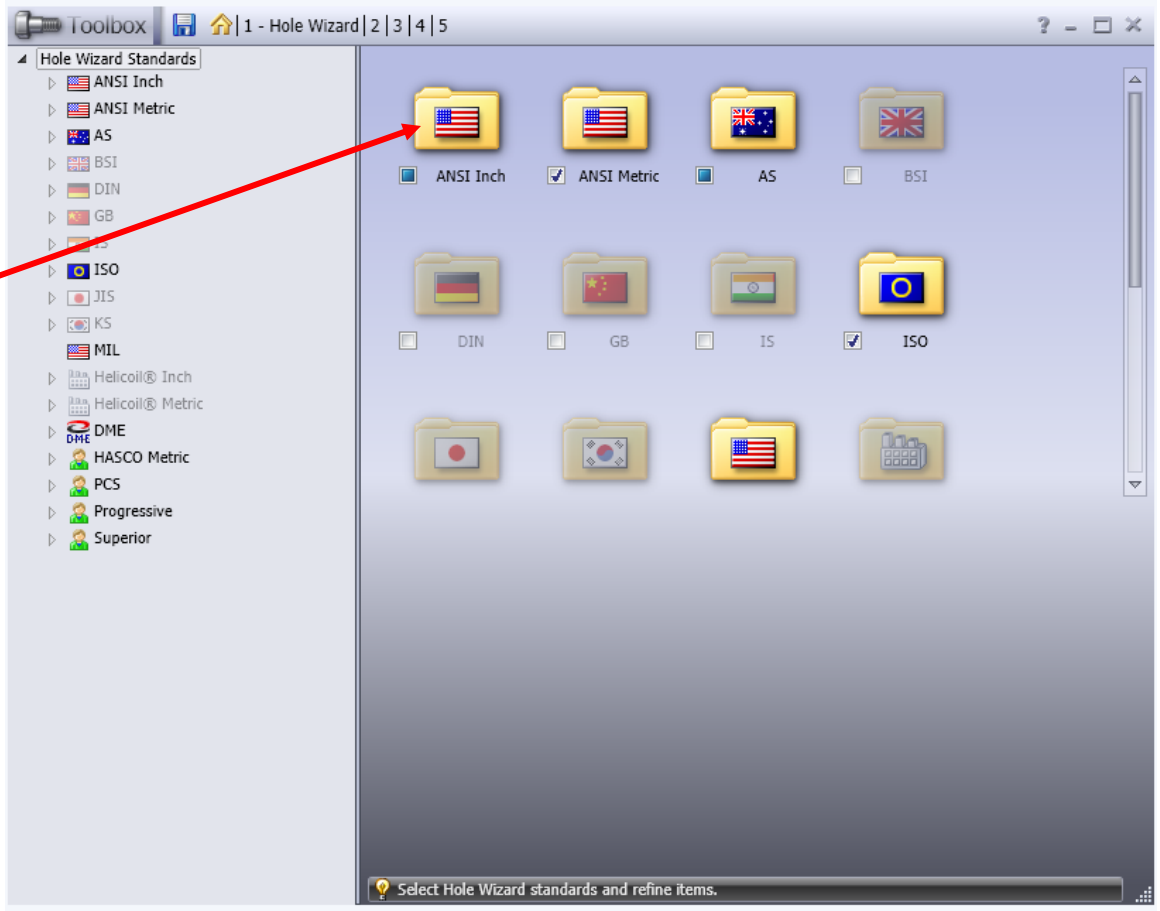
# Modifying the Hole Wizard



**Step 3**

Select

ANSI INCH

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

# Modifying the Hole Wizard

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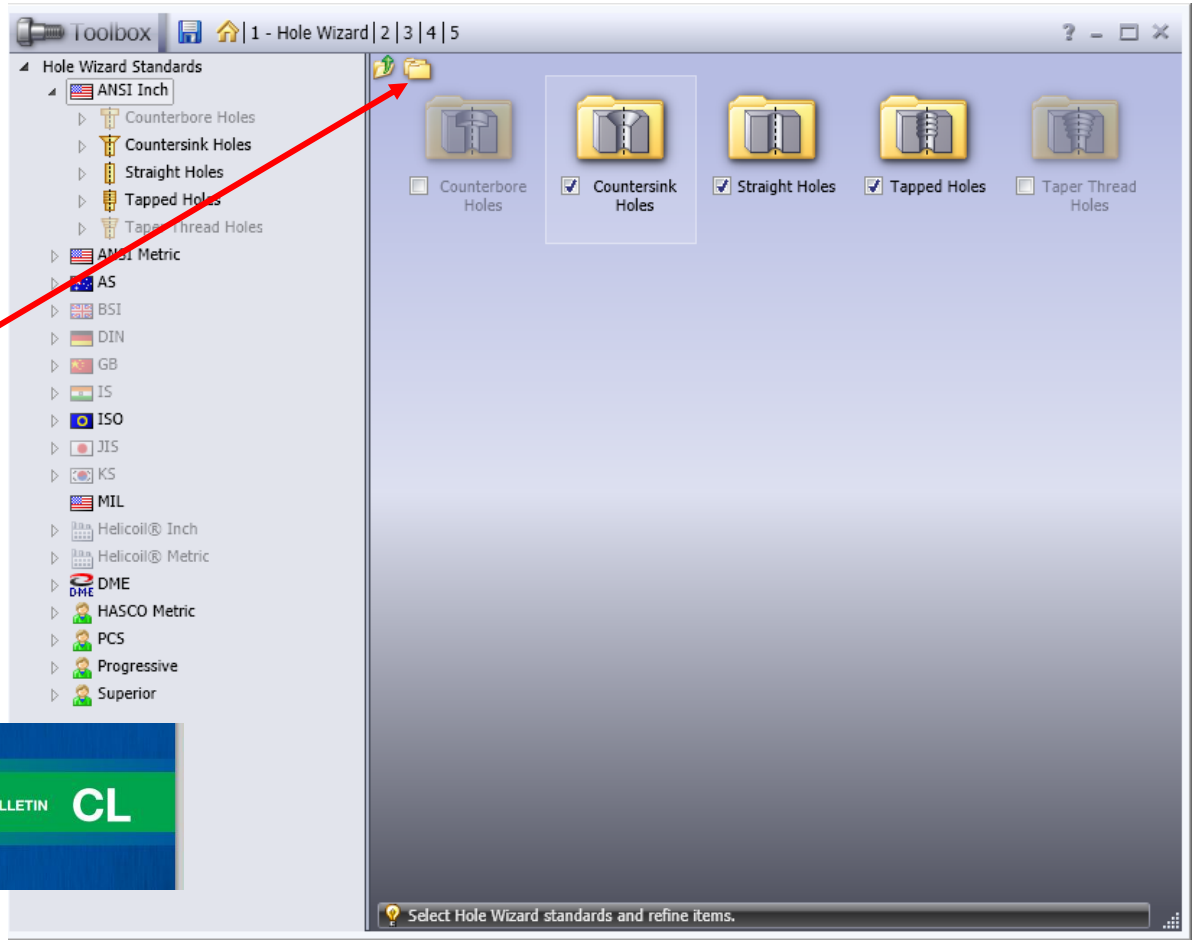
NESWUC 2012

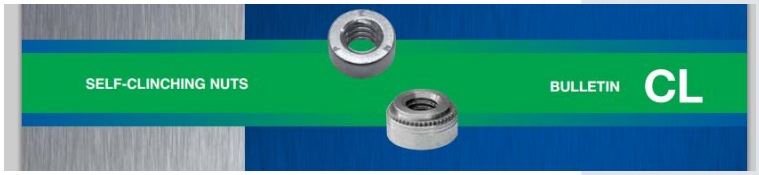
**Step 4**

Press Copy

Enter New Name

(I used “Pem CL UNI”)




RAPID SHEET METAL INC

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

# Modifying the Hole Wizard

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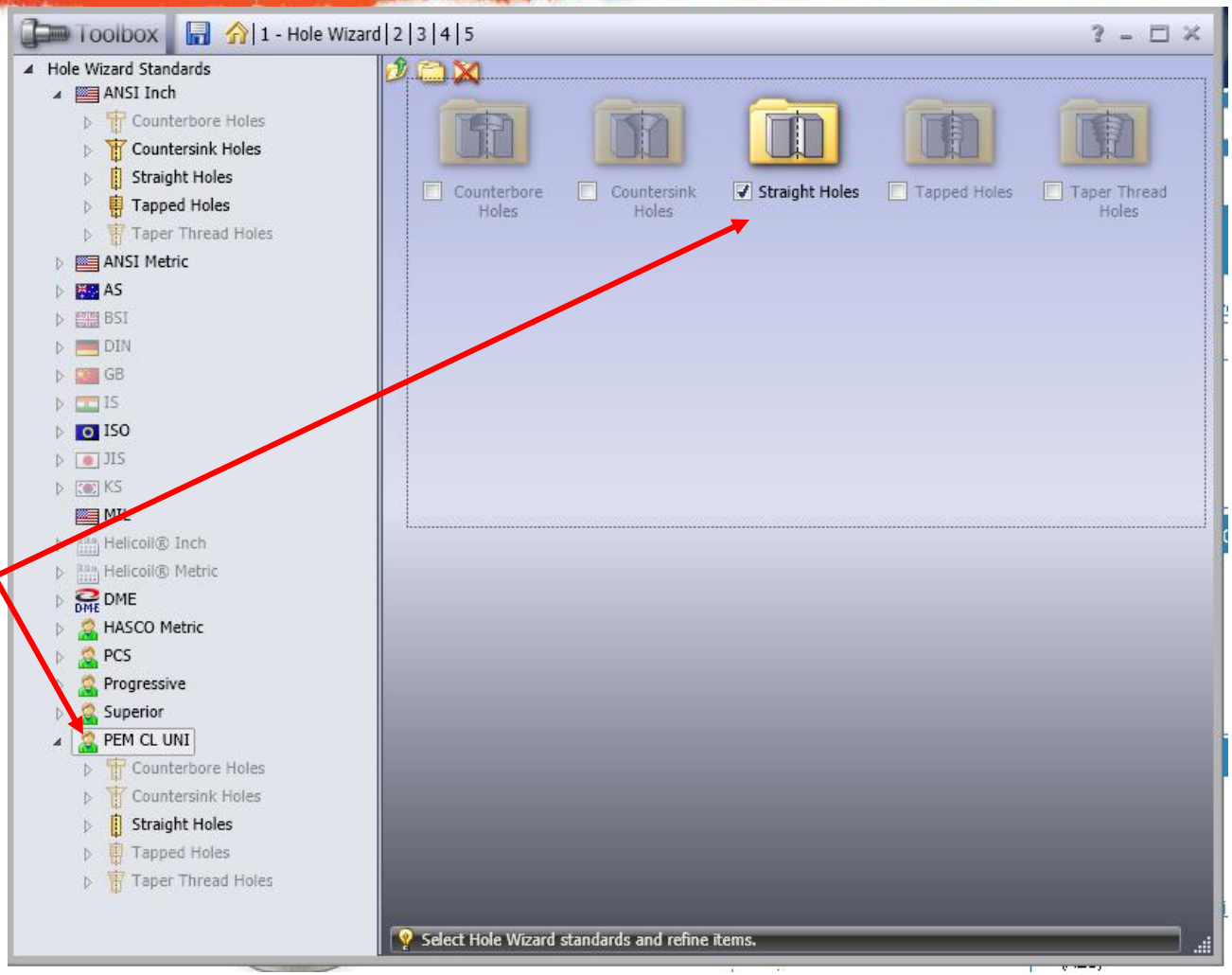
NESWUC 2012

**Step 5**

Choose

**Step 6**

Uncheck everything but Straight Holes

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

# Modifying the Hole Wizard

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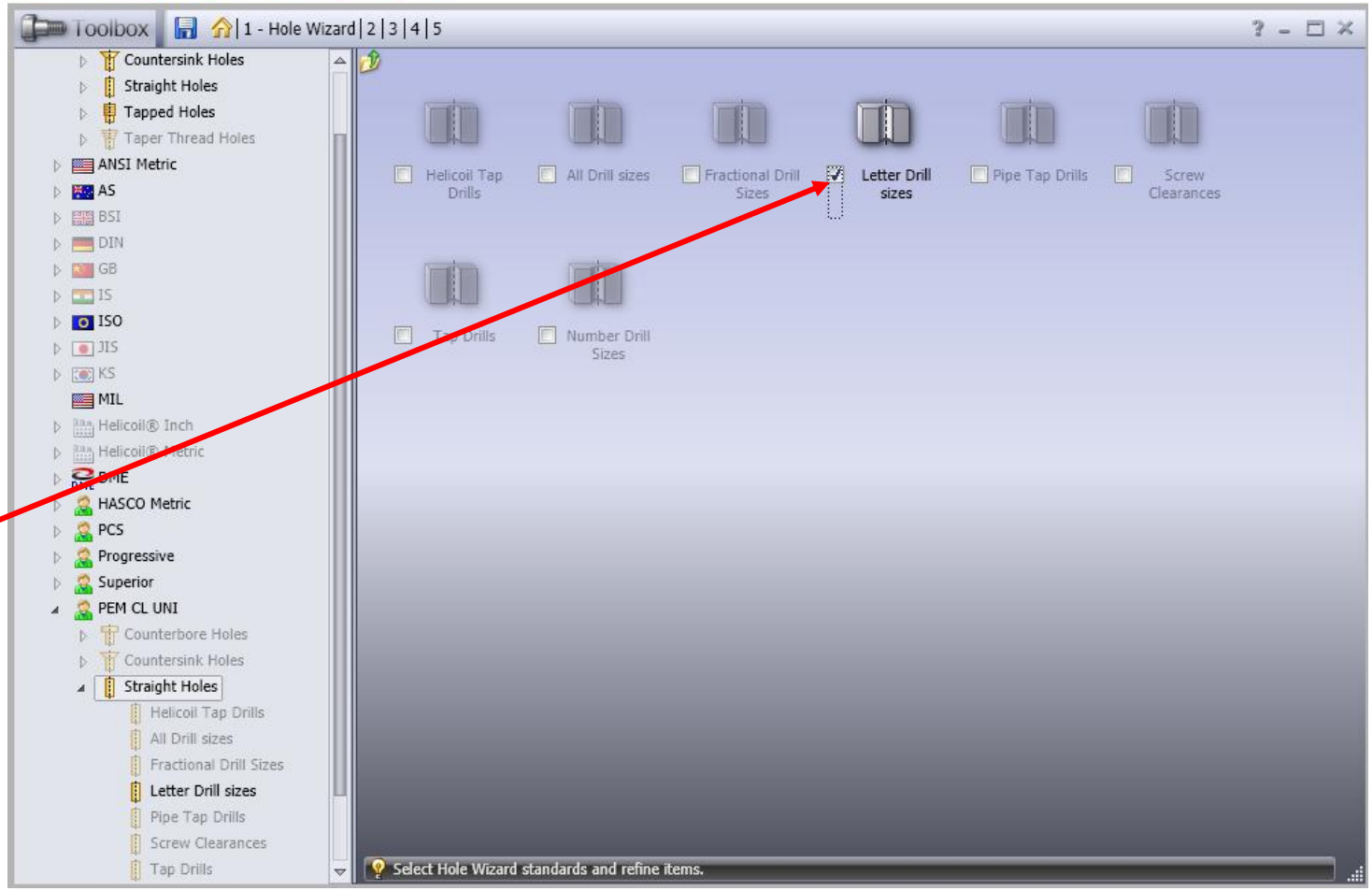
**Step 7**

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

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

# Modifying the Hole Wizard

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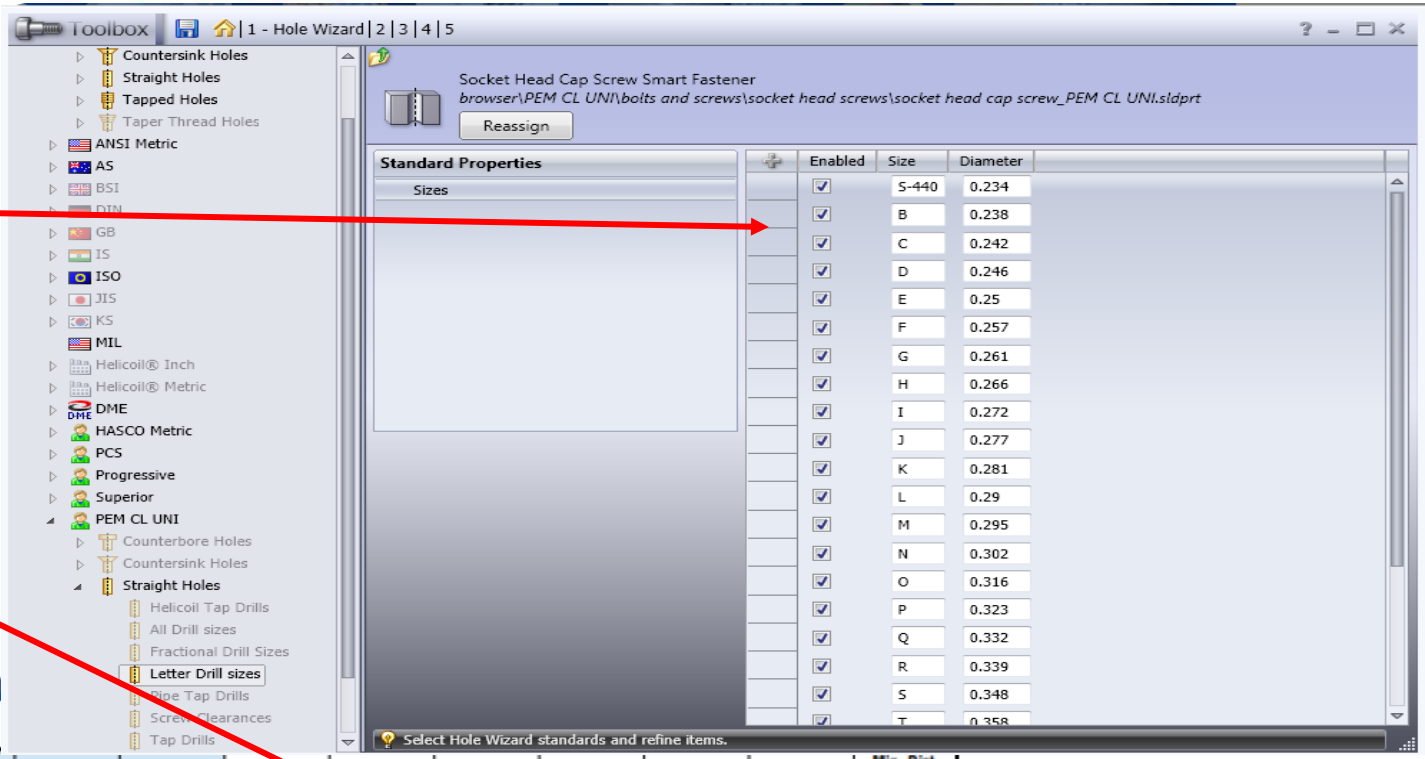
**Step 8**

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: Fastener Material: Carbon Steel | Stainless Steel | Hardened Stainless Steel | 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) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .086-56 (#2-56) | S | CLS | NA | 256 | 0 | .030 | .030 | .166 | .165 | .250 | .070 | .19 |
| | | | | | 1 | .038 | .040 | | | | | |
| | | | | | 2 | .054 | .056 | | | | | |
| .099-48 (#3-48) | S | CLS | NA | 348 | 0 | .030 | .030 | .166 | .165 | .250 | .070 | .19 |
| | | | | | 1 | .038 | .040 | | | | | |
| | | | | | 2 | .054 | .056 | | | | | |

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

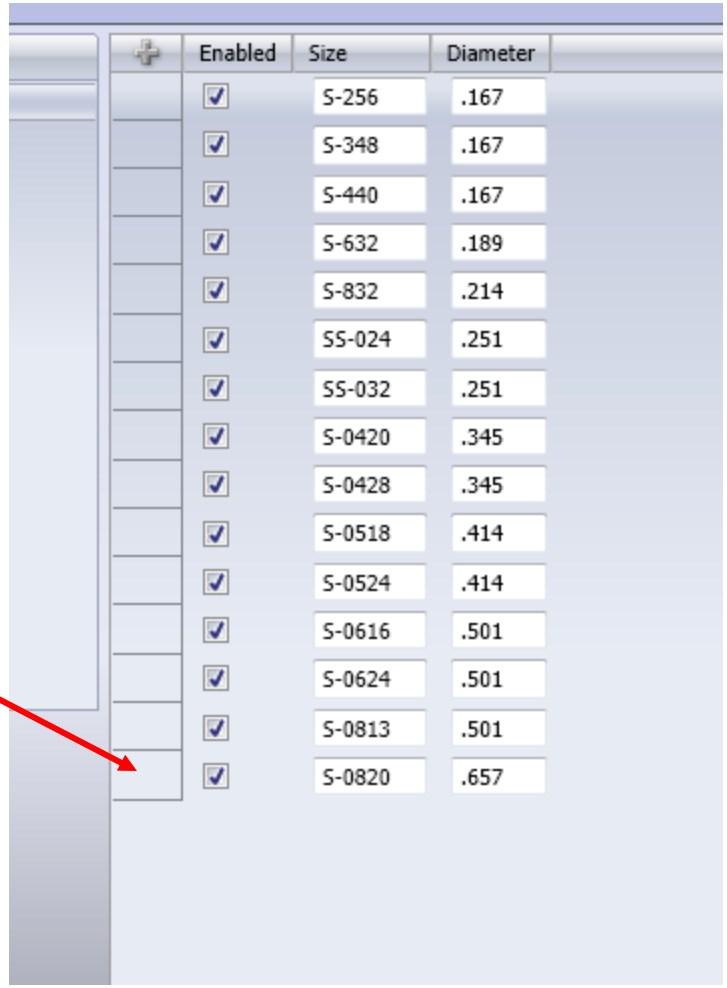
# Modifying the Hole Wizard



**Step 9**

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

Get the data from PEM

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

# Modifying the Hole Wizard

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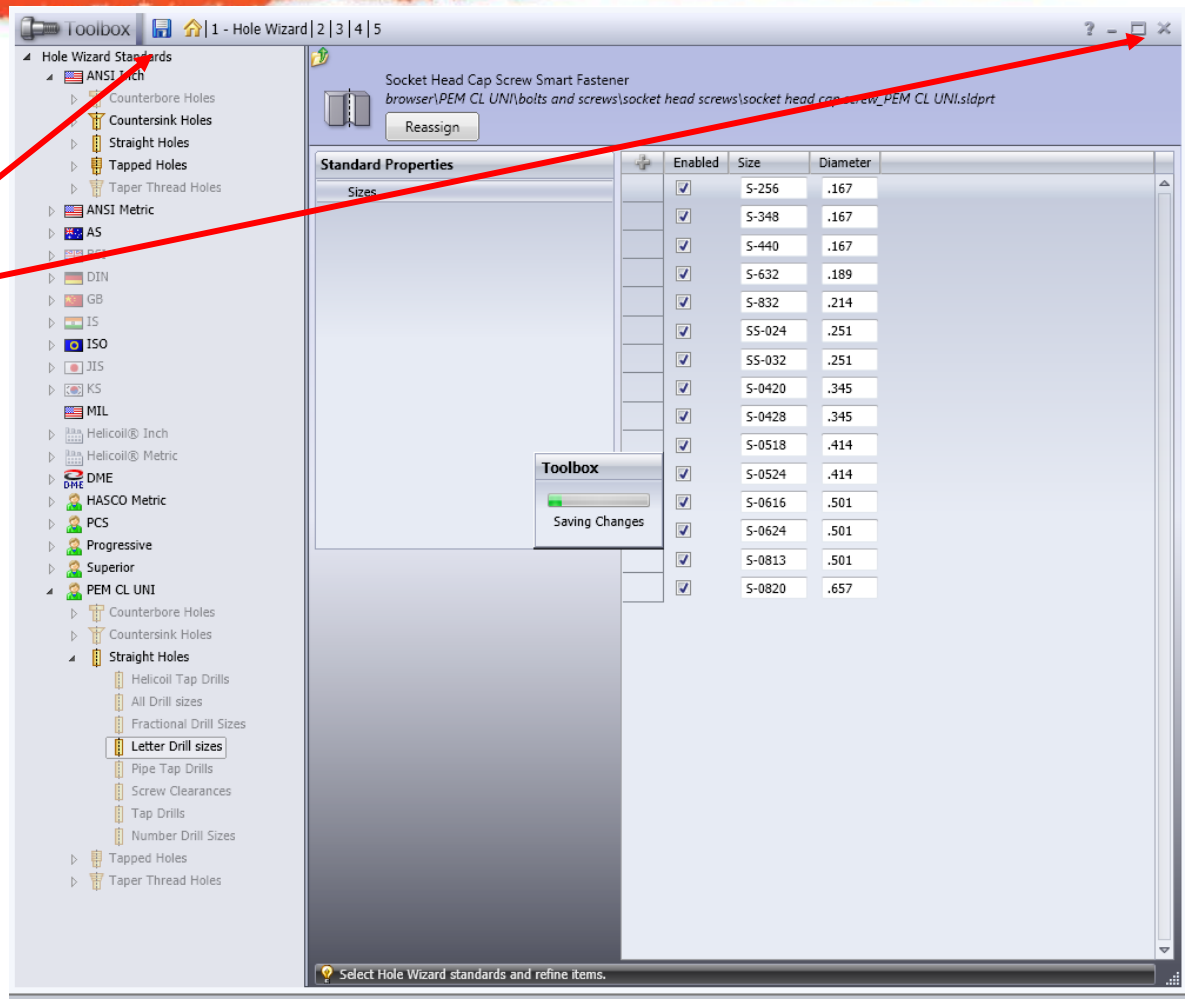
## Step 10

Save and close

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

# Modifying the Hole Wizard

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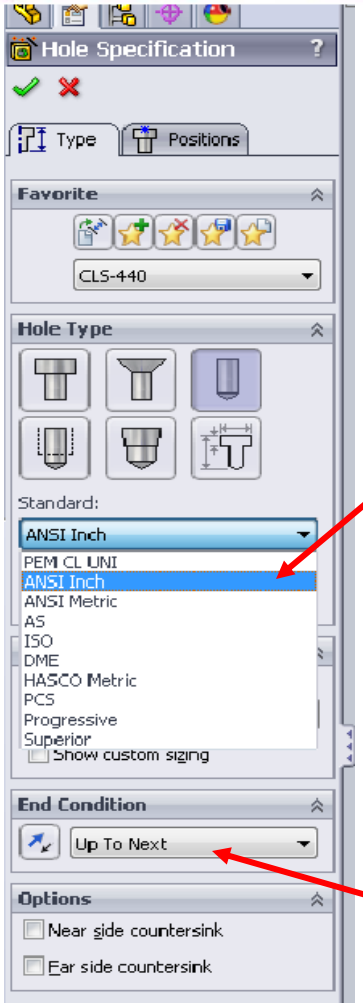



**Step 11**

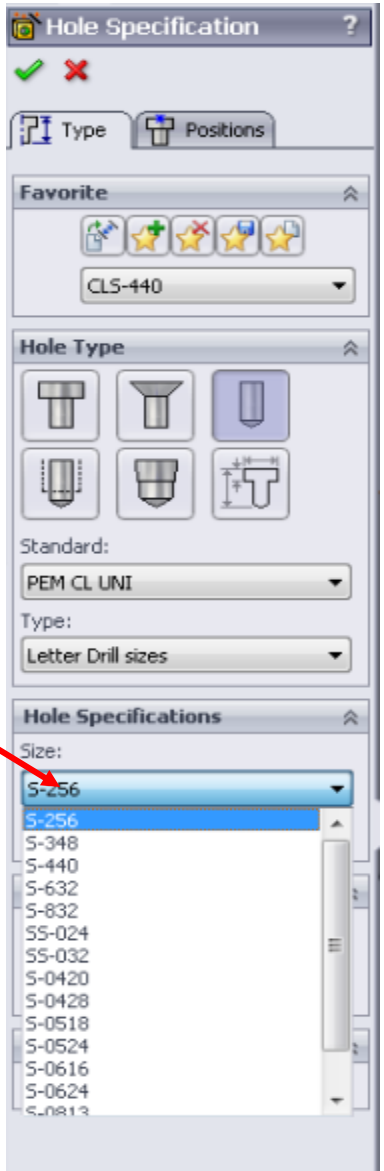
Add Hole wizard to a part Select

"PEM CL UNI"

**Step 12**

Choose your Hardware

***For sheet metal use up to next***



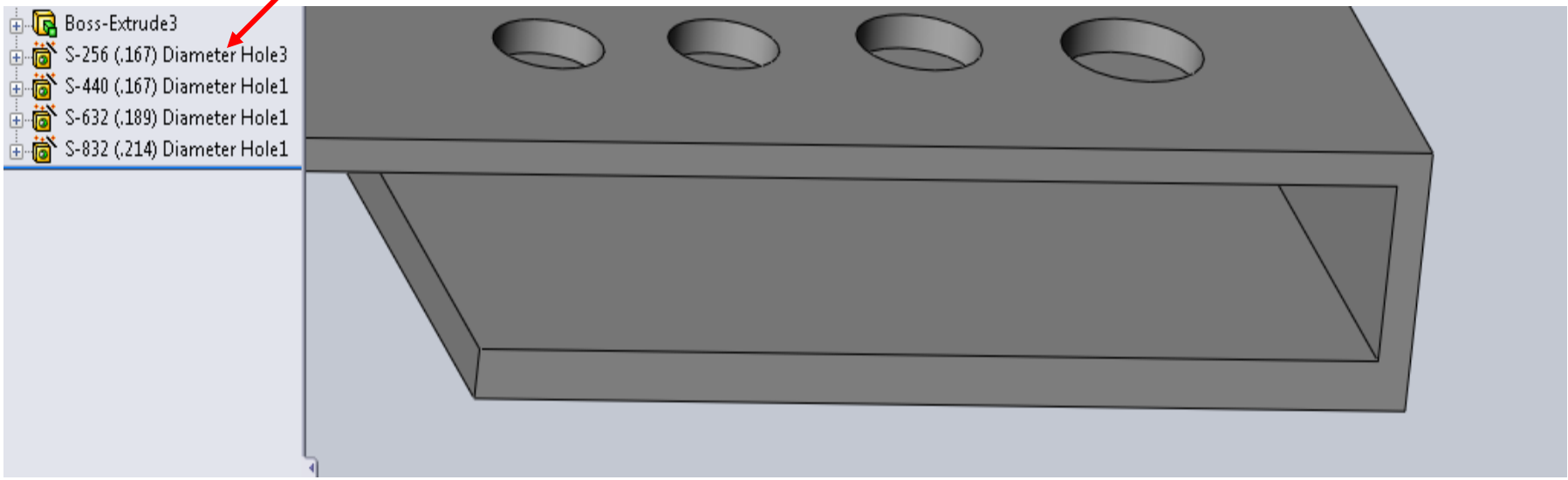

RAPID SHEET METAL INC

# Modifying the Hole Wizard



**Step 12**

Enjoy the benefits of A clean nice looking tree

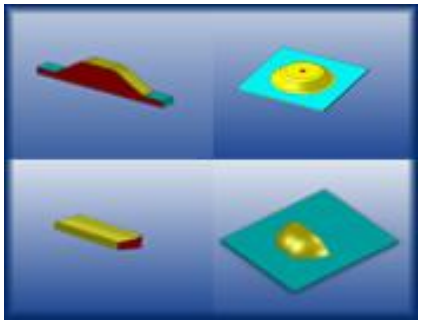


# Rapid Sheet Metal online Form Tools



Why use a form tool from the Rapid Tooling Library?

- Save Time!
- Save Money!

www.rapidsheetmetal.com/tooling

RAPID SHEET METAL INC

# Rapid Sheet Metal online Form Tools

SOLIDWORKS

NESWUC 2012

Step 1 www.rapidsheetmetal.com

Step 2 Click Rapid tooling library



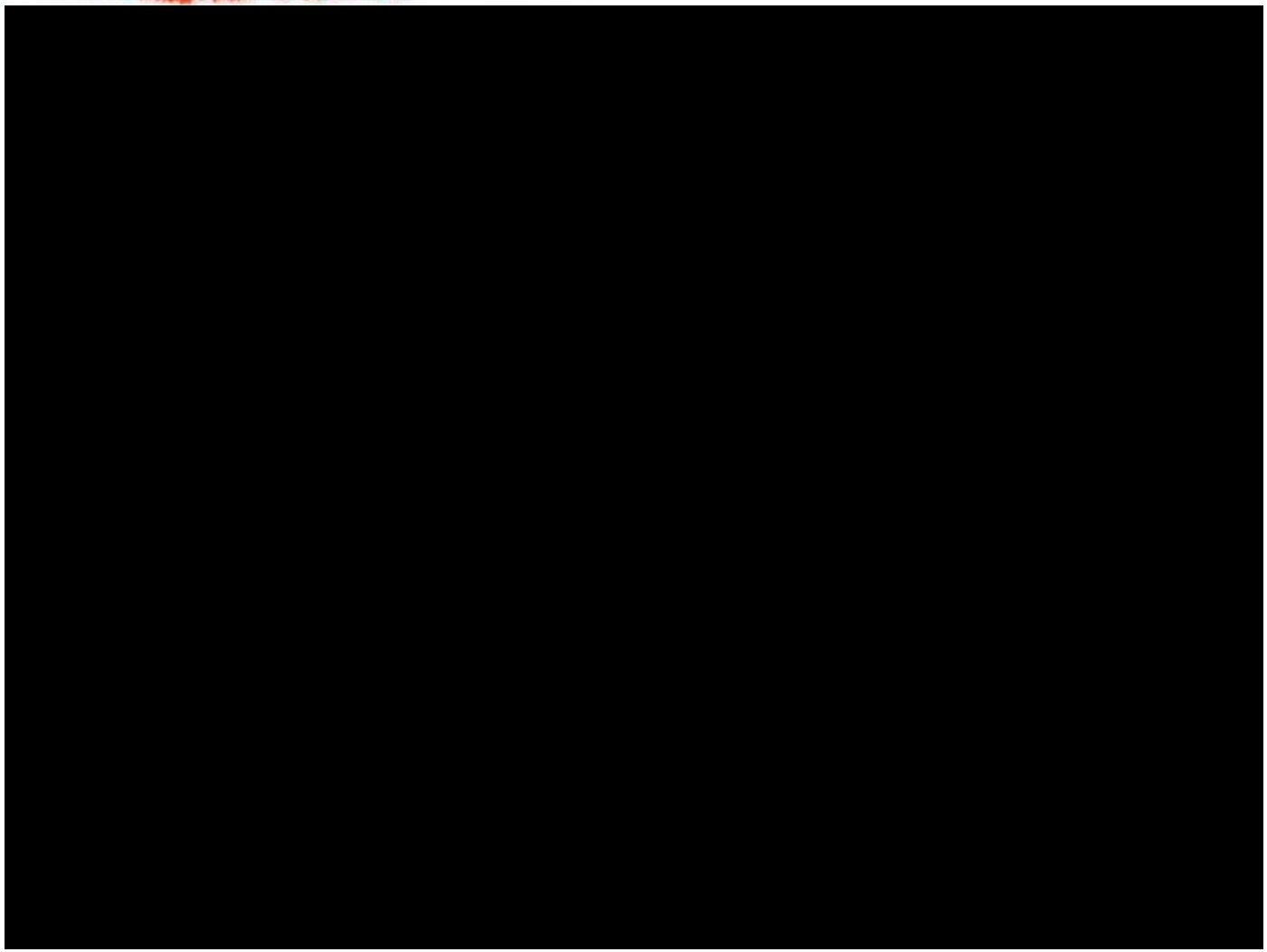
RAPID SHEET METAL INC

# Rapid Sheet Metal online Form Tools



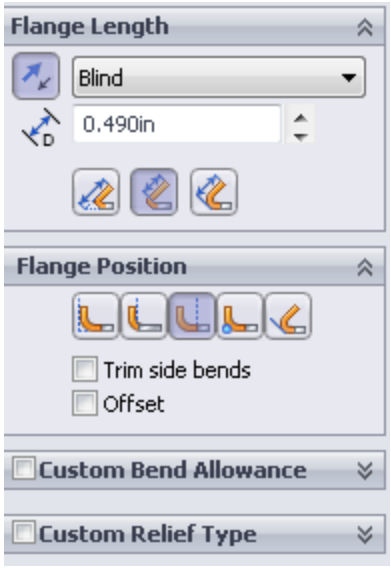
**Step 3**
Choose a file

**Step 4**
Download and drag onto a sheet metal part



RAPID SHEET METAL INC

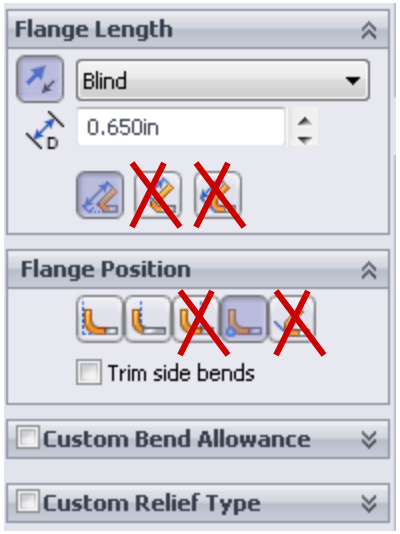
# Setting I wish could be set as default




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




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.

# Setting I wish could be set as default

Show demonstration

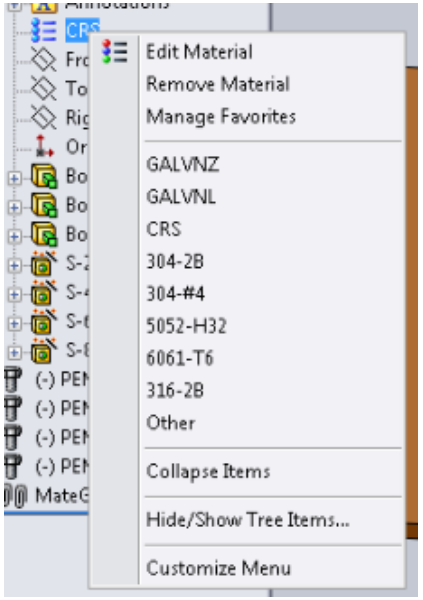
# Sheet Metal Material List

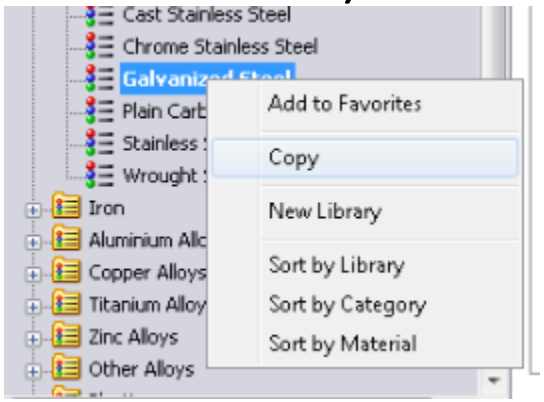


You can build this list from SolidWorks Materials

- 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 |

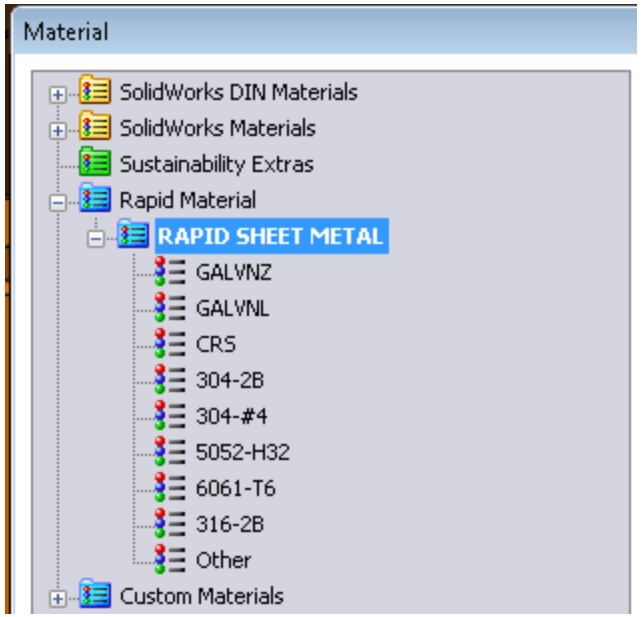



RAPID SHEET METAL INC

# 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

RAPID SHEET METAL INC

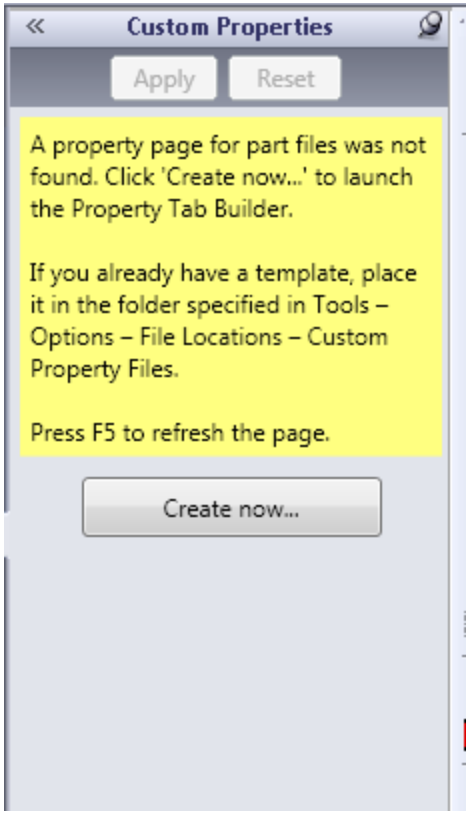
# Setting I wish could be set as default



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

# Custom Properties –






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.

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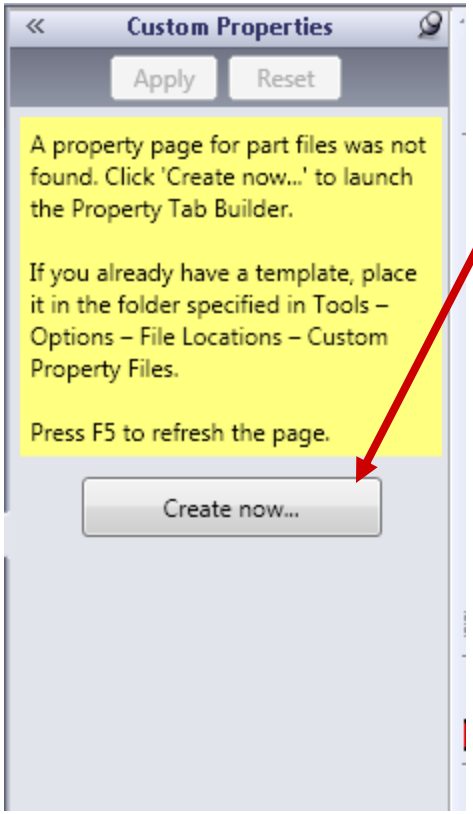
# Custom Properties –



Step 1 Click “Create Now..”





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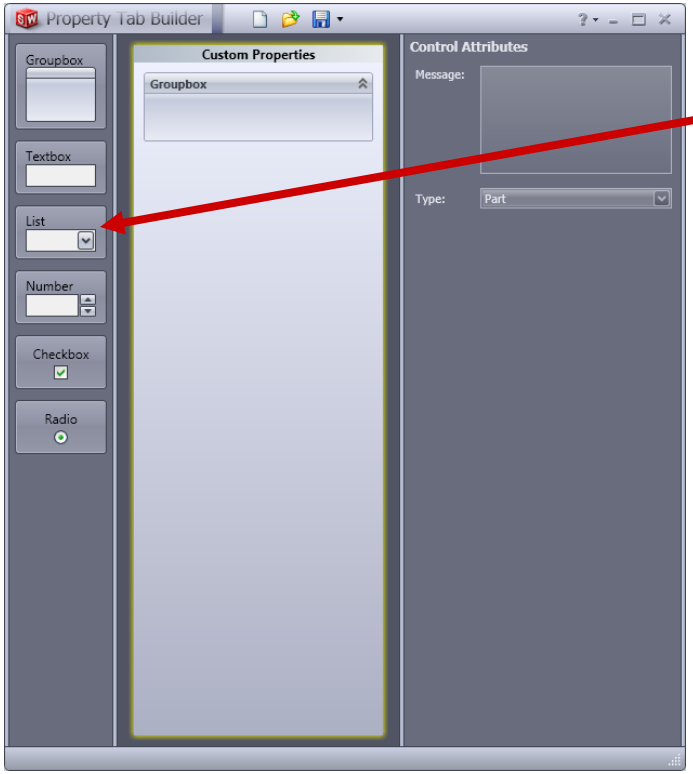
# Custom Properties –

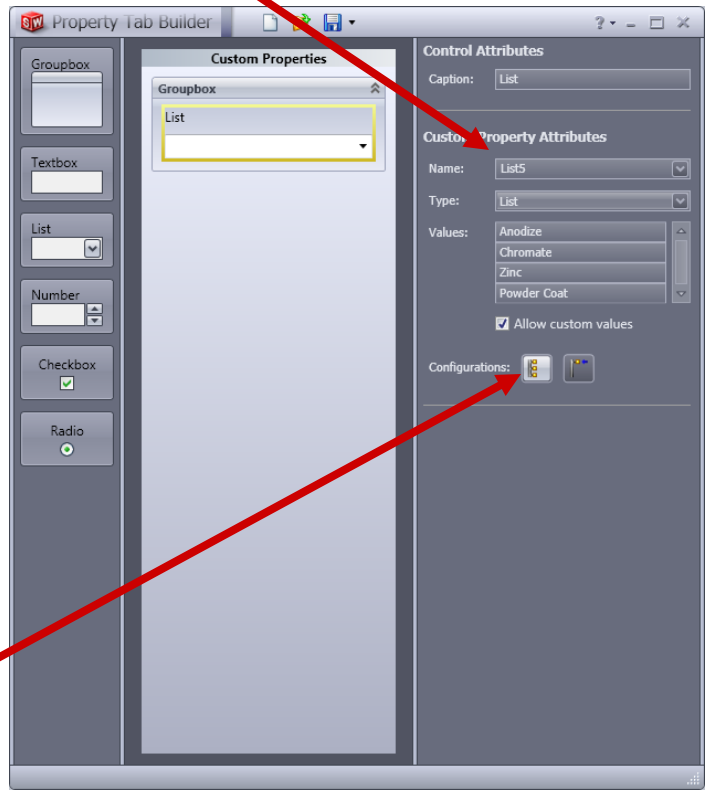
SOLIDWORKS

NESWUC 2012




Step 2 Click “List”

Step 3 Add your values




Step 4 Set to Custom Tab

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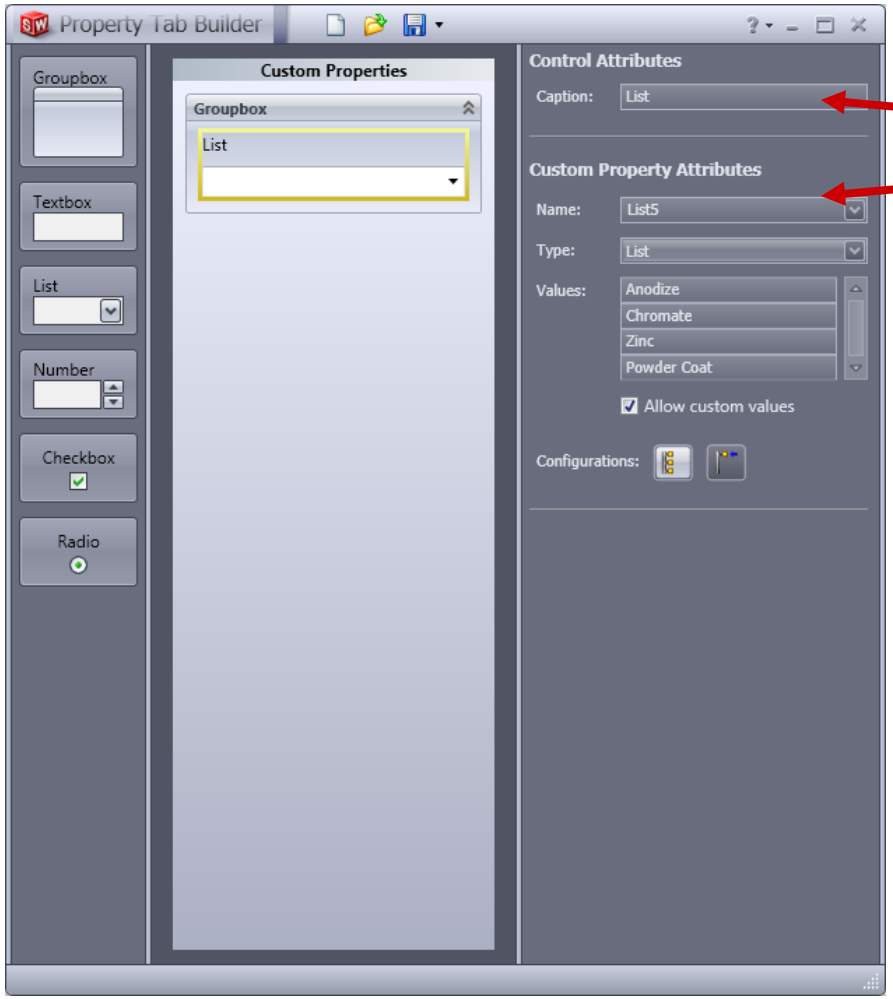
# Custom Properties –






Step 5 Change These to “Finish”

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

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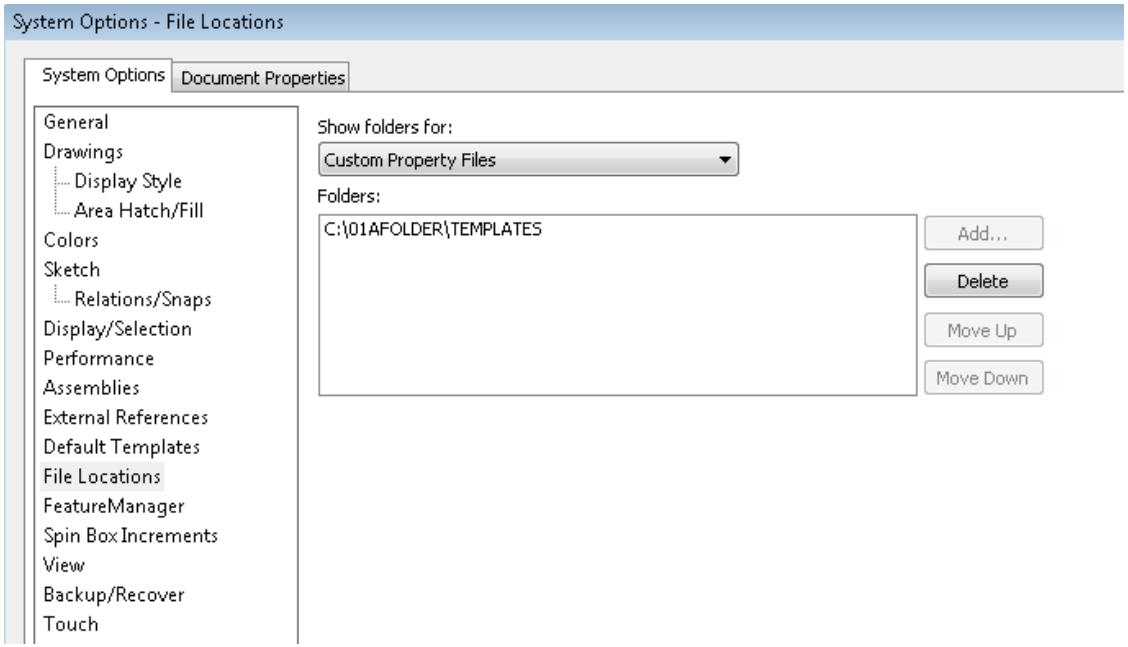
# Custom Properties –






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

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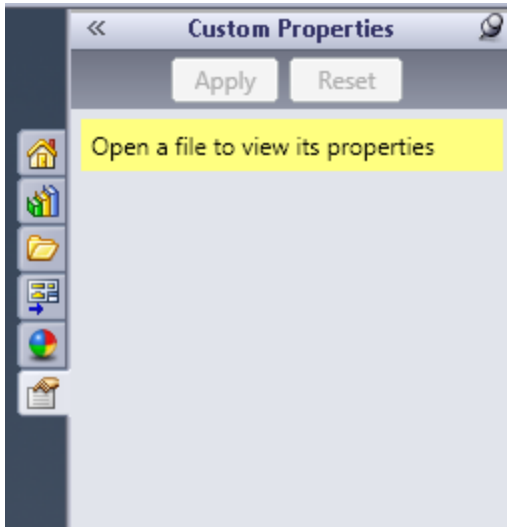
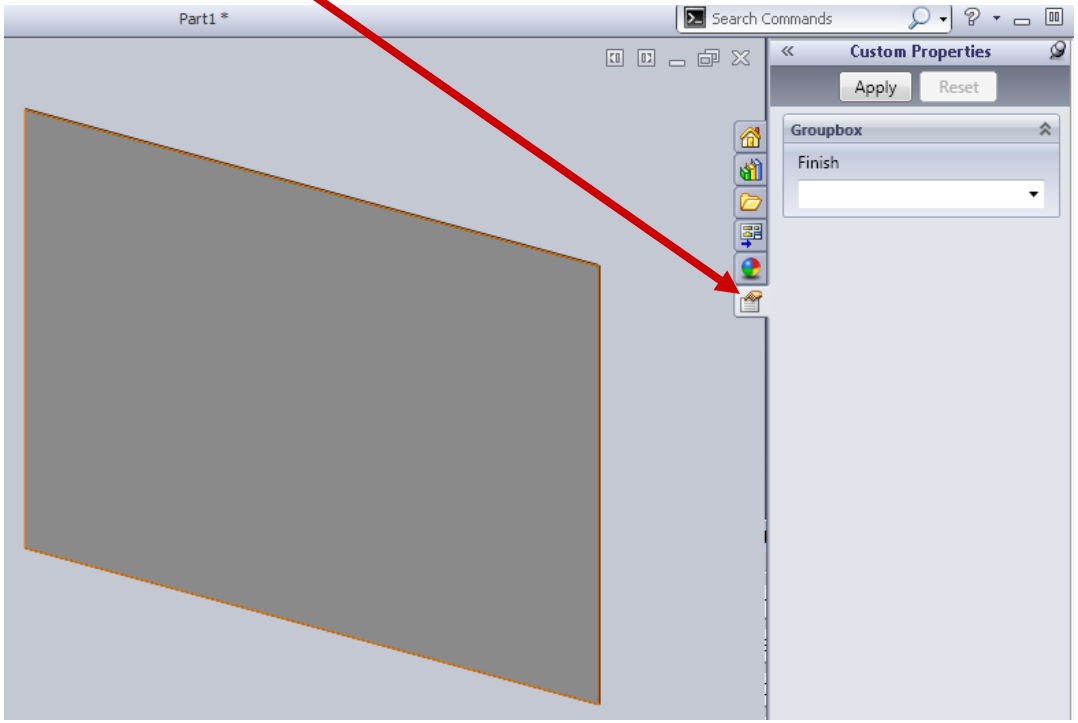
# Custom Properties –

SOLIDWORKS

NESWUC 2012

Open a part and click

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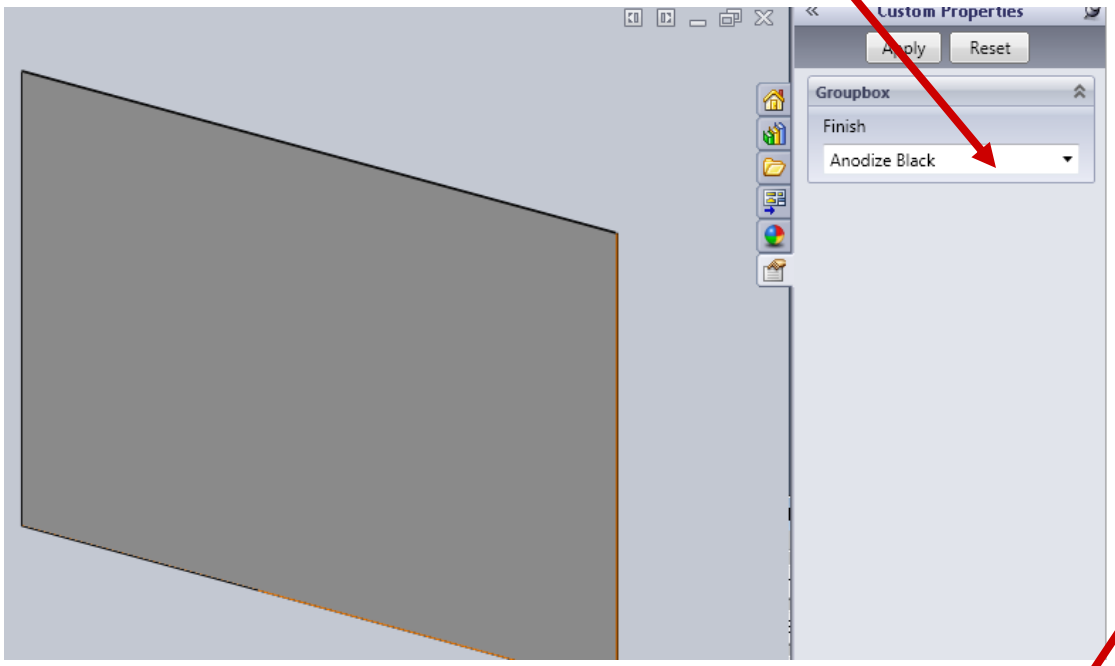
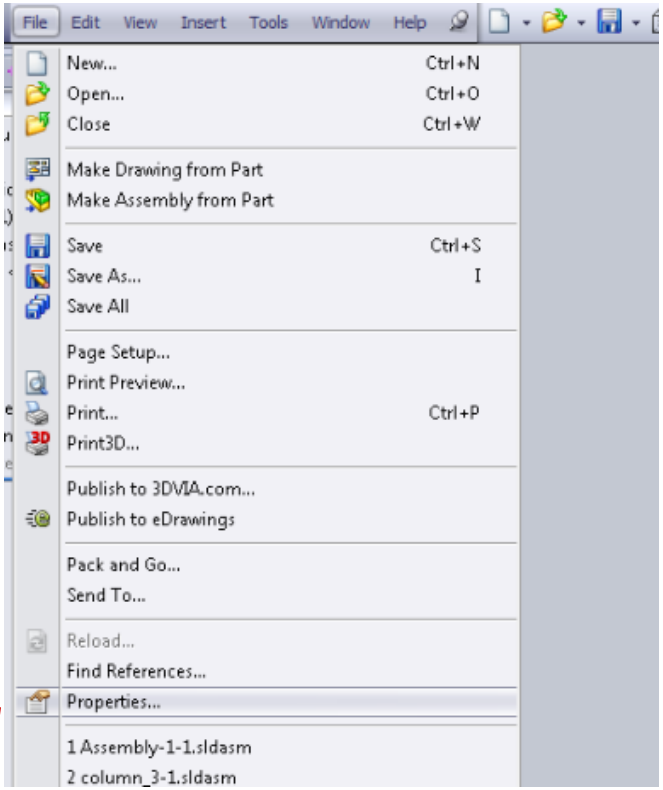
# Custom Properties –

SOLIDWORKS

NESWUC 2012

Now set your finish value and apply




This is now added to your part properties

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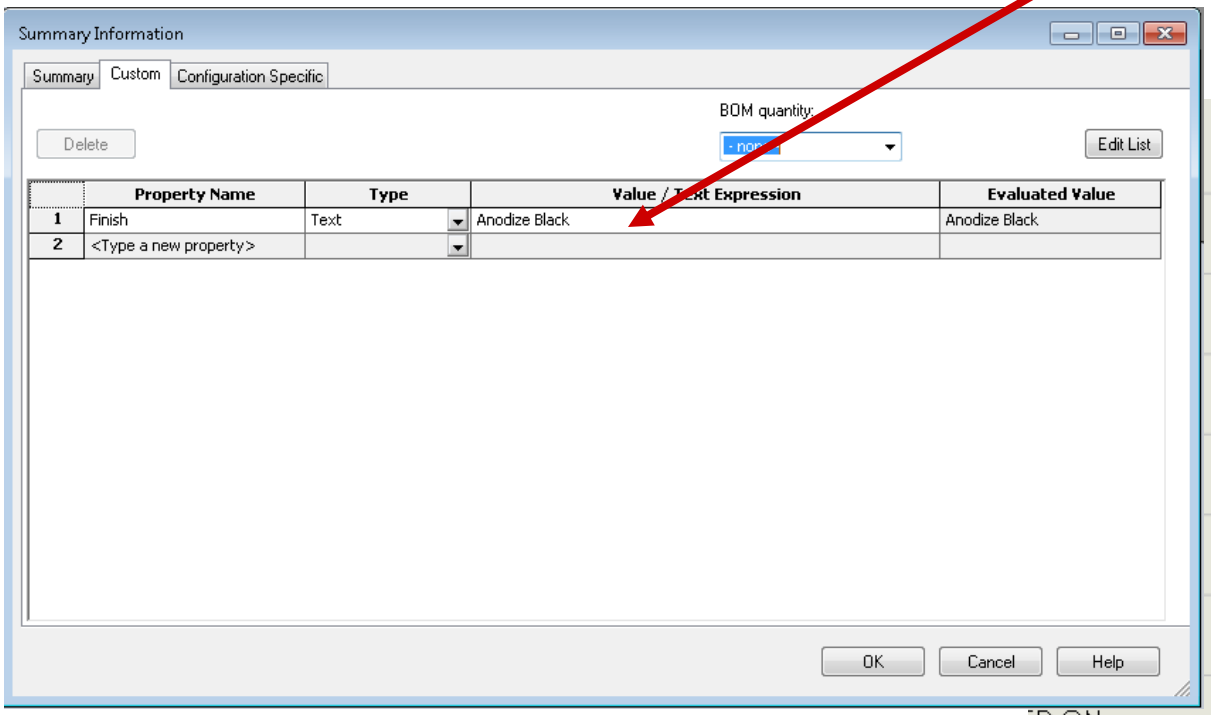
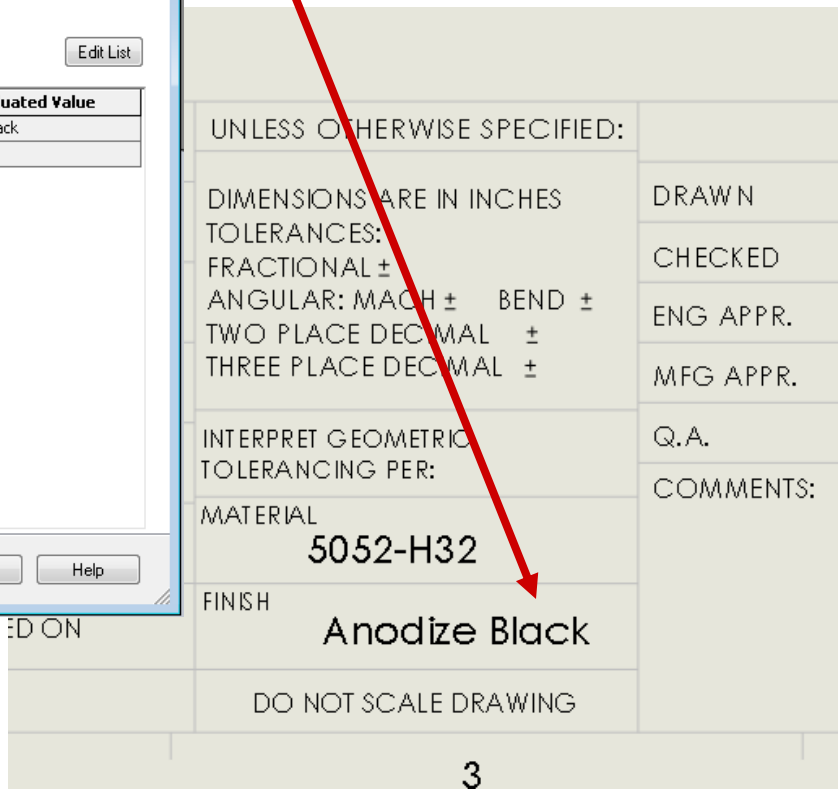
# Custom Properties –

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

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# Custom Properties –

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

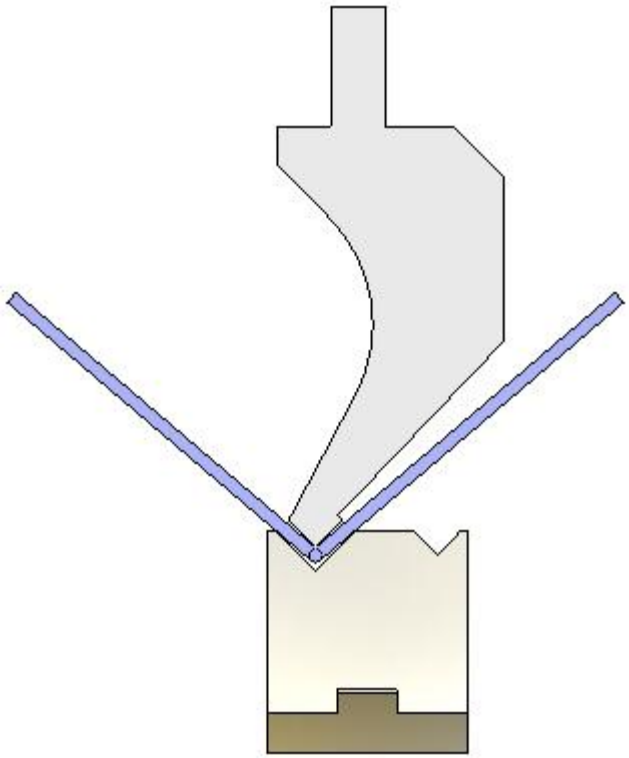
Plating

| 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.** |

RAPID SHEET METAL INC

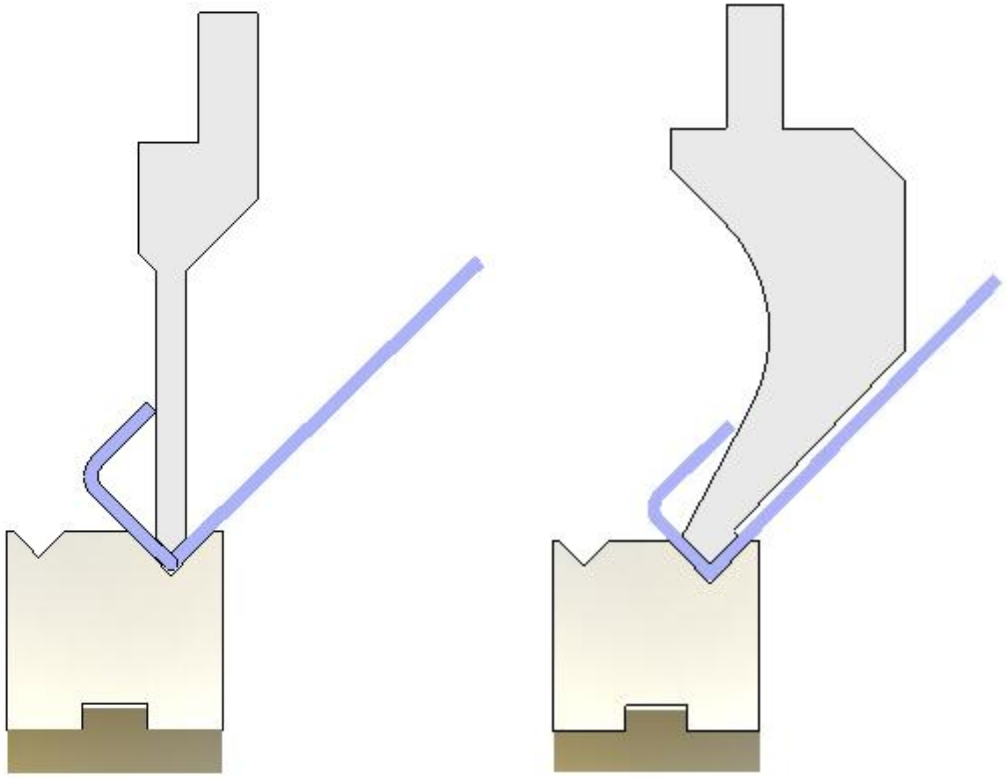
# Forming tools

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



# Forming tools

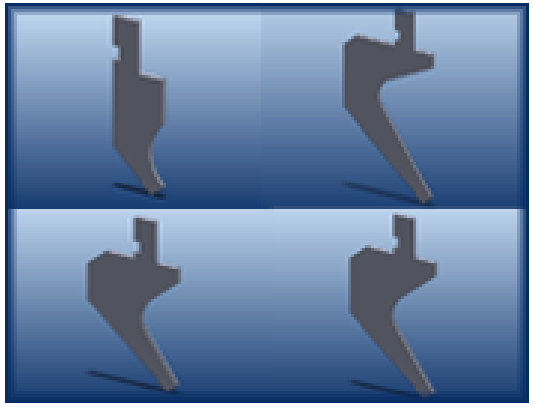
- Badly designed return flanges crash into the tooling



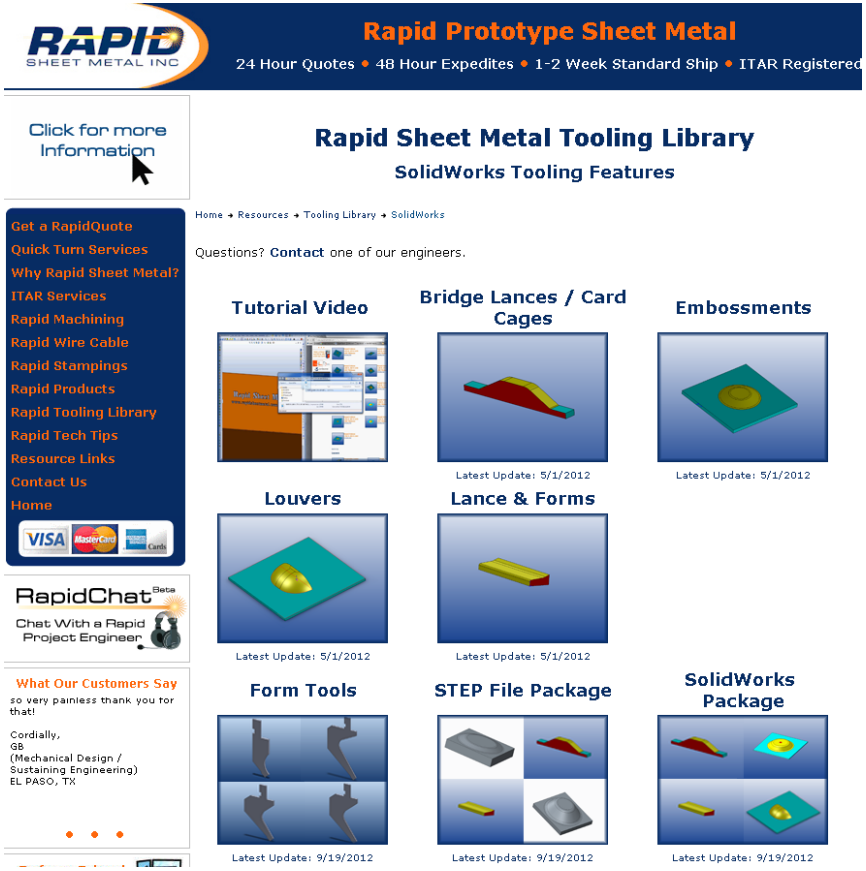
# Forming tools

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

### Form Tools



Latest Update: 9/19/2012

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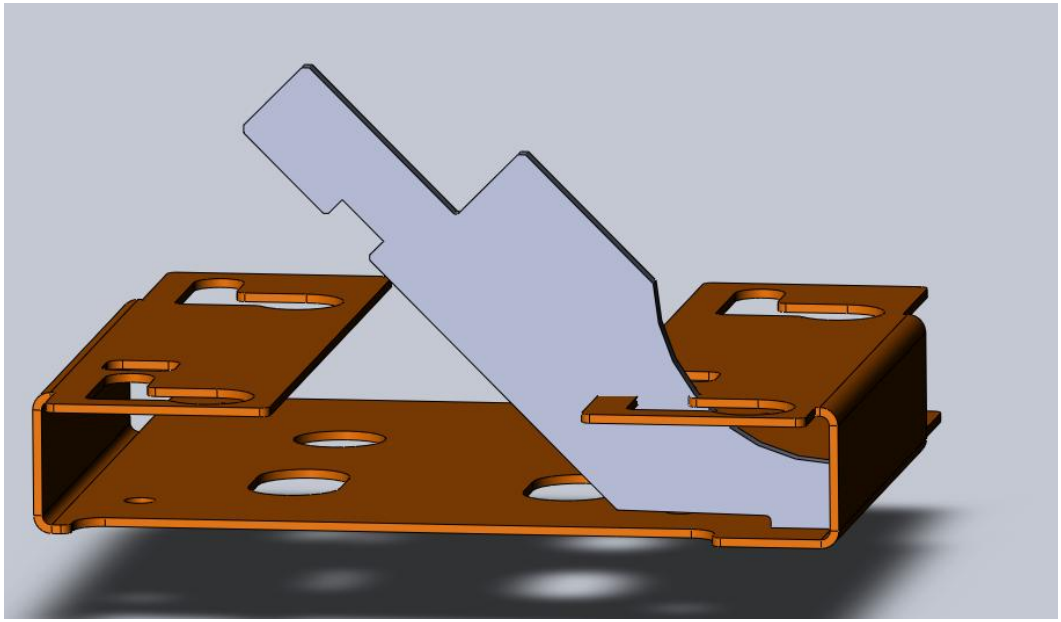
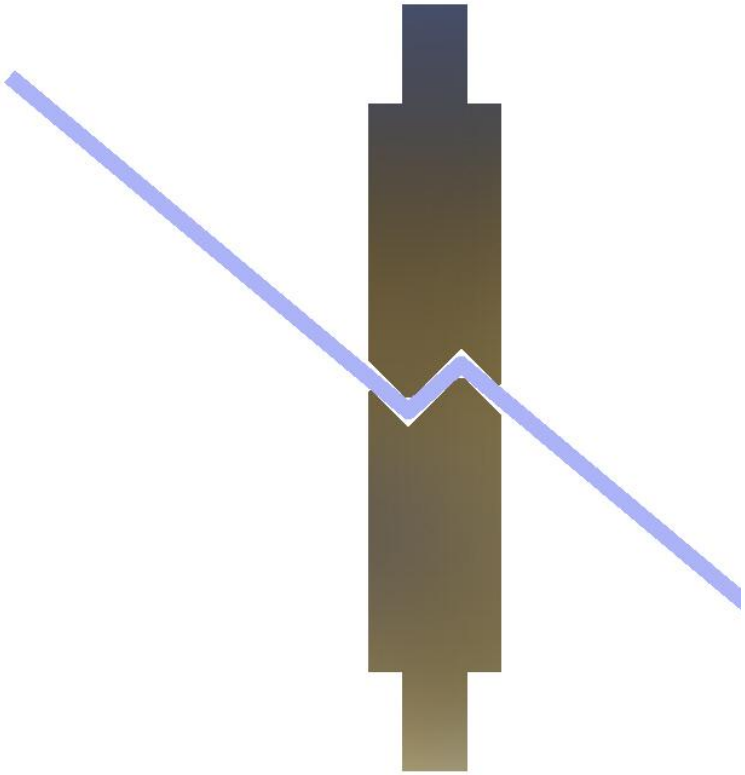
# Forming tools

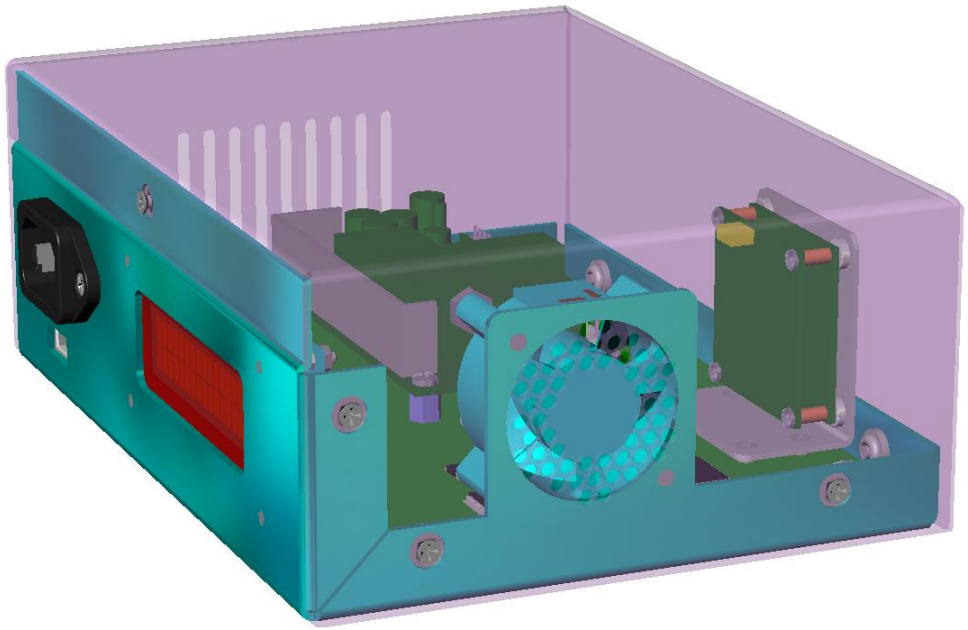
After downloading the punch tooling add a punch tool to your assembly. This will show how much room you will have.



# Forming tools

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

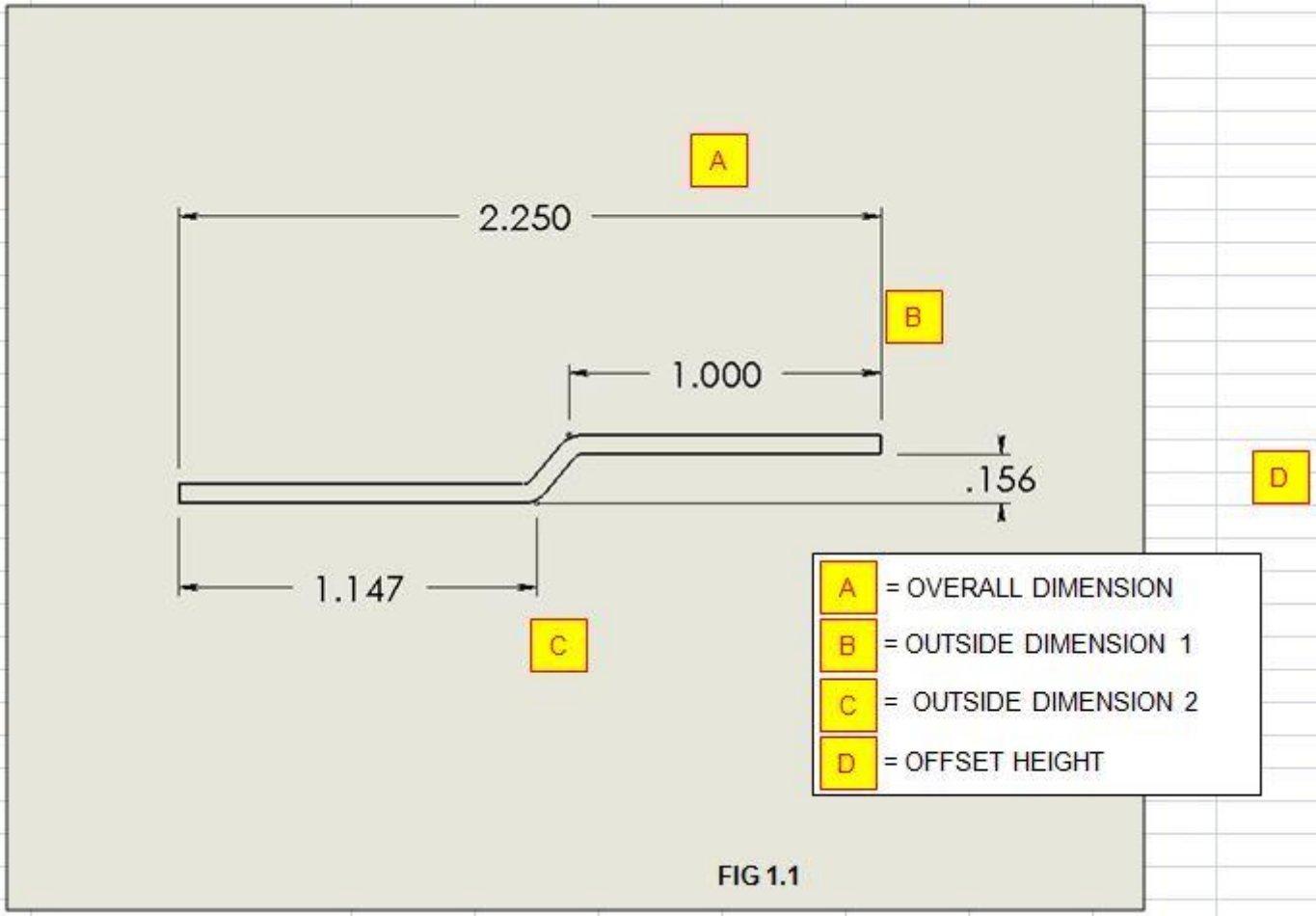




# Forming tools

- How to measure Offset – (JOG)

Standard Sizes

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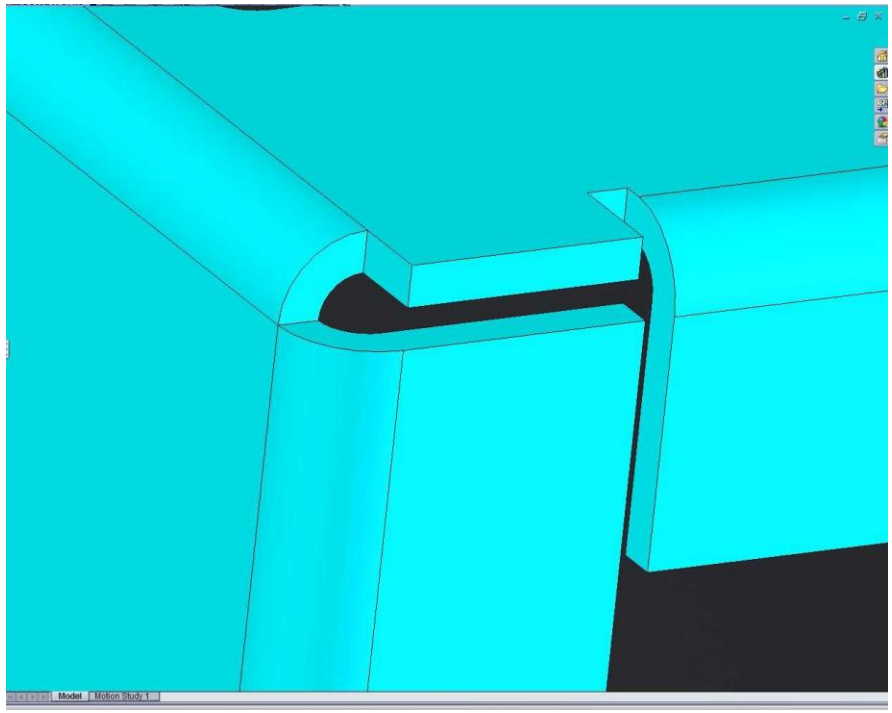
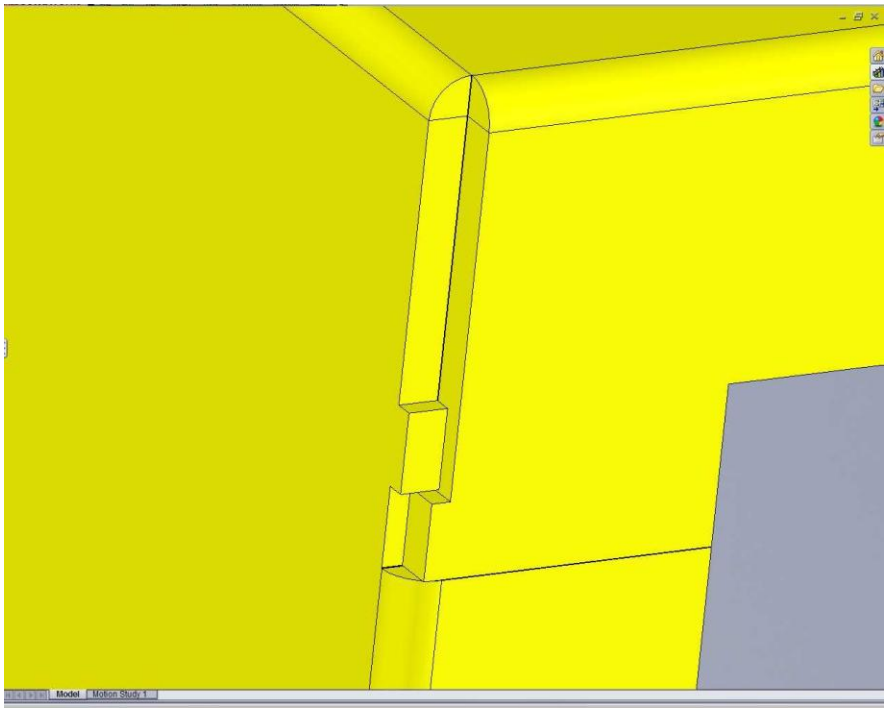
# Before and after

Before



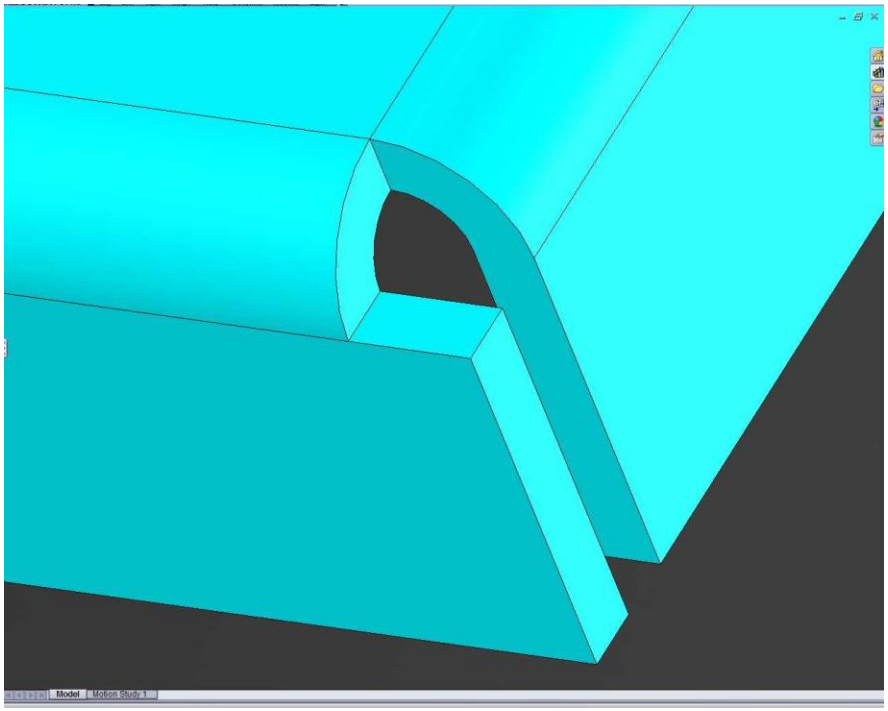
After



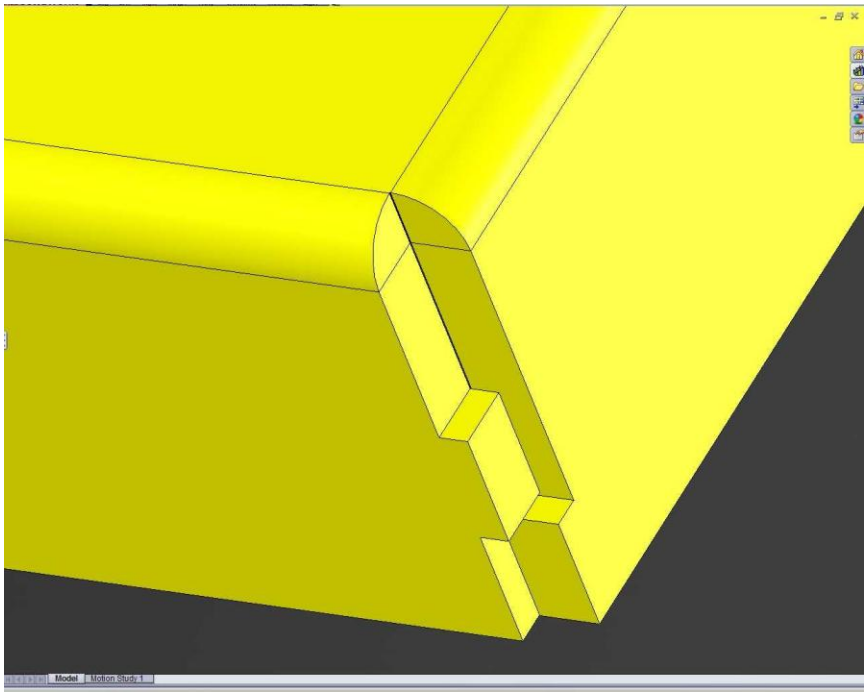
RAPID SHEET METAL INC

# Before and after

Before



After



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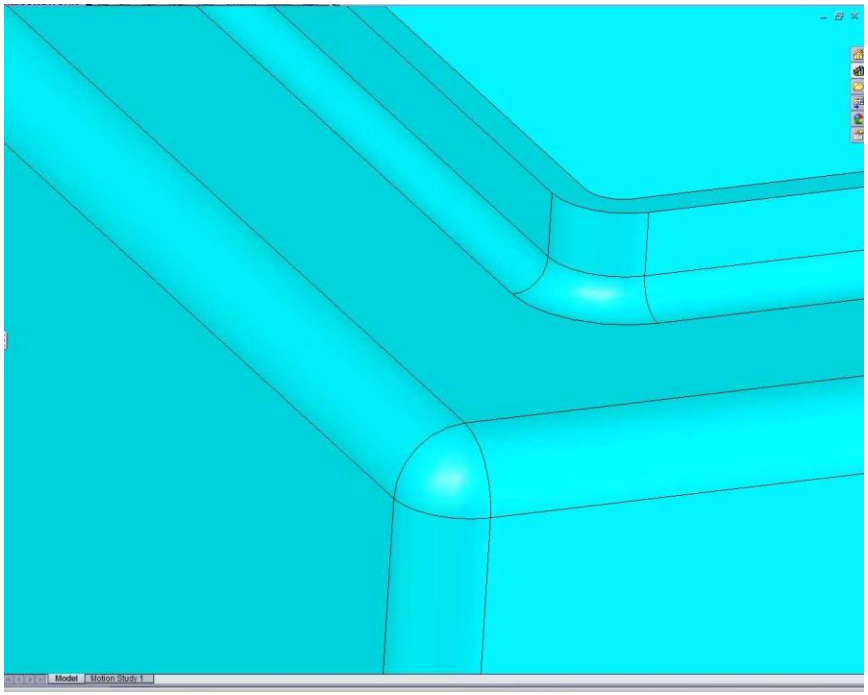
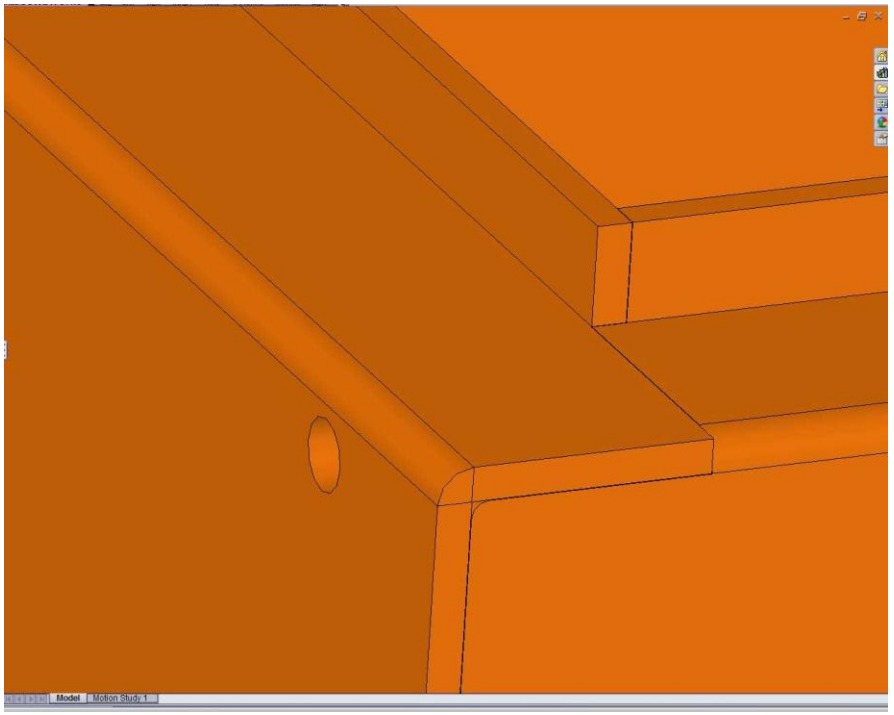
# Before and after

Before



After



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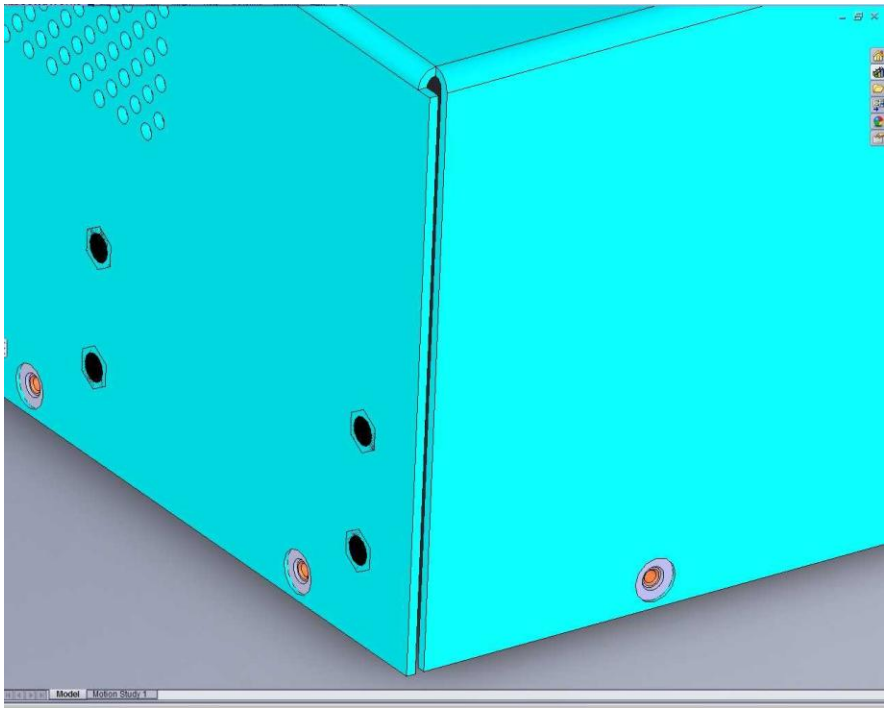
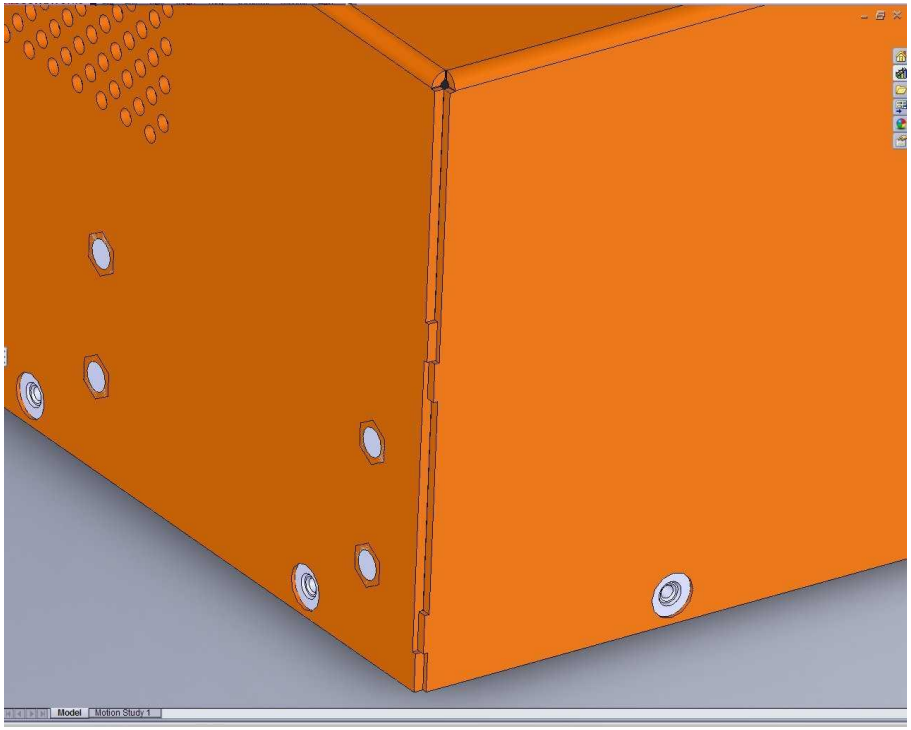
# Before and after

## Before



## After



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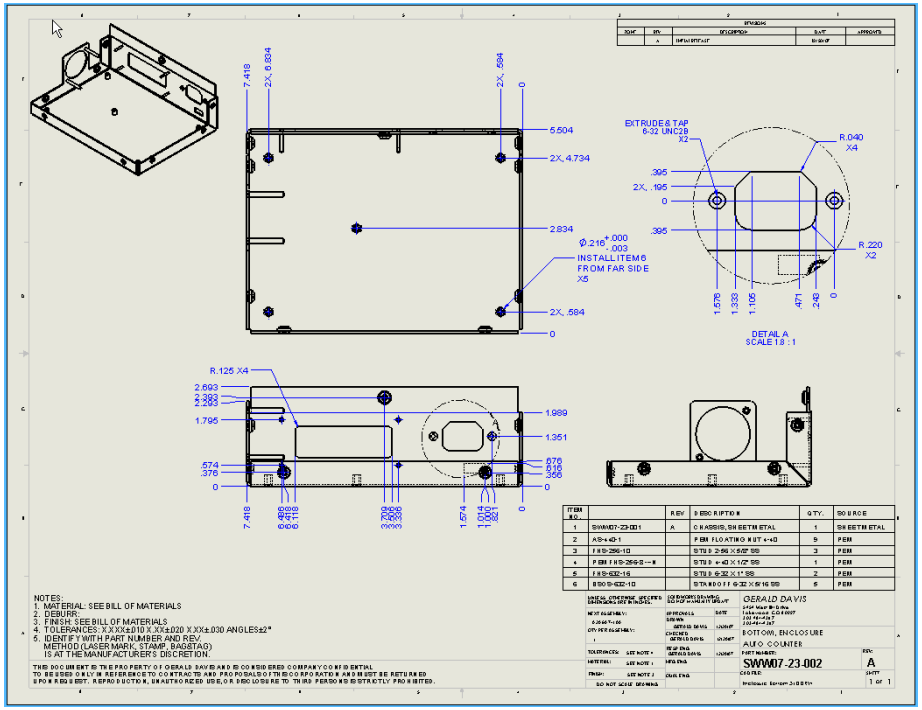
- Paper size – B size is standard in manufacturing
- Pretty views– easy to read
- Hidden lines / tangent lines – avoid busy confusion
- Revision notes – keep it brief
- Always provide a BOM
- Welding Notes
- Grain Direction
- Material Type - Finish

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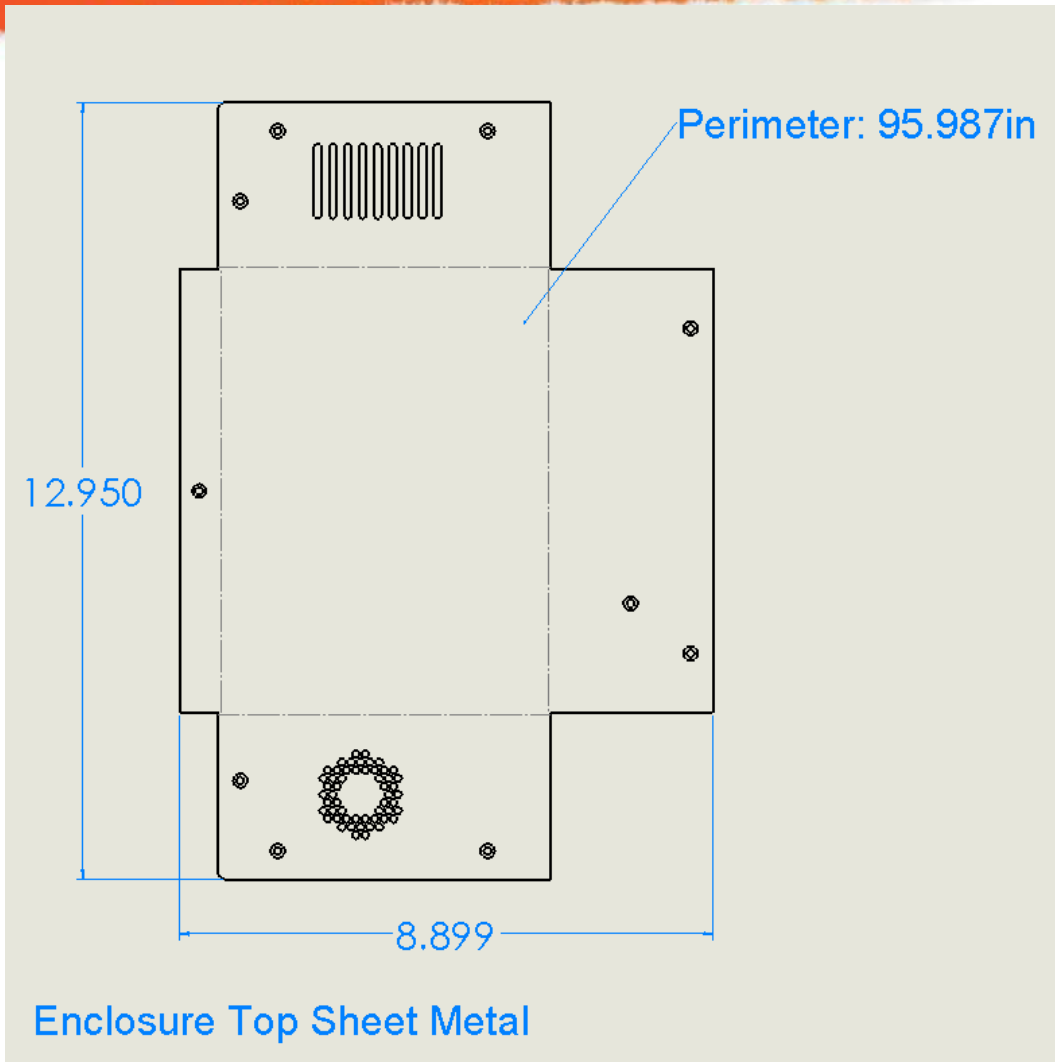
# Simple Flat

- Flat layouts
- Overall X length
- Overall Y length
- Simple Hole Chart
- Grain direction

Extra Credit

- Perimeter
- Side View Dim Thickness

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# Manufacturer wish list

- 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

RAPID SHEET METAL INC

- 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

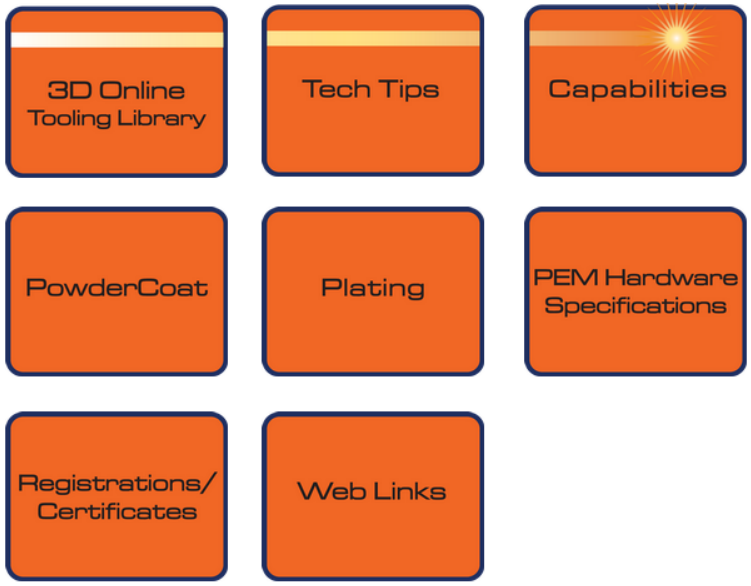


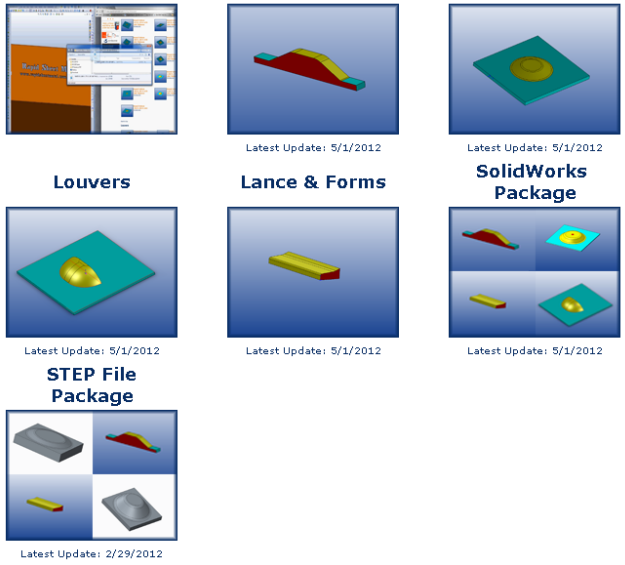
**Rapid Sheet Metal's**
web site can help!

http://www.rapidsheetmetal.com

603-831-5300


Department * Rapid Engineering Online! Customer Service Offline Send a Message

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