

Get Your Welders and Designers Connected

(20-Plus Tips on Using Welds in Inventor)

Mike Hilvers (Design Engineer / CAD Management)

323109

Steve Hilvers (Design Engineer / Data Management)

Unverferth Manufacturing Company, Inc.



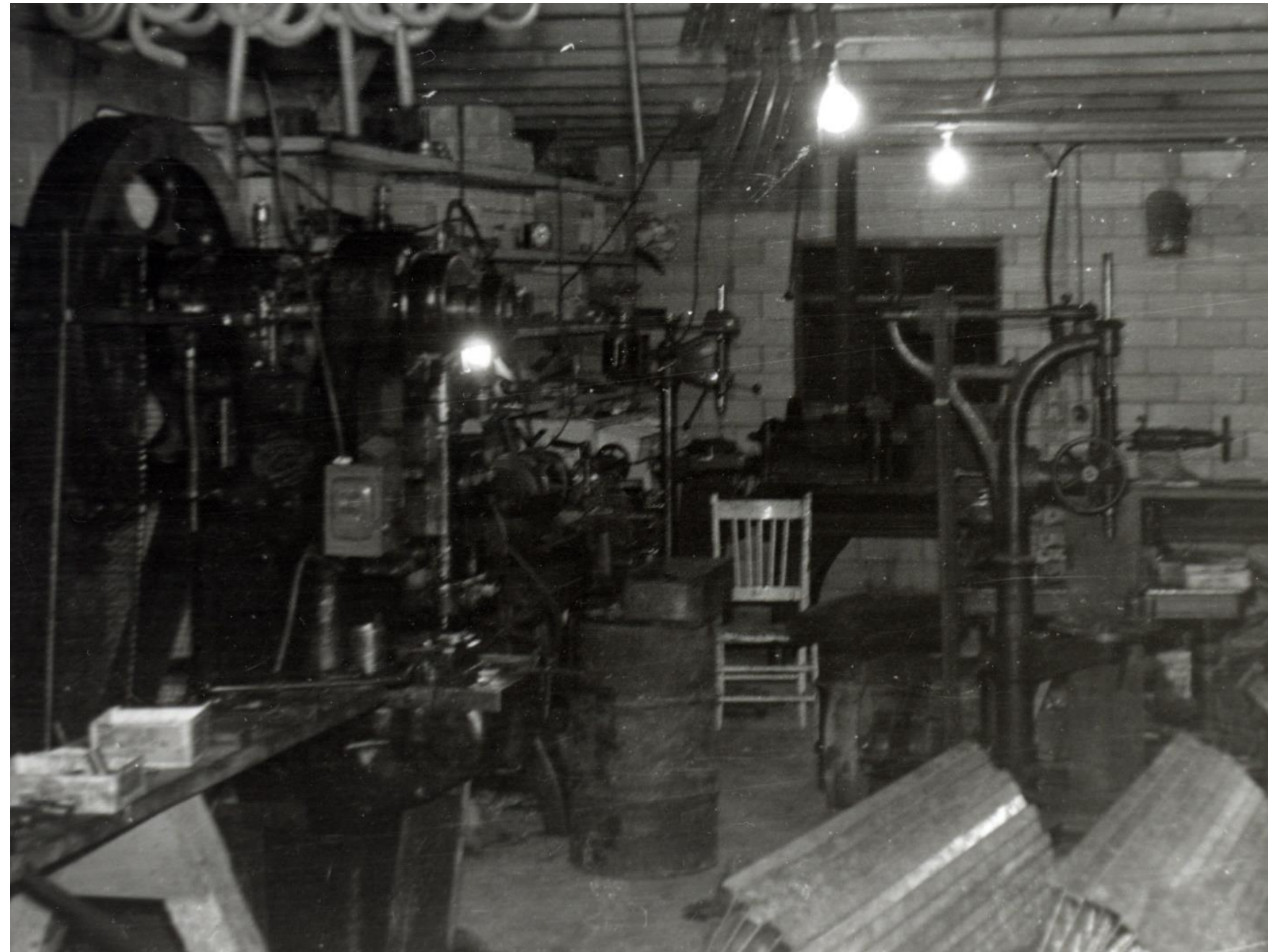


About the Speaker

Mike Hilvers (mikeh@unverferth.com)

- Design Engineer/CAD Manager/Standards Manager
- Unverferth Mfg. for 24 full time years
- BS - Agricultural Engineering from **The** Ohio State University - 1996
- Dad/Husband
- 5th Generation Farmer – Kids are the 6th
 - Established Era of Abe Lincoln Presidency
- Maker, Builder



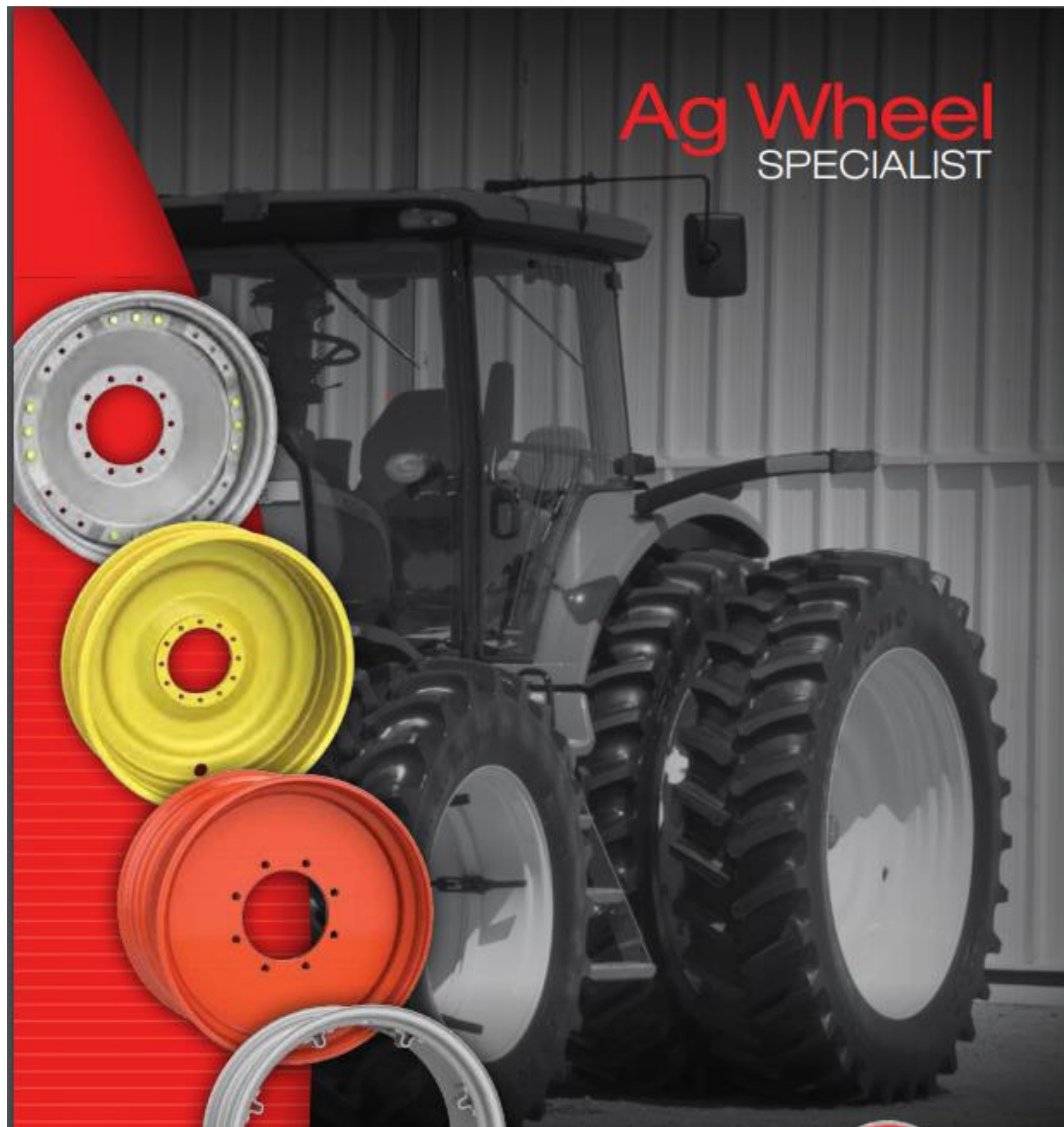


Unverferth[®]

Manufacturing Company, Inc.

Founded in 1948 by L.G. and Richard Unverferth

- Passion for Farming making neighbors more Efficient
- Started tinkering in 1938 with a Beet Blocker/Thinner
- Graduated High School – Enlisted in Navy for WW II
- Returned home in 1947 to a shortage of jobs
- His Passion survived and the business was started in 1948.

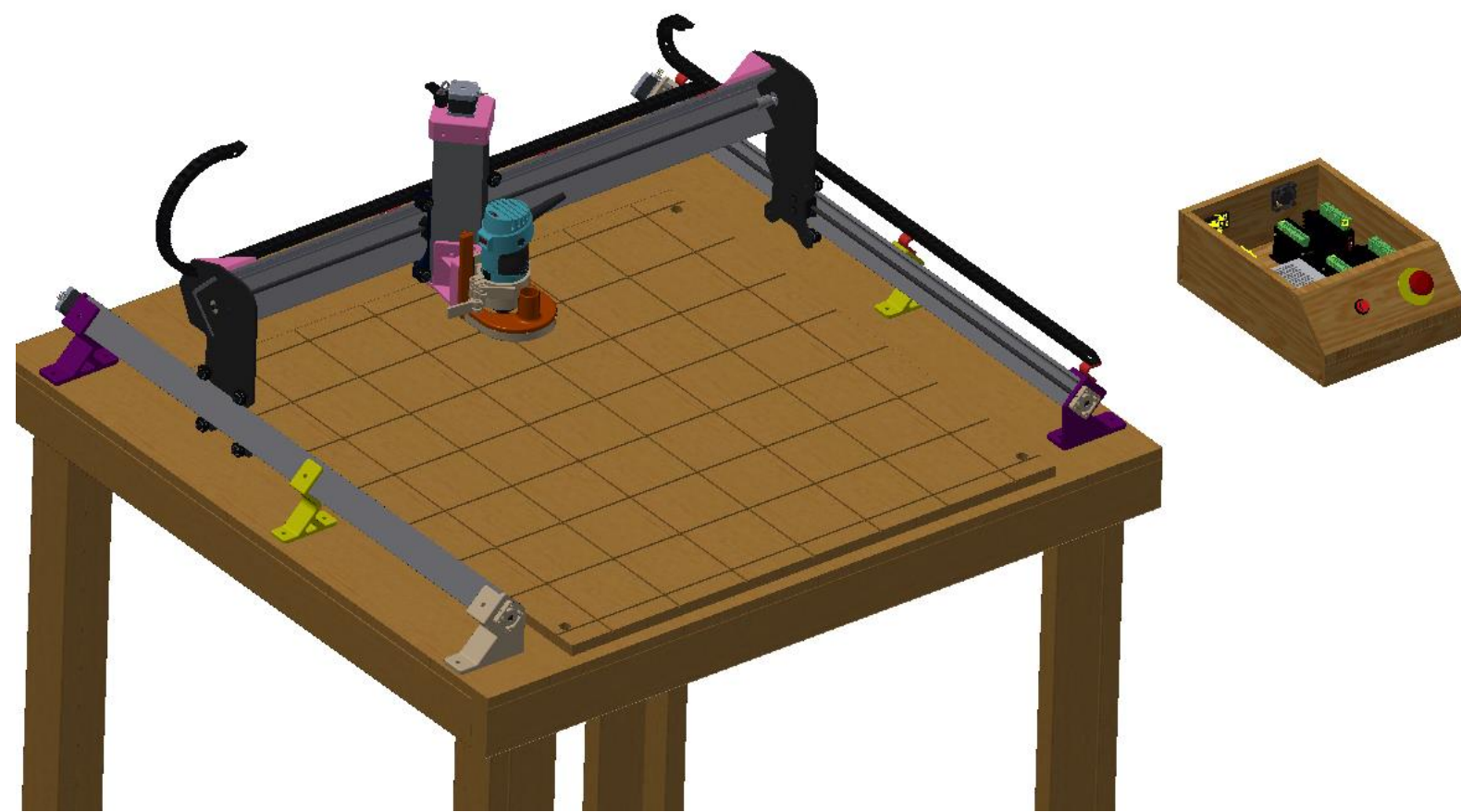


Unverferth[®]

Manufacturing Company, Inc.

- 1st Product was Steps and Levers for Tractors.
- 1950's Invented Dual Wheels
- Grain Handling, Seed Conveying, Chemical Application, Tillage & Wheel Systems continue.
- 2 Locations in Ohio, 1 in Iowa
- Warehouses throughout US and Canada
- Ship through Out North America, Brazil and Europe.

Innovating for the Efficiency of Farmers



About the ~~Co~~-Speaker

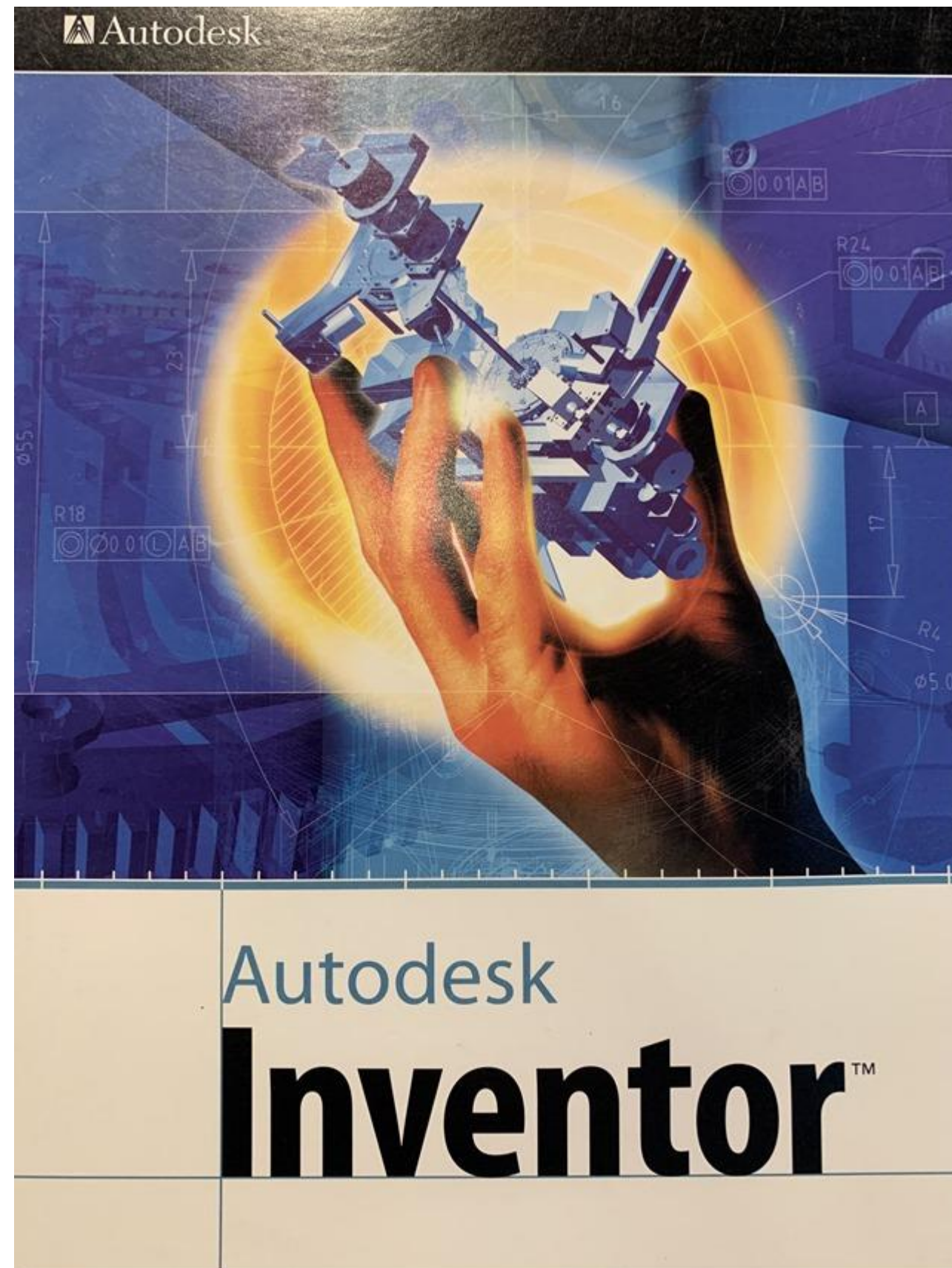


Steve Hilvers (steveh@unverferth.com)

- Design Engineer/CAD Manager/ Data Management / Sales Configurator
 - Unverferth Mfg. for 30 years
 - BS - Agricultural Engineering from **The** Ohio State University - 1994
 - Autodesk Products 29+ years
- Husband, Dad
- Township Trustee
- Woodworker / Maker / Builder / Tinkerer



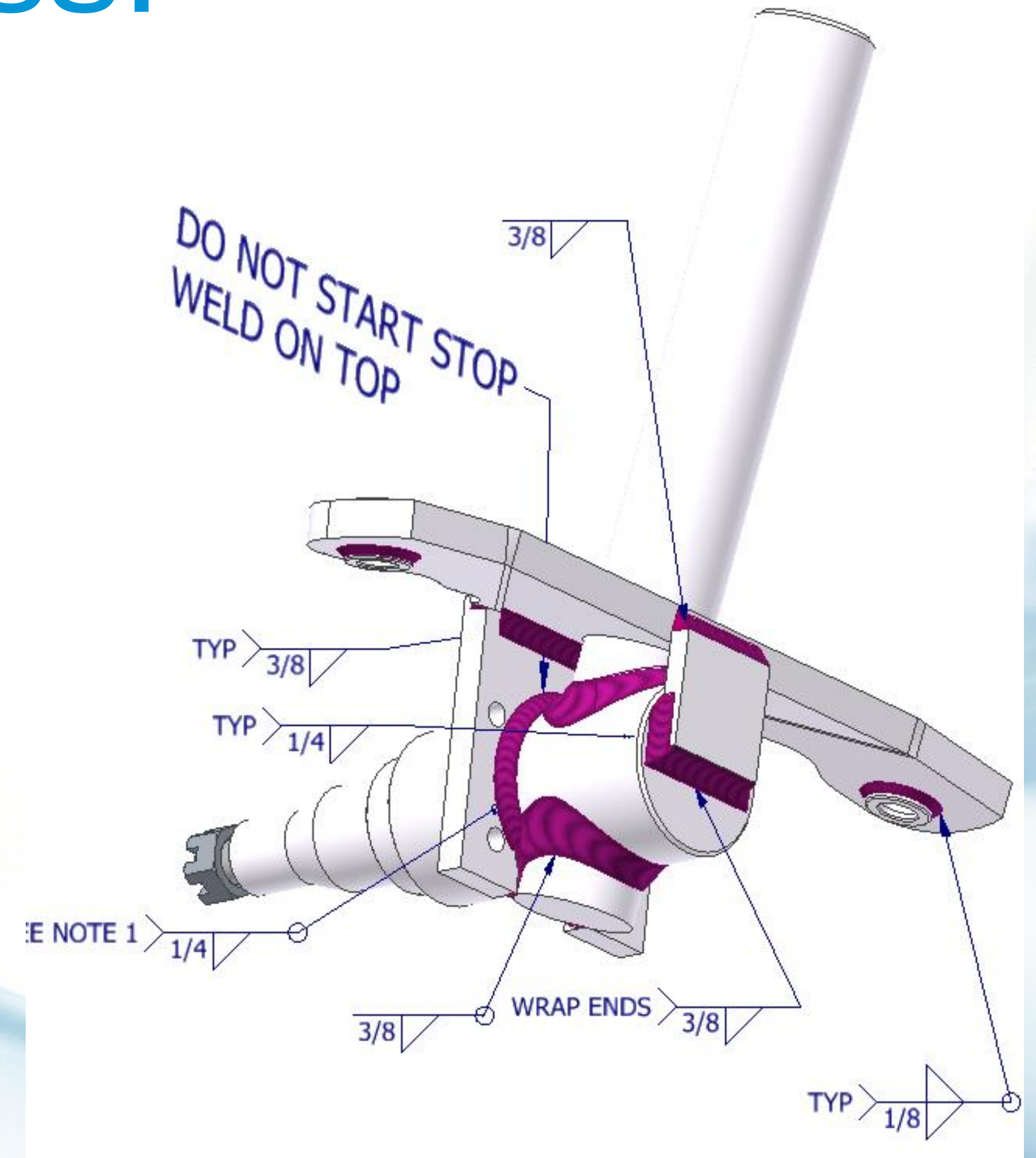
Autodesk & Unverferth History



- Autocad (~1990)
- Mechanical Desktop (~1994)
- Rubicon (aka Inventor) 20+ Years
- Productstream (aka Vault Professional) 17+ years
 - One of the first implementations of Vault Pro in North America
- FEA and Simulation
- Generative Design will be the next revolution

Objectives in the Class:

- Why should you model your welds?
- Basics of the Weld Environment
- Tips for modelling welds - even the tricky ones
- Deliver your weld data to the production floor



Objective 1:

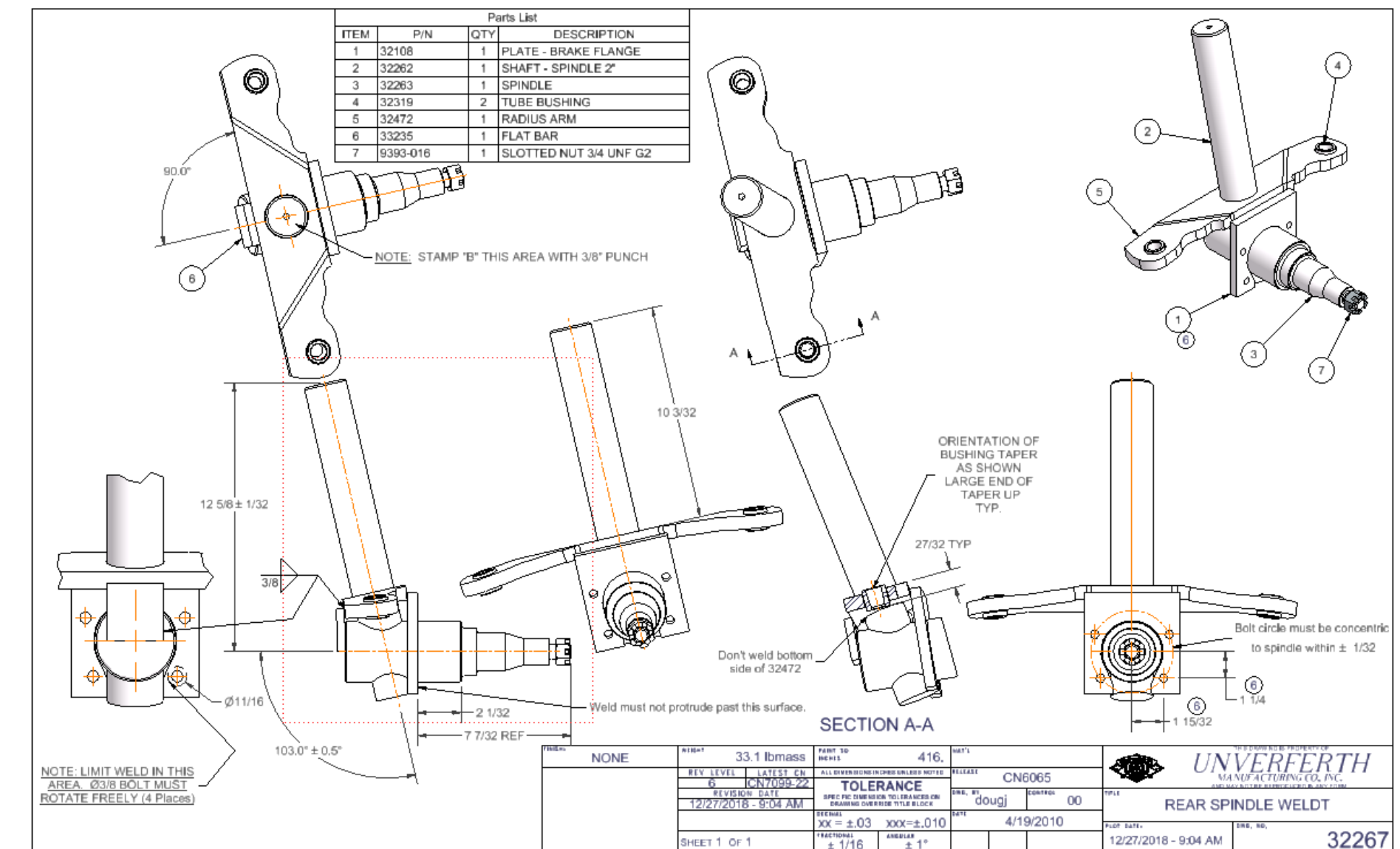
Why should you
model your welds?

Why should you model your welds?

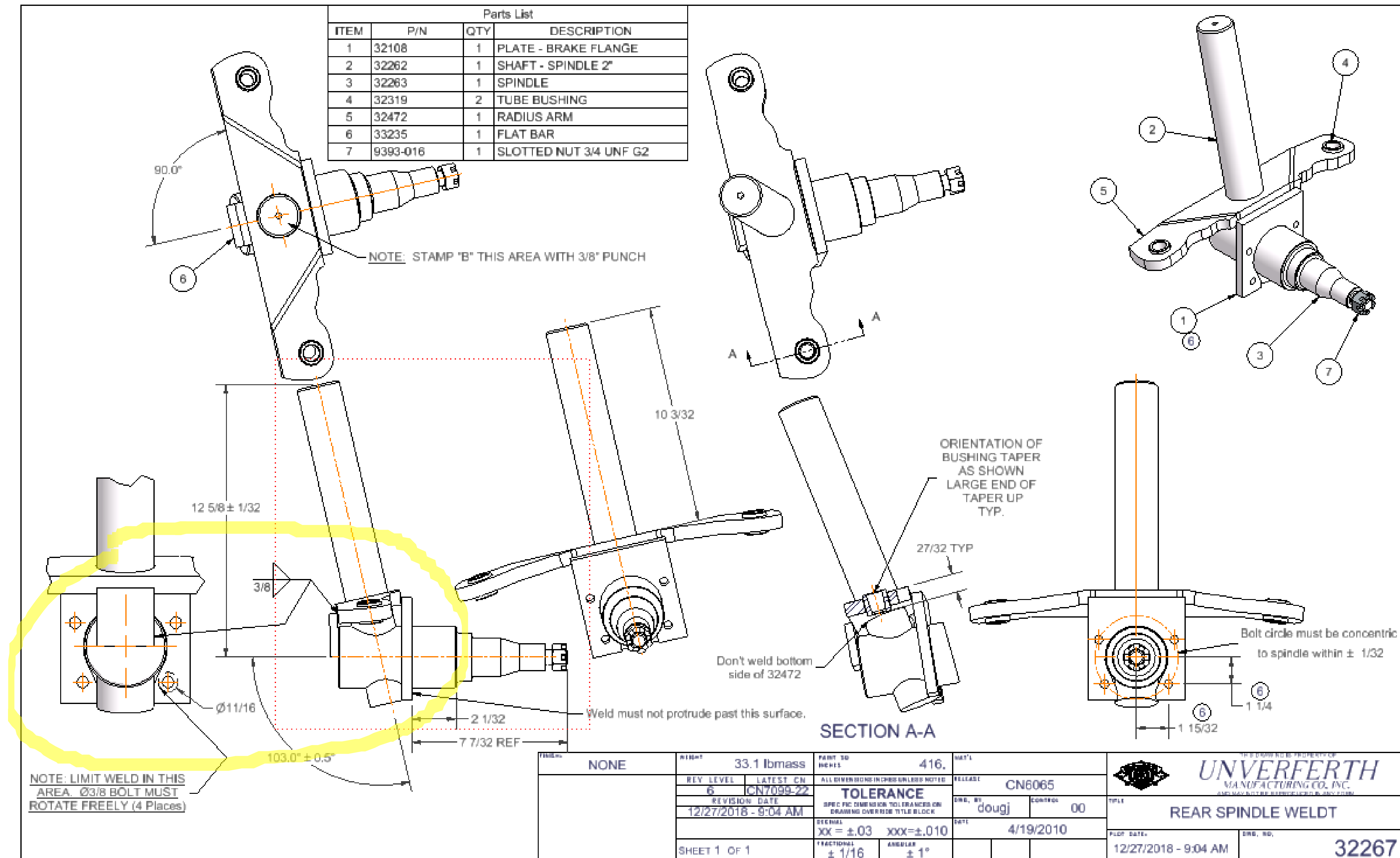
Effectively communicate welds to the shop floor with no potential of misinterpretation.

Get your Welders and Designers connected without speaking a word.

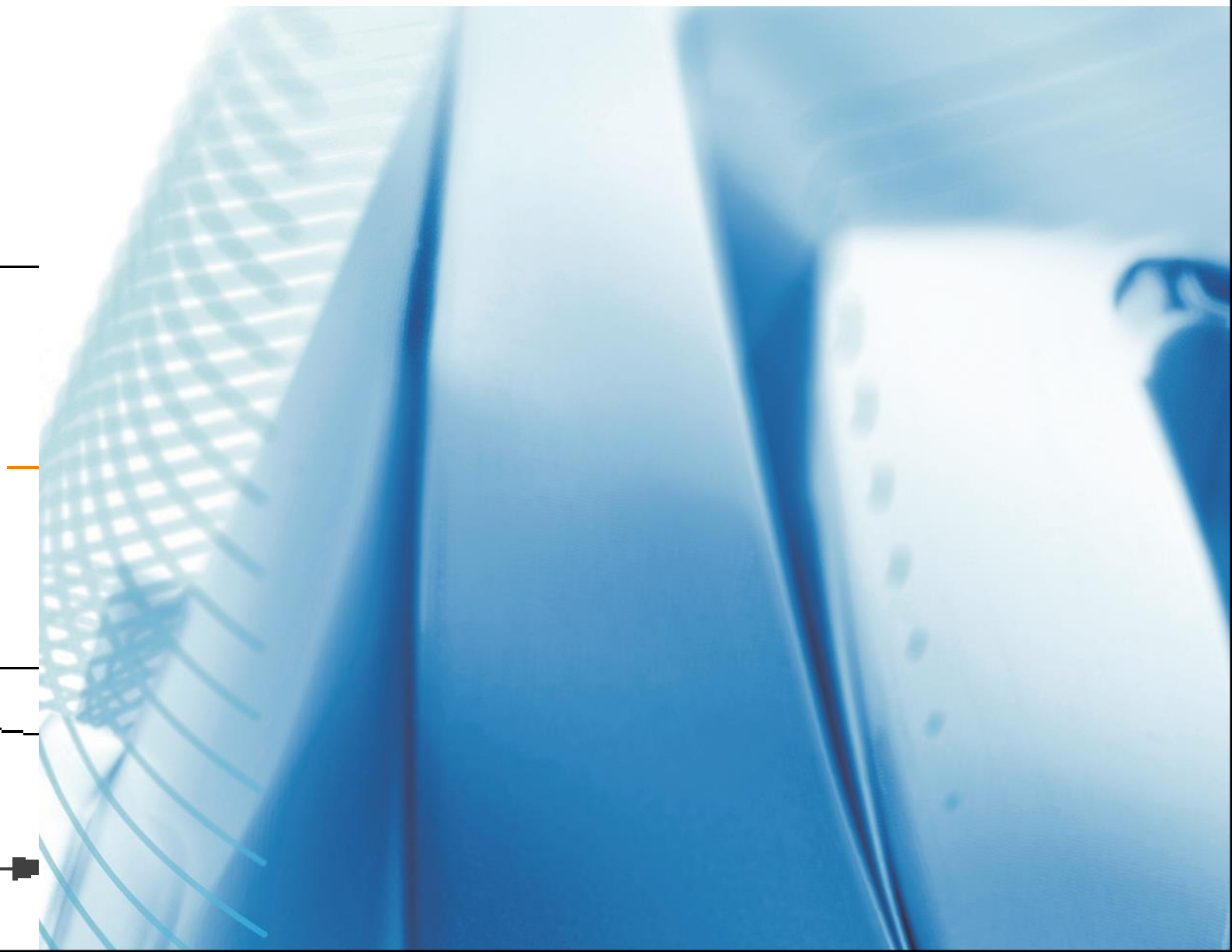
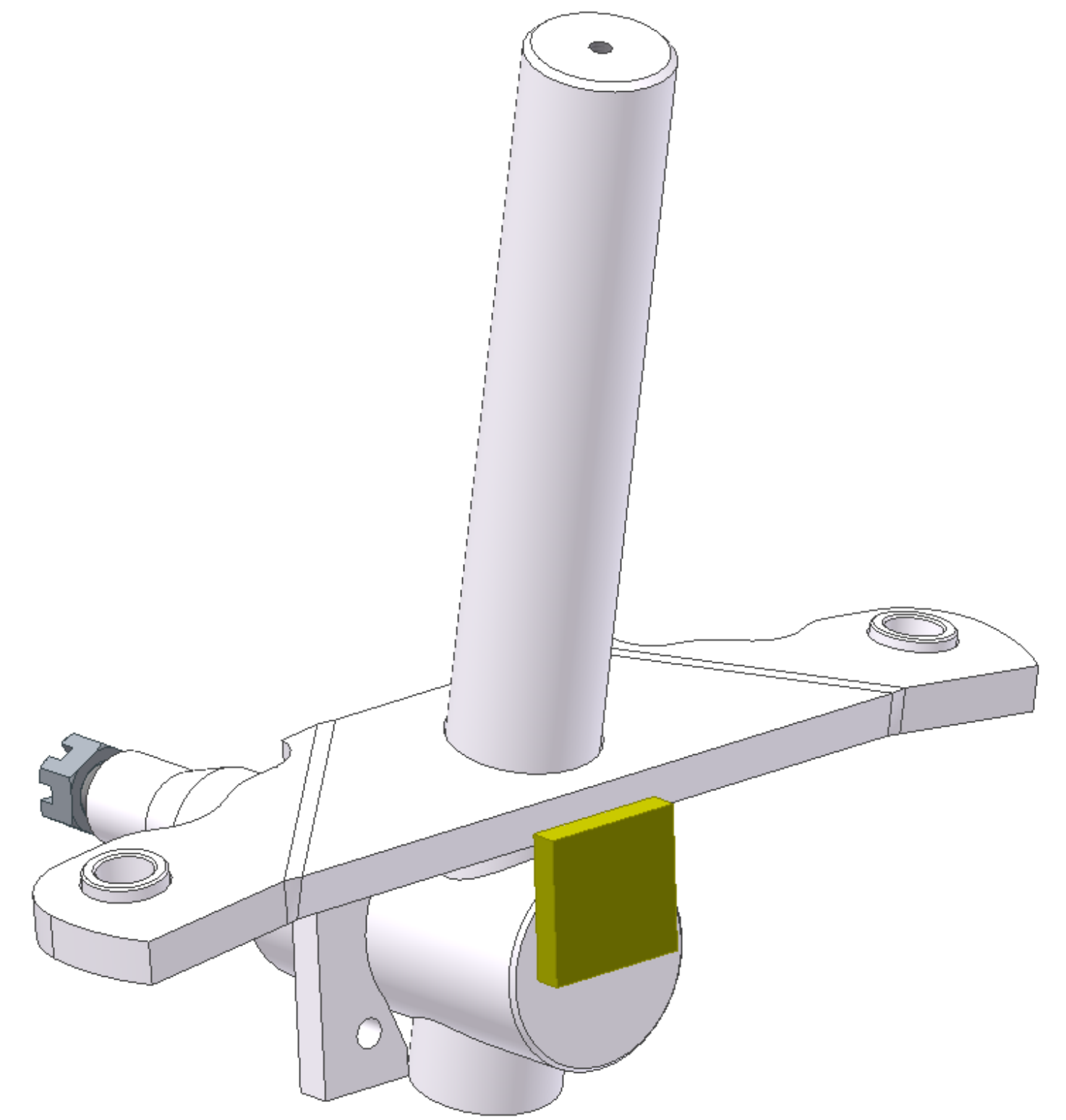
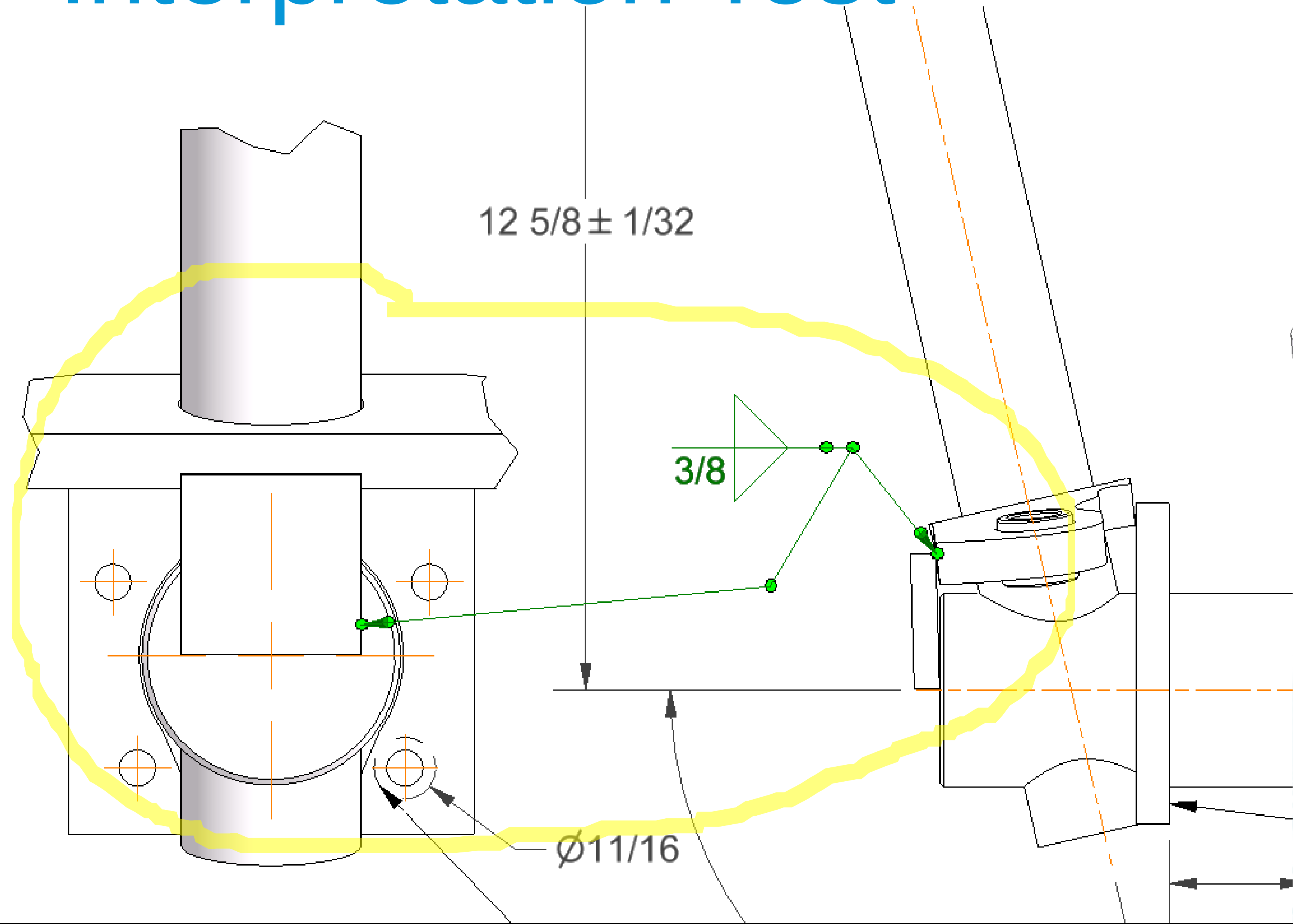
Have workers doing what they're hired to Do – Weld & Design



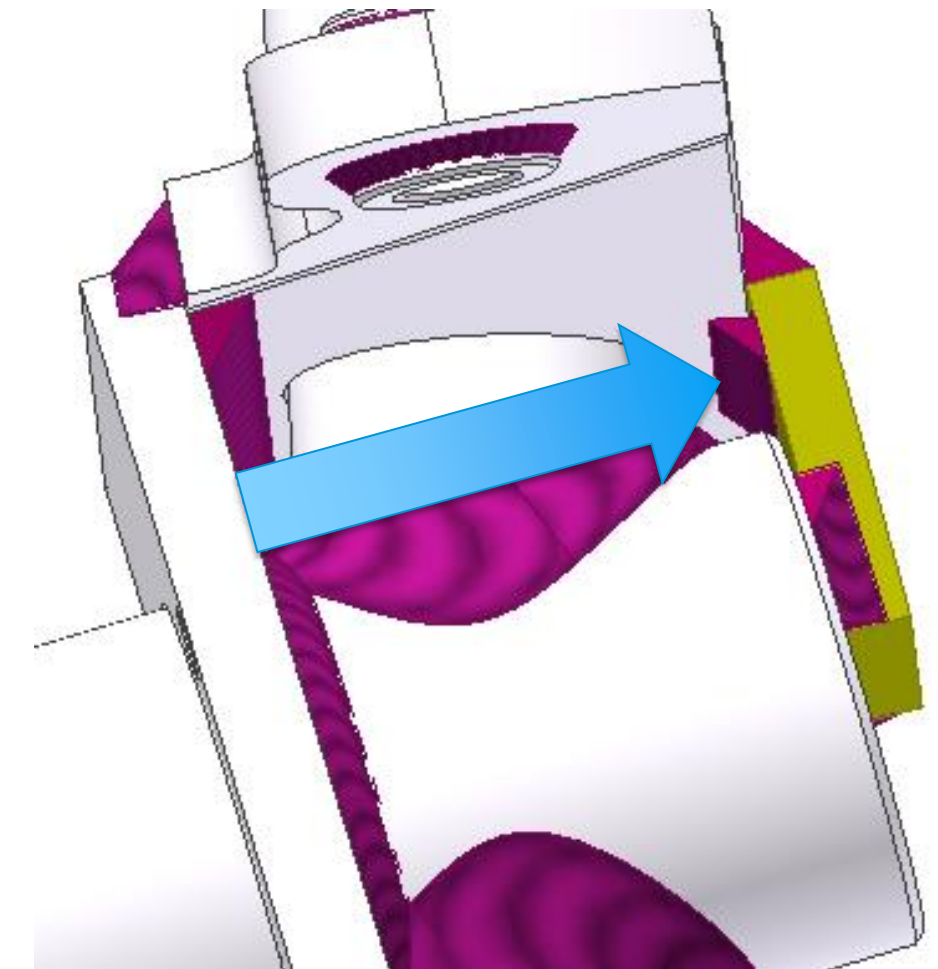
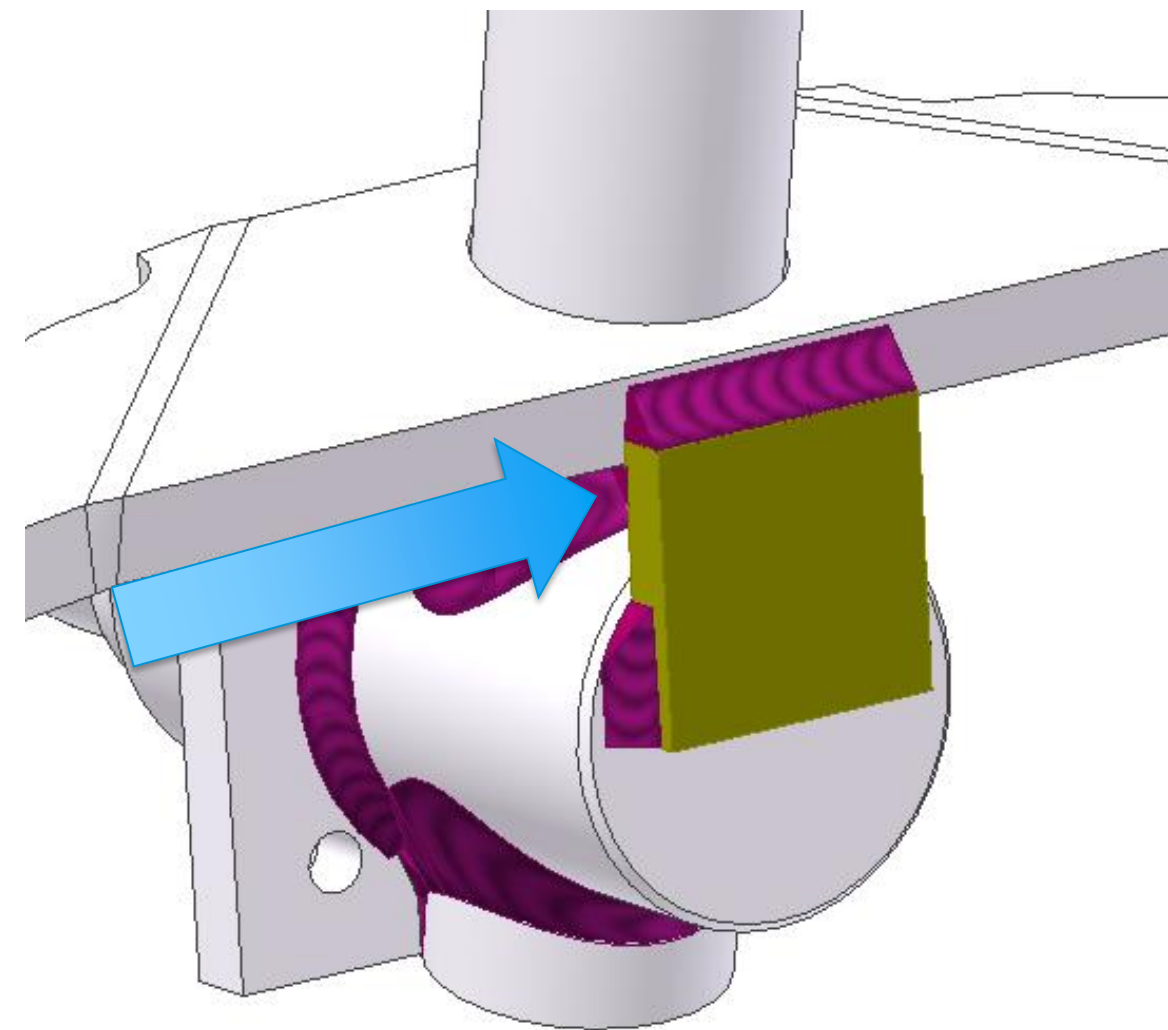
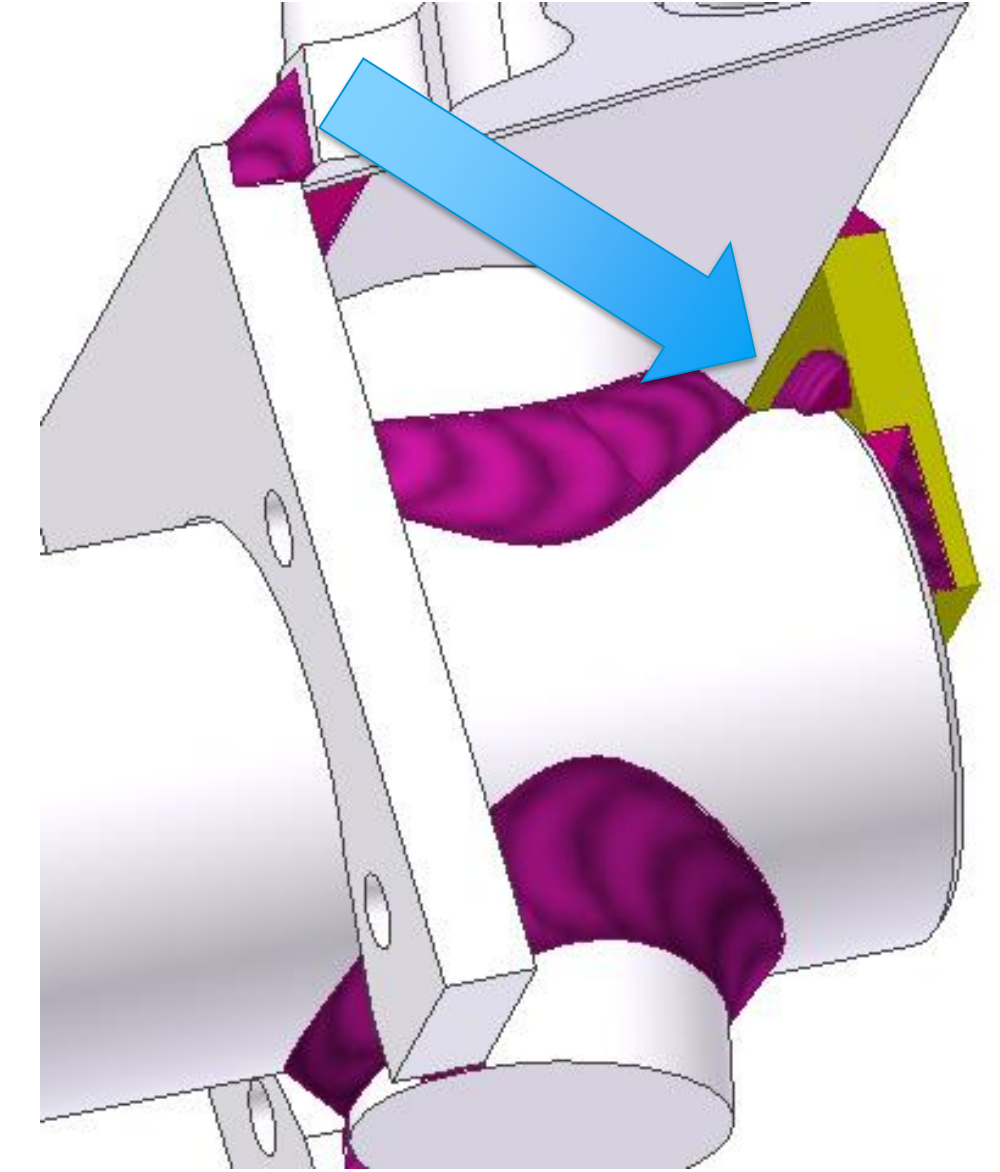
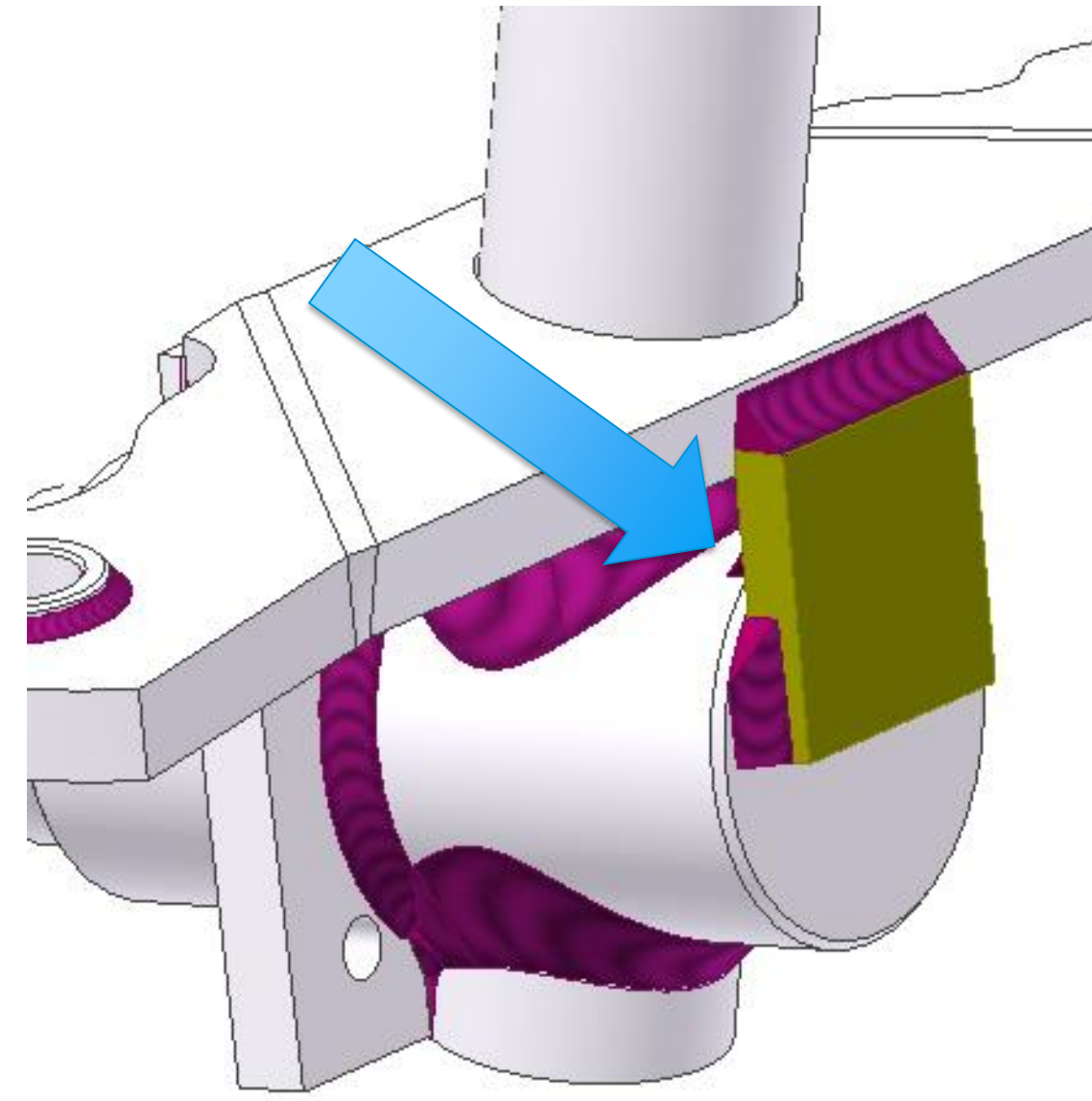
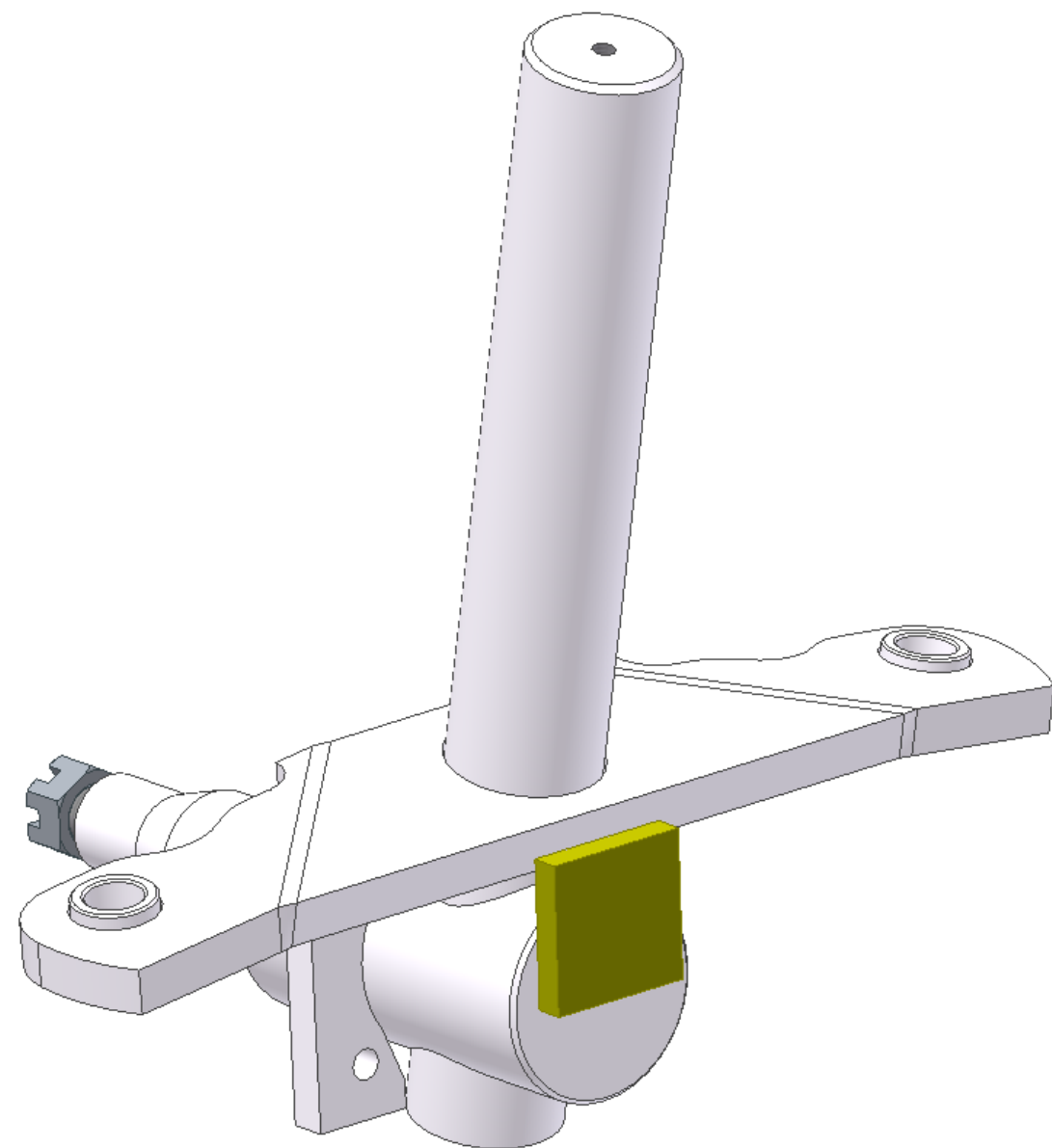
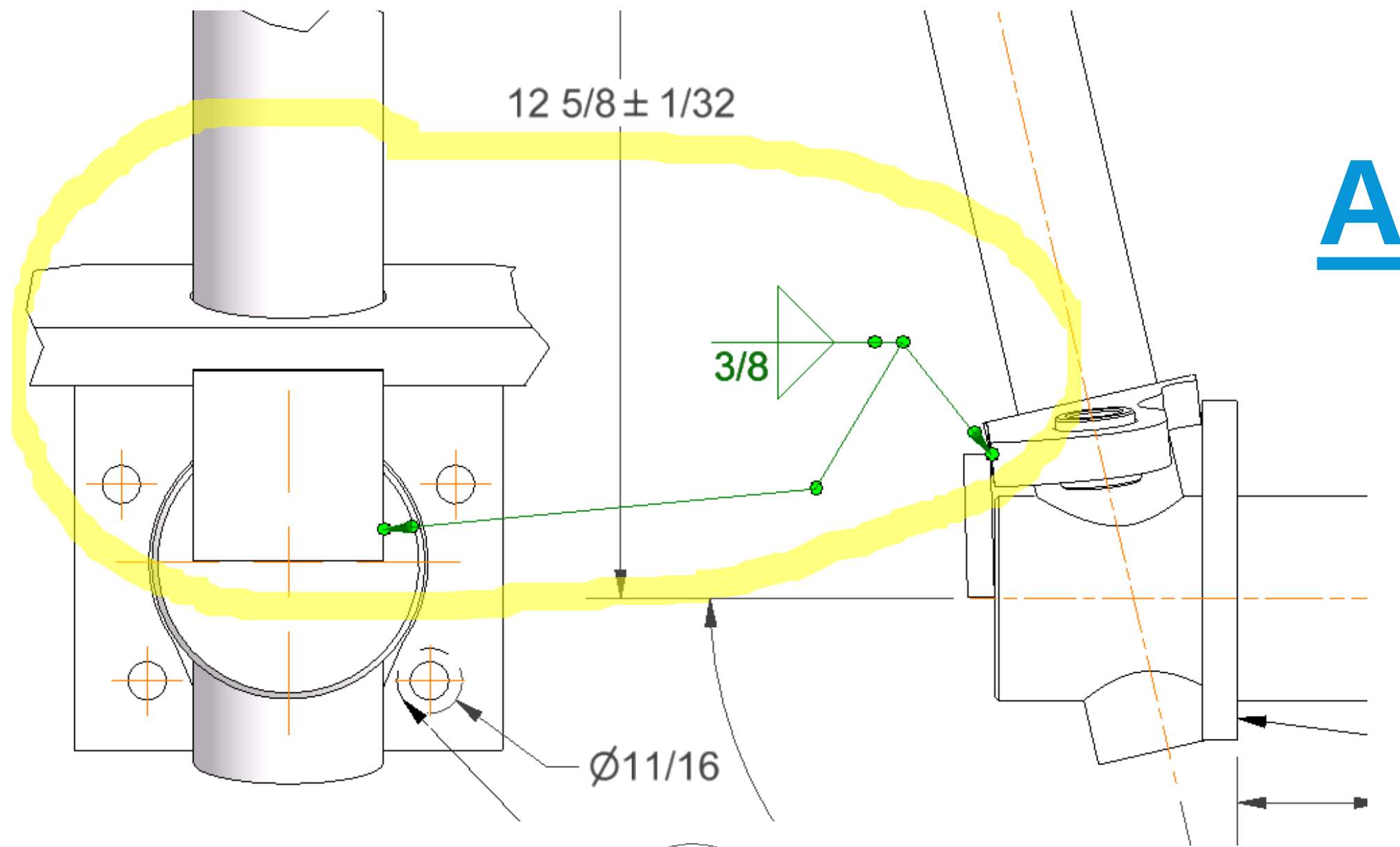
Interpretation Test



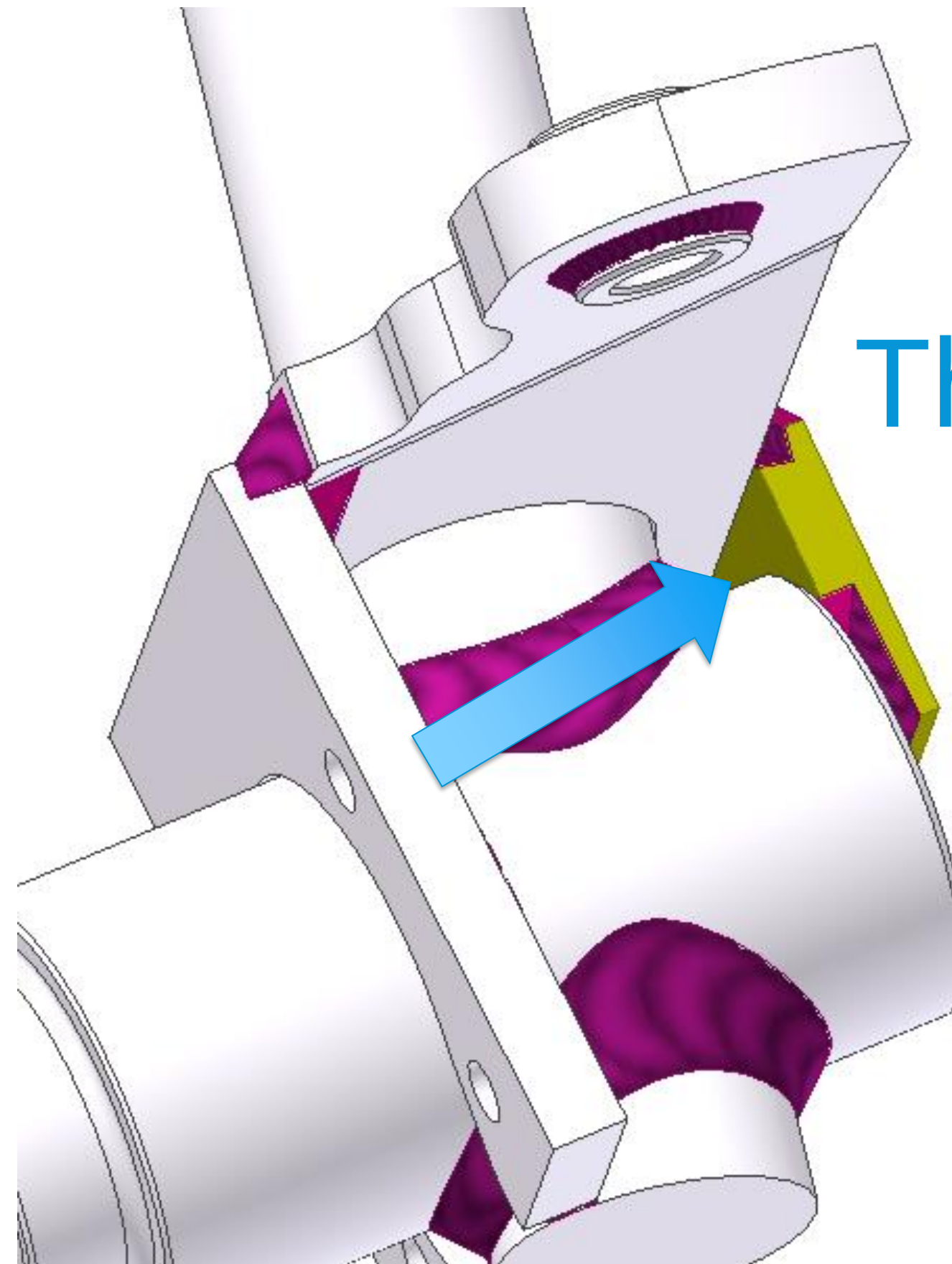
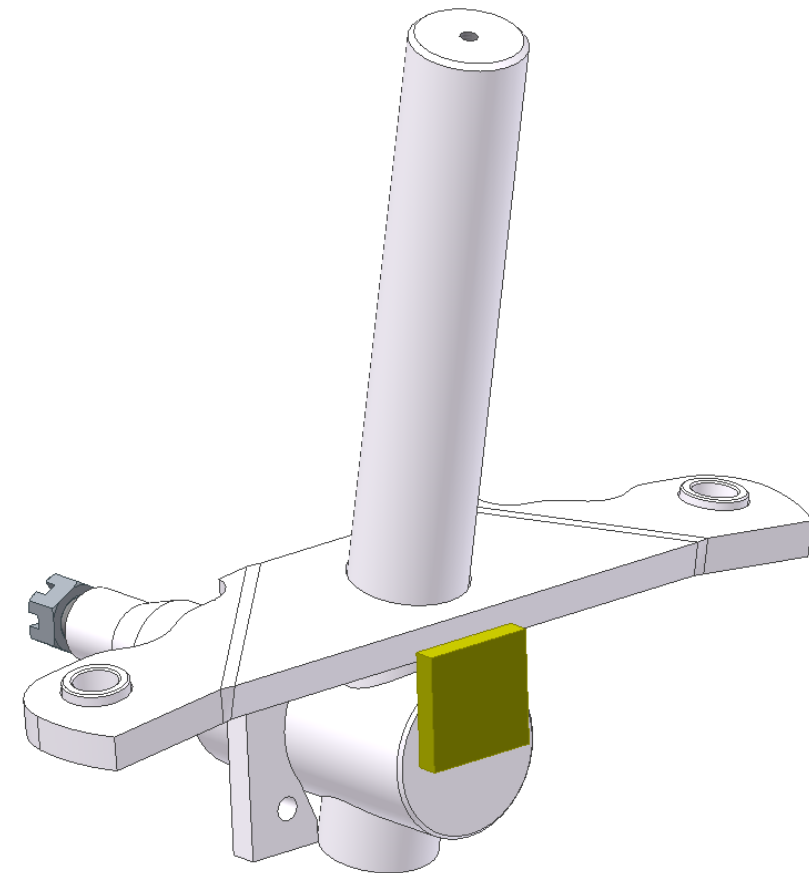
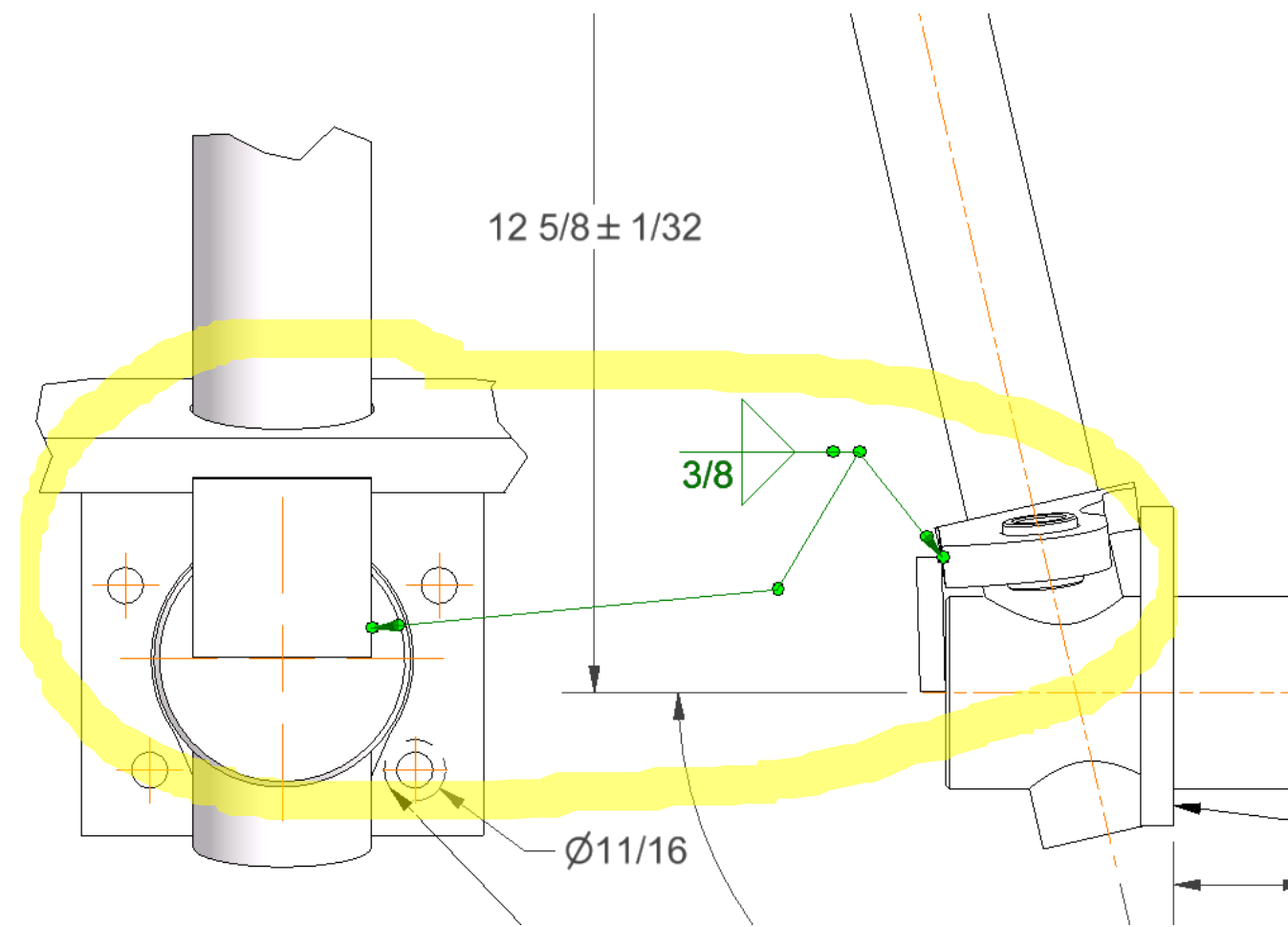
Interpretation Test



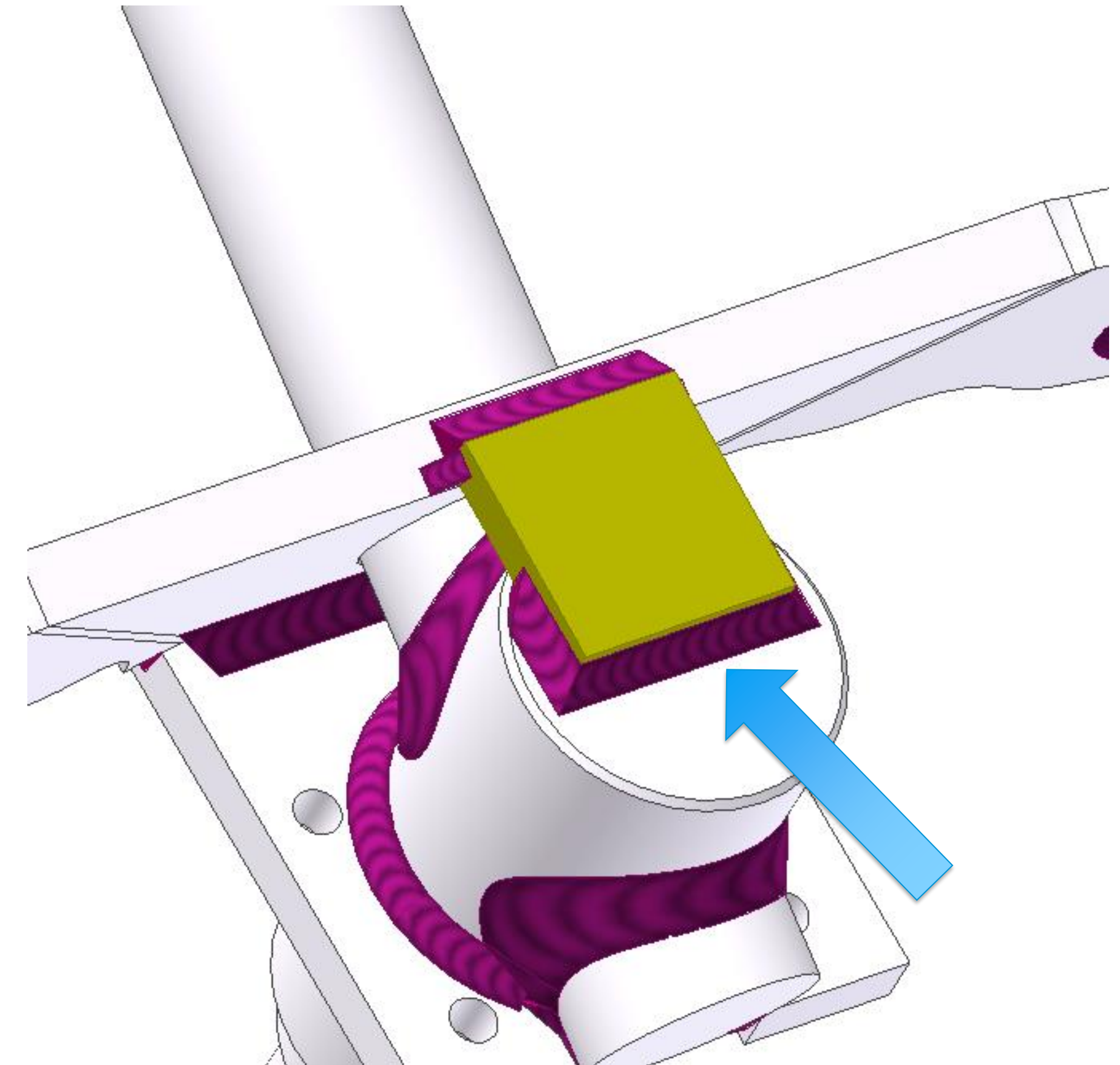
Interpretation Test



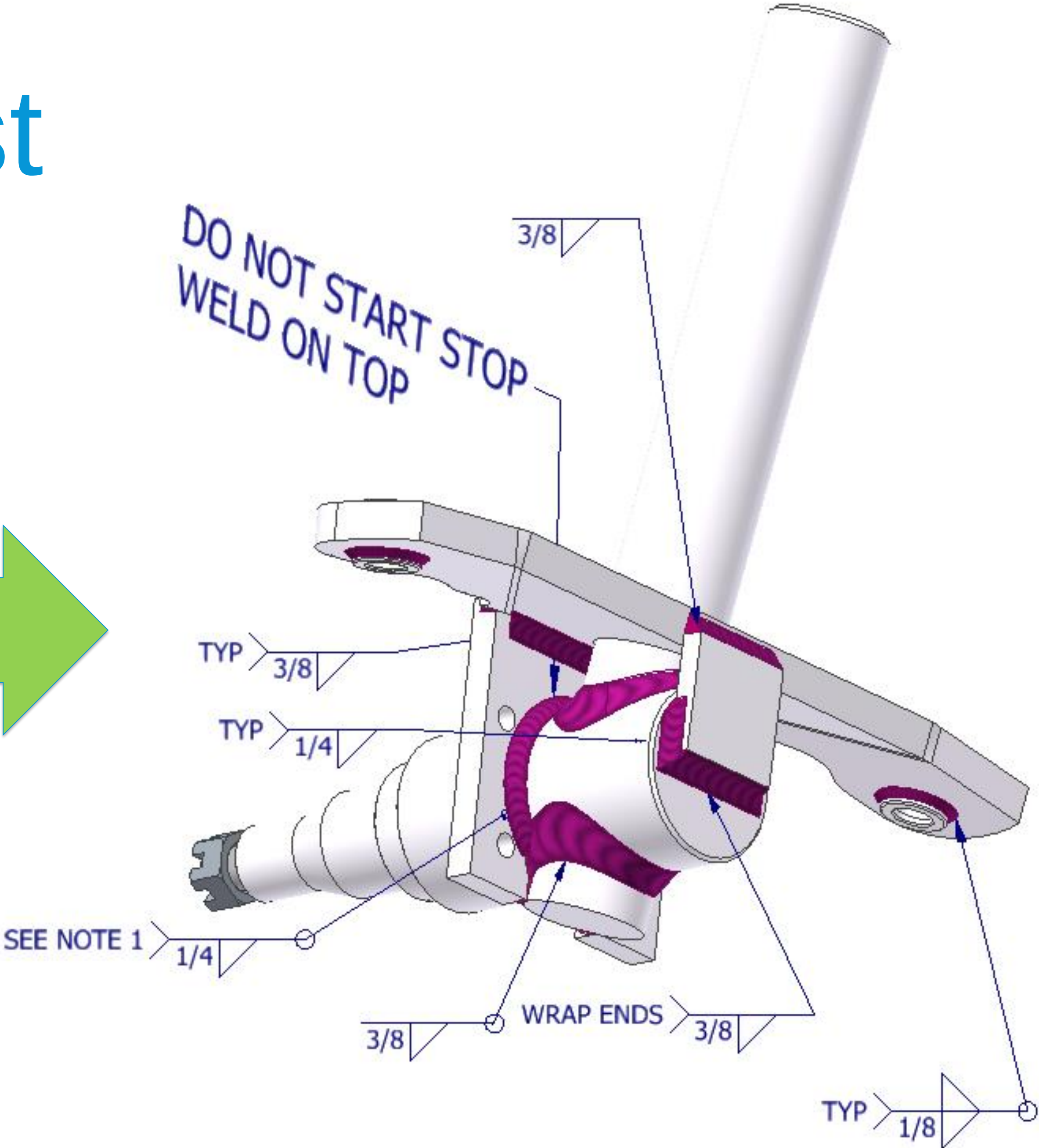
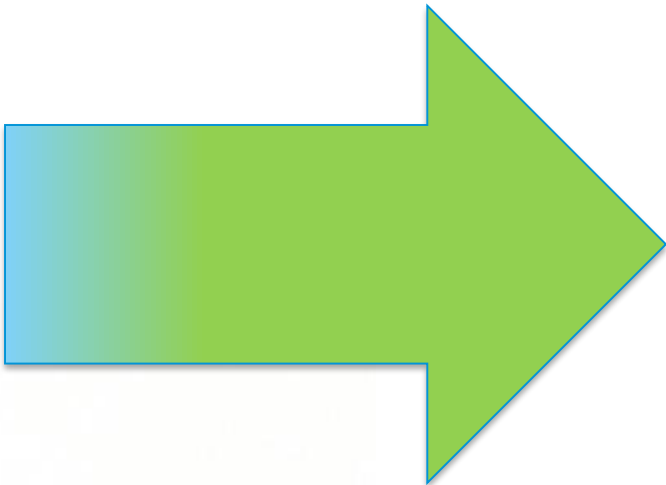
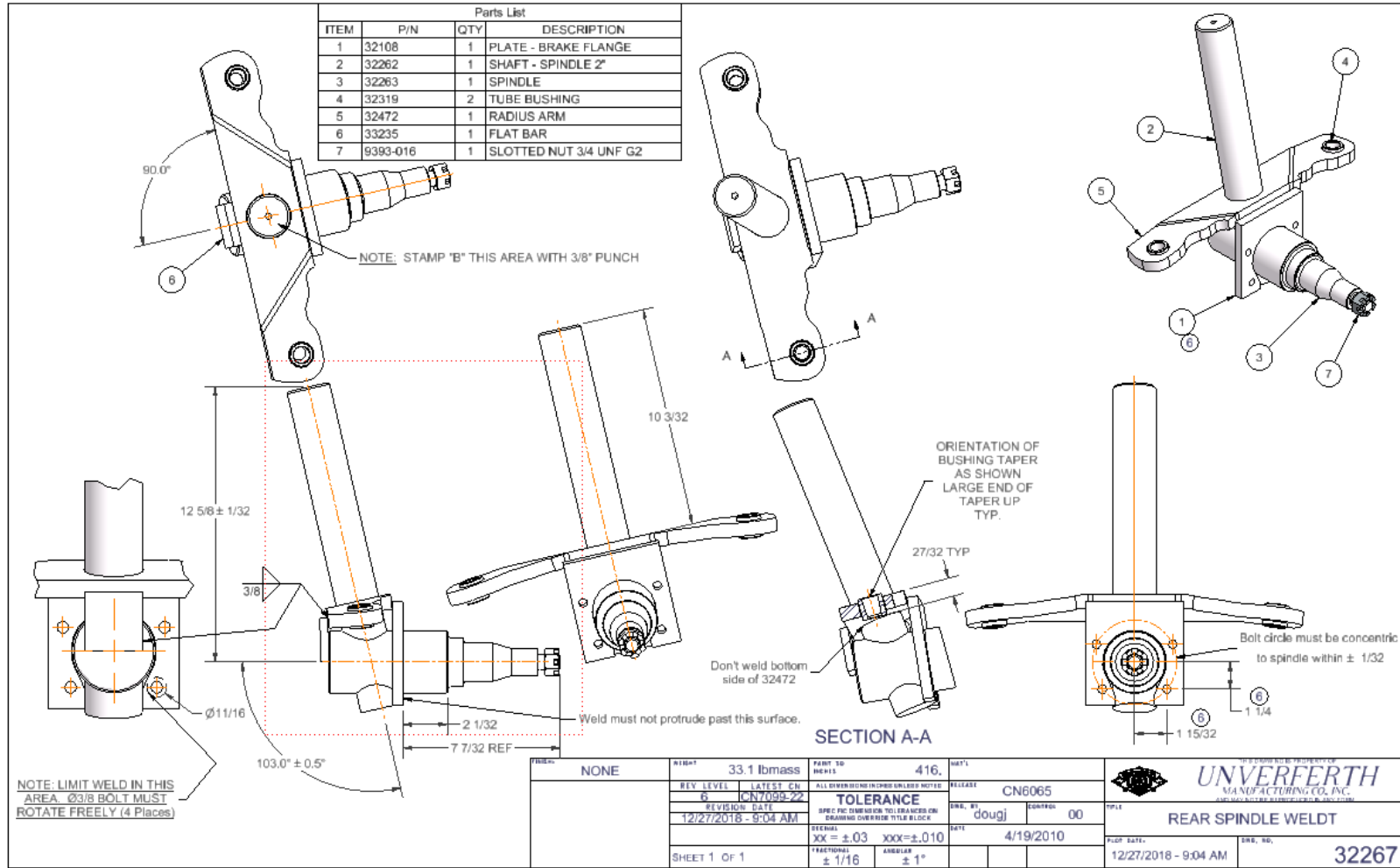
Interpretation Test



This is what was expected

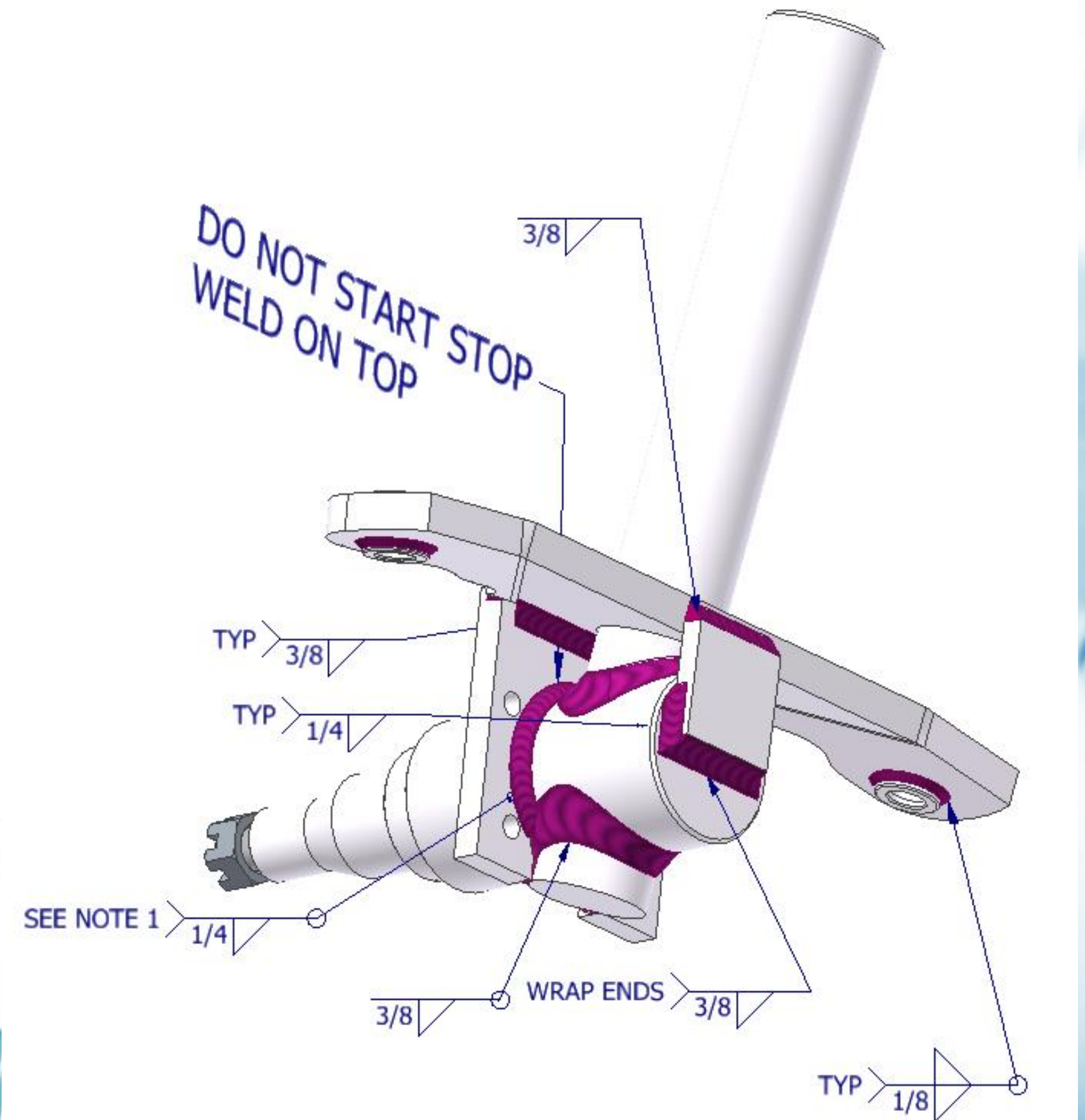


Interpretation Test



What's in it for you and your Company?

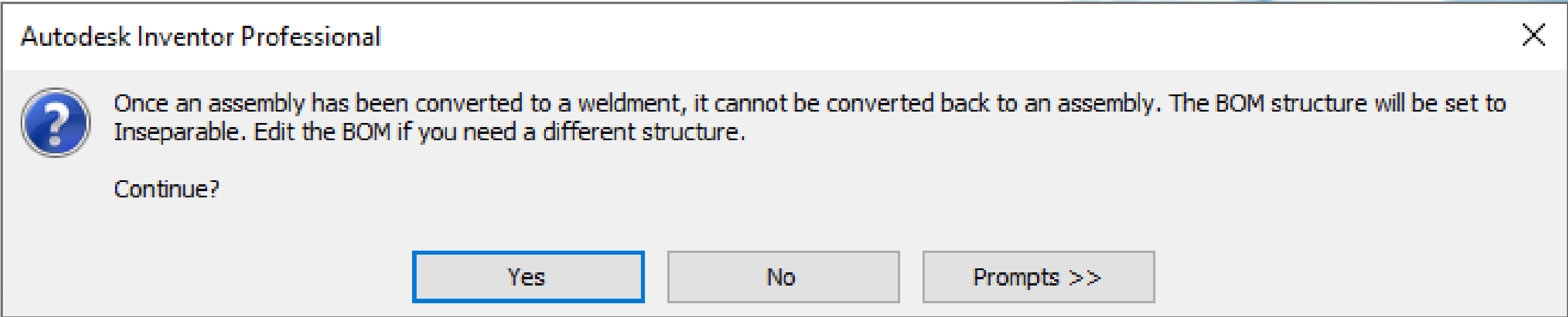
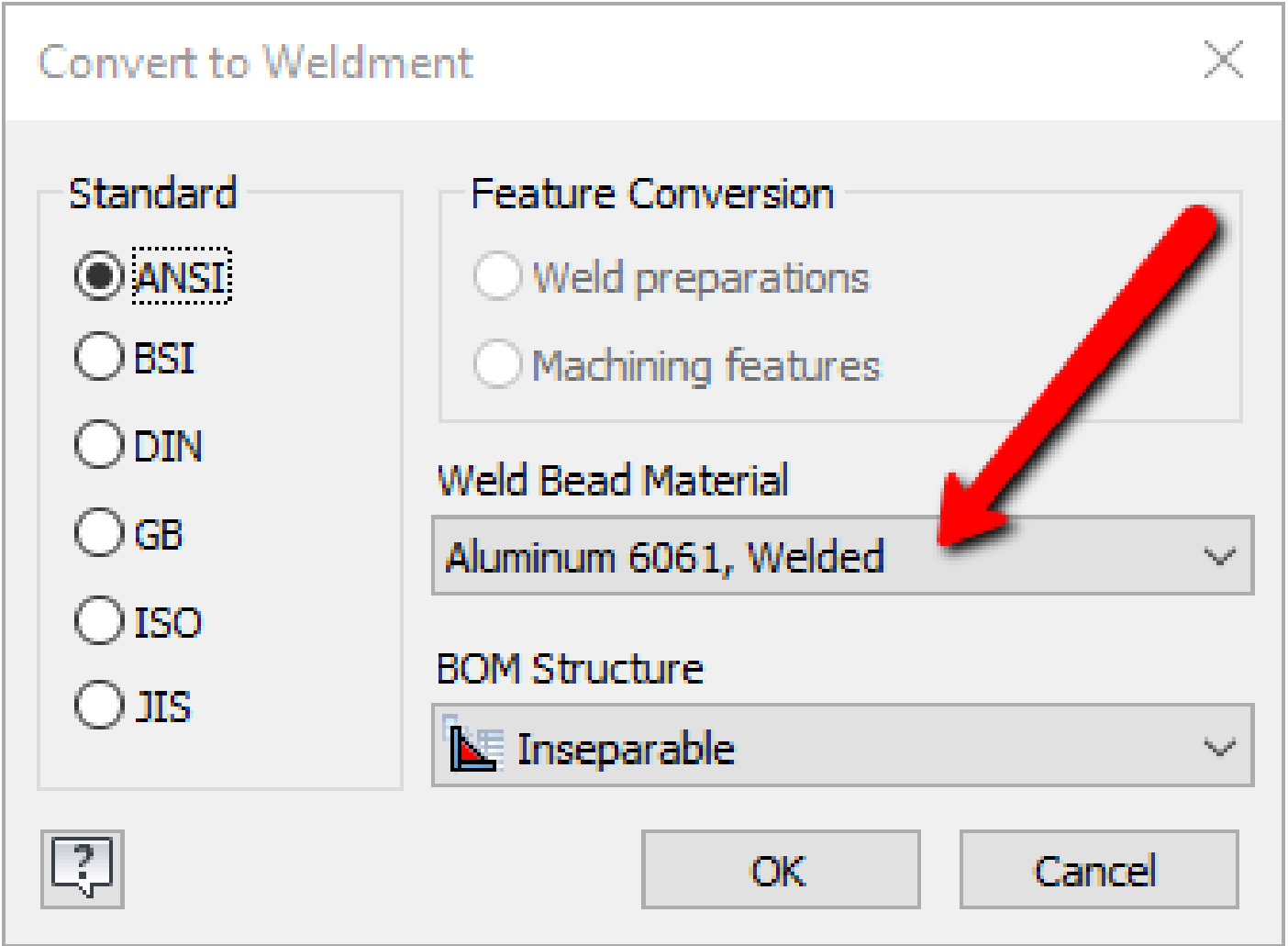
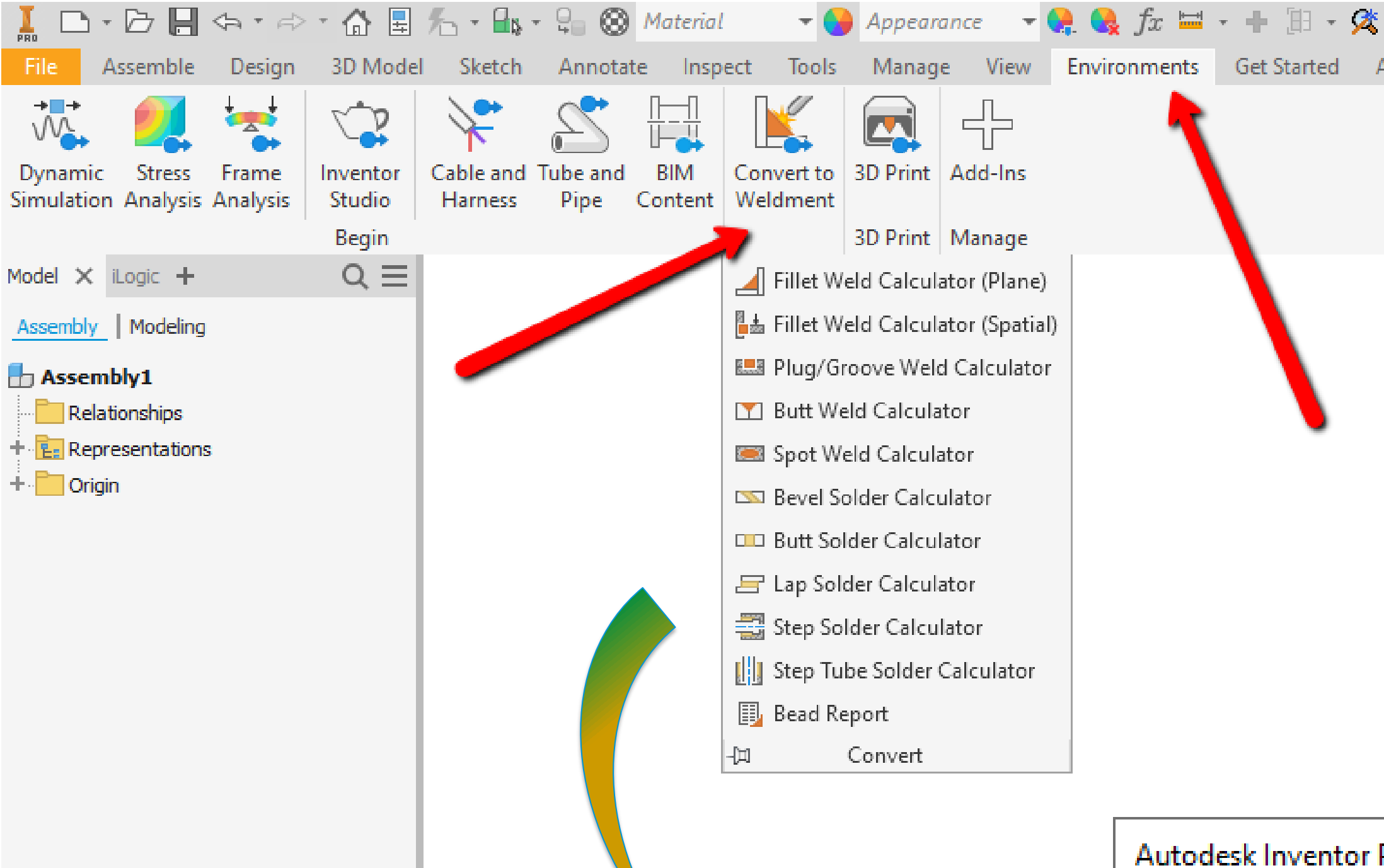
- Spend less time interpreting and communicating welds
- Spend More time Welding
- Spend More time Designing
- Build consistent quality product



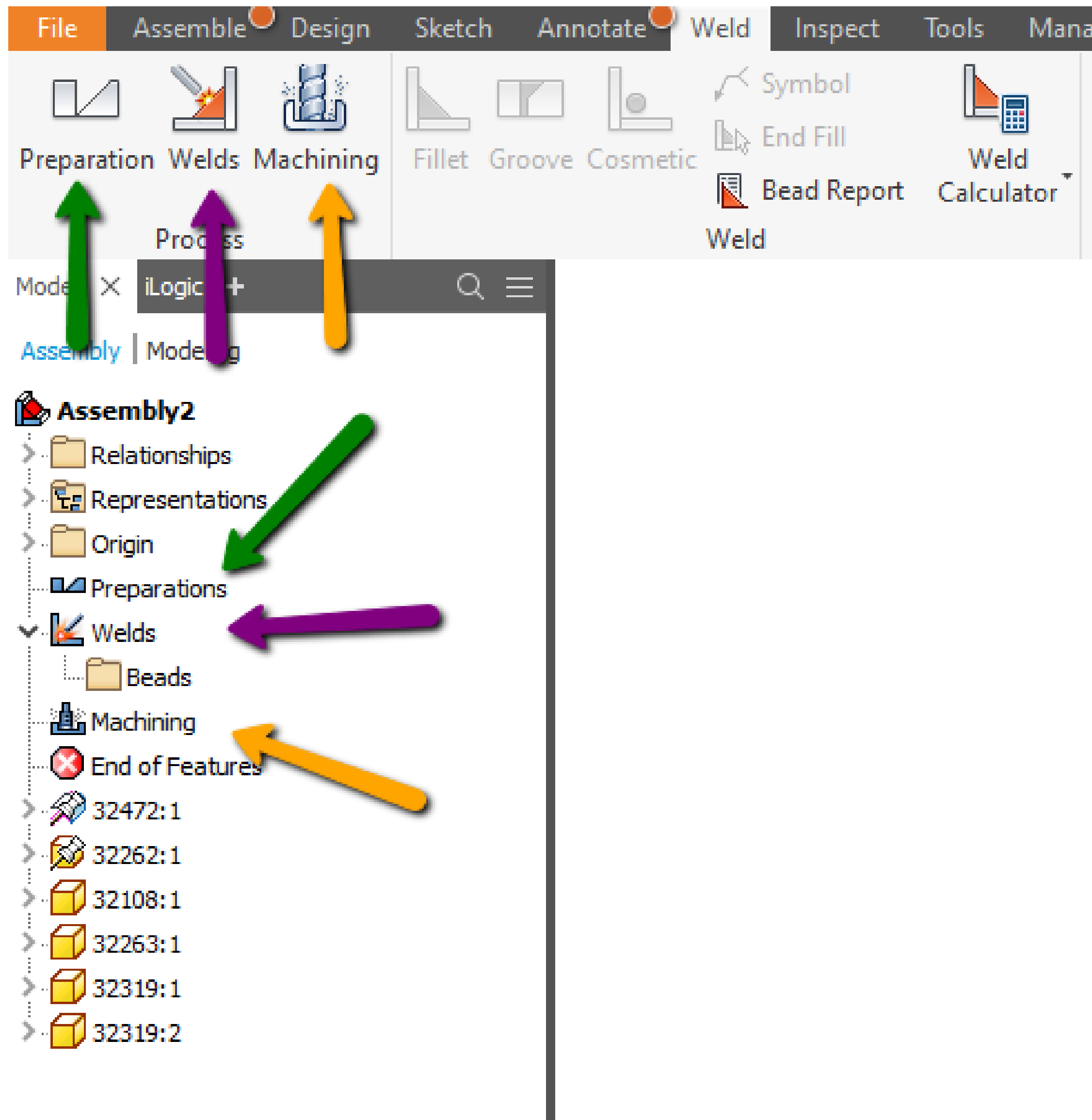
Objective 2:

Basics of the Weld Environment

Weld Environment



Prep / Weld / Machining

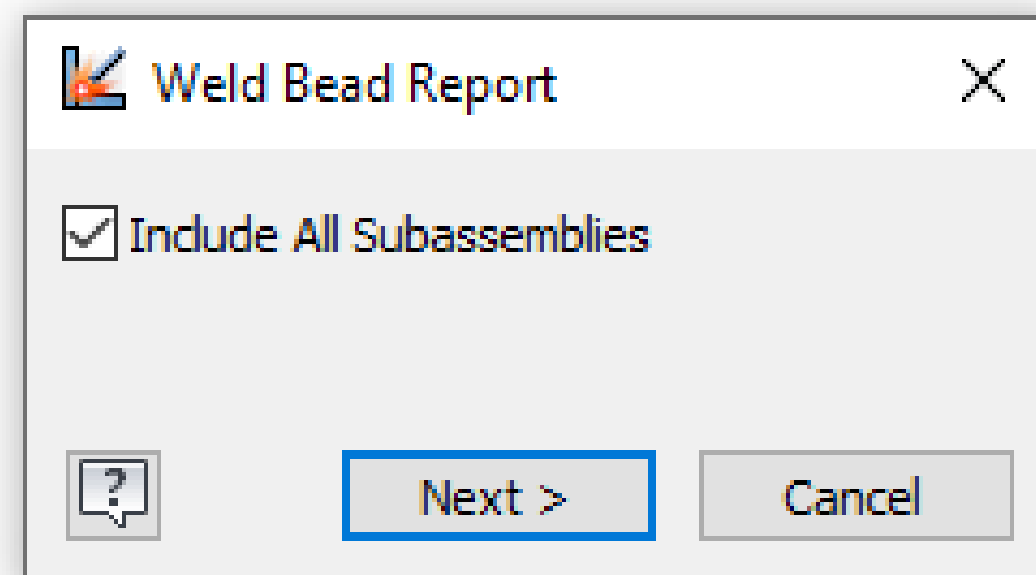
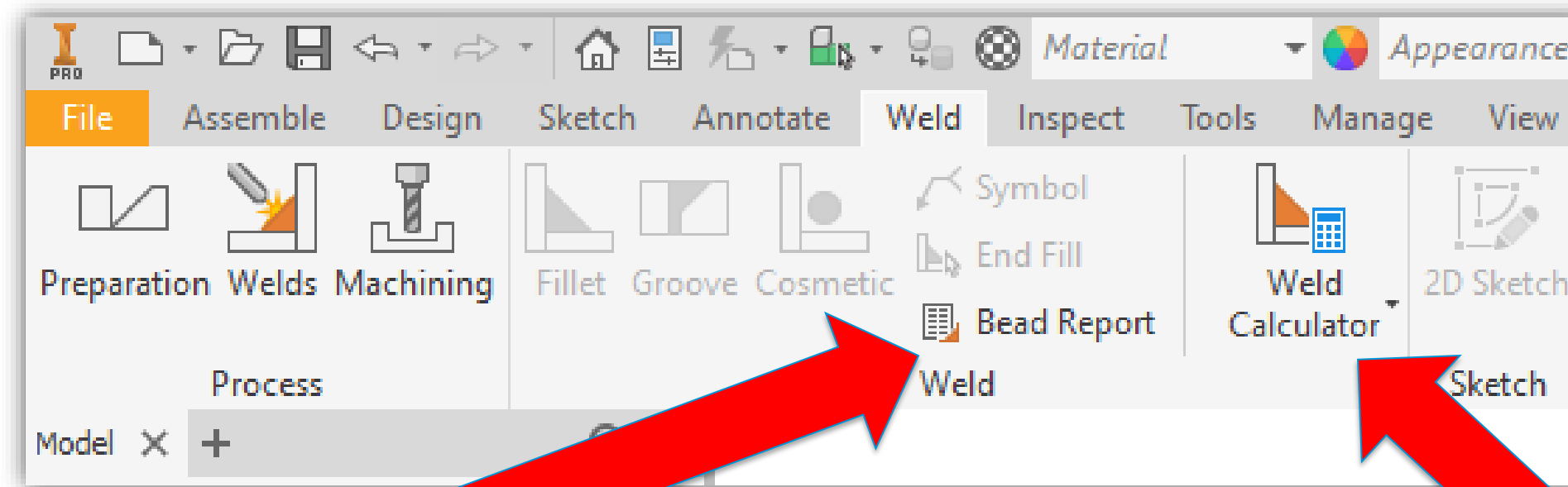


- **Preparations**

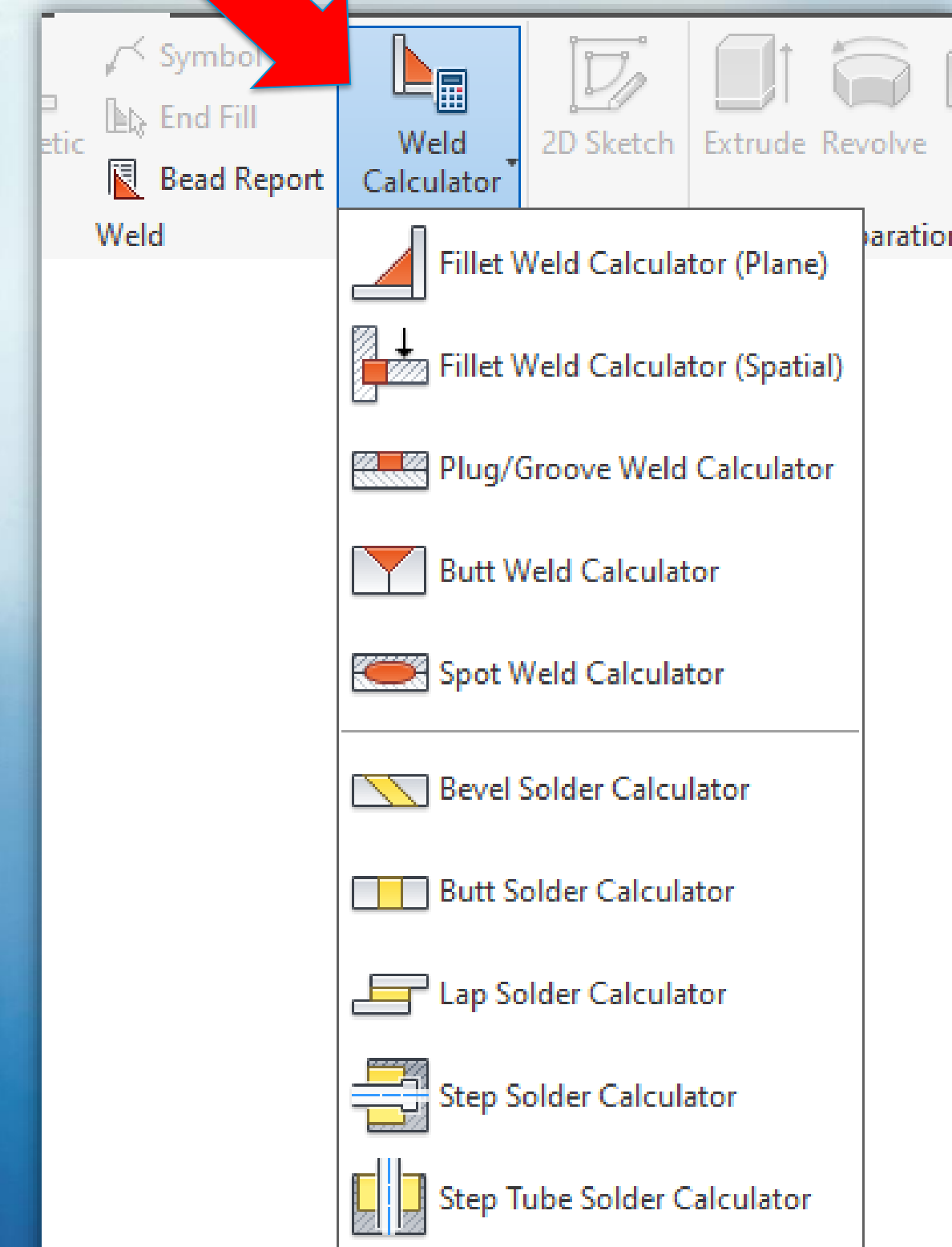
- **Welds**

- **Machining**

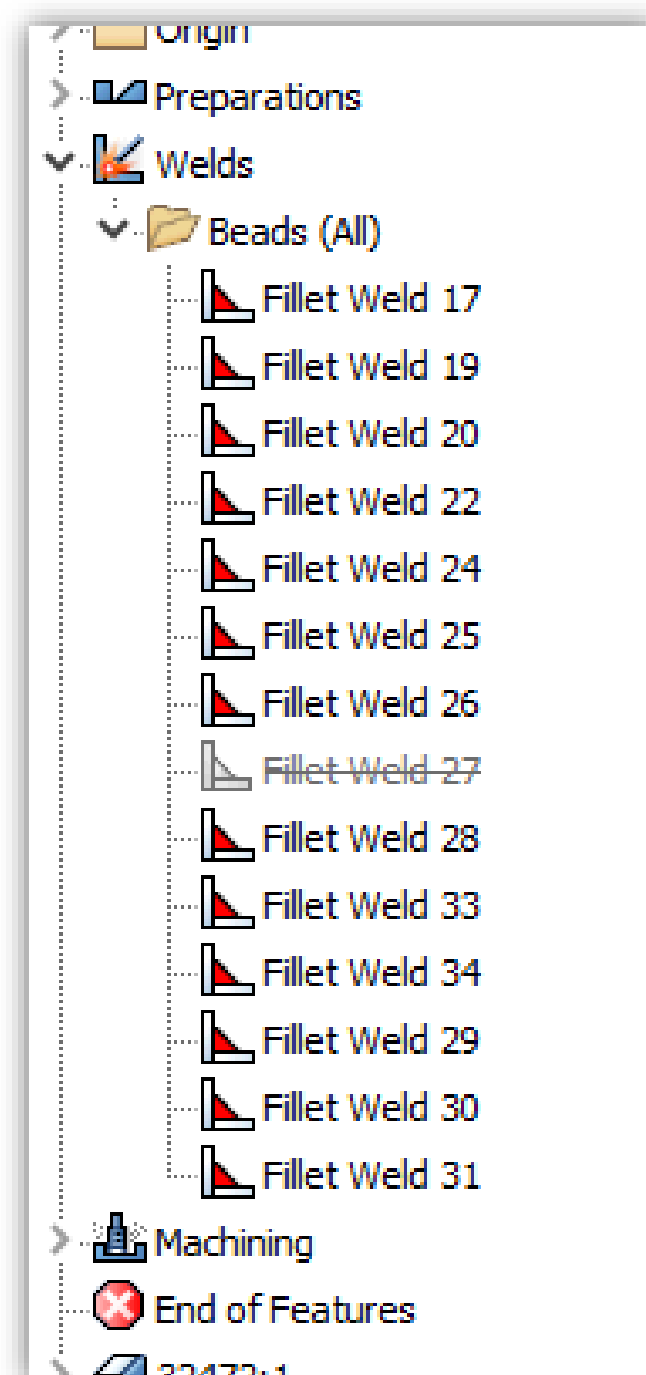
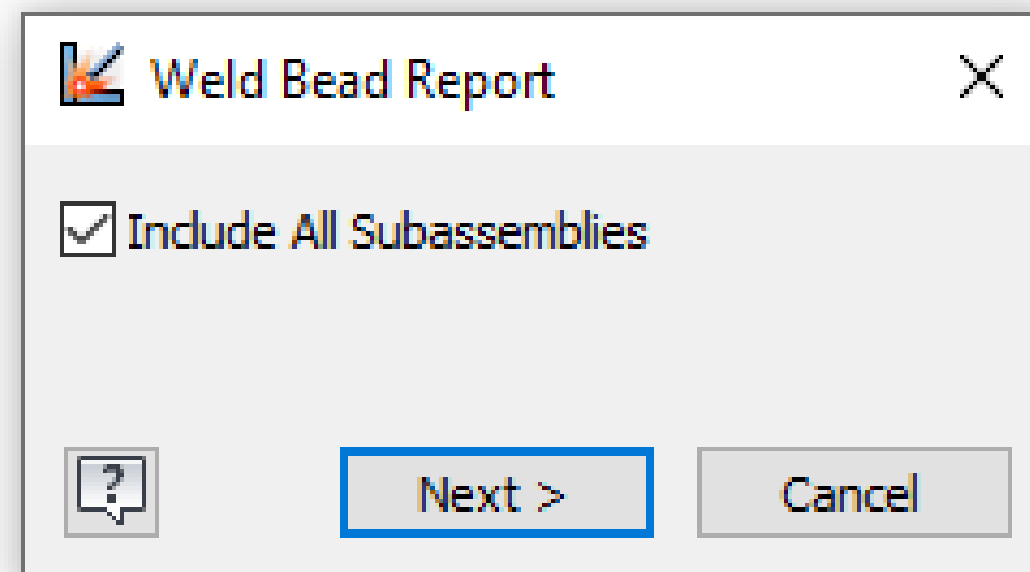
Design Tools



- Bead Report
 - Lists all welds in a spreadsheet format
 - Option to include sub-assemblies if preferred.
 - Can Calculate total weld length
- Weld Calculator
 - To determine adequate weld size

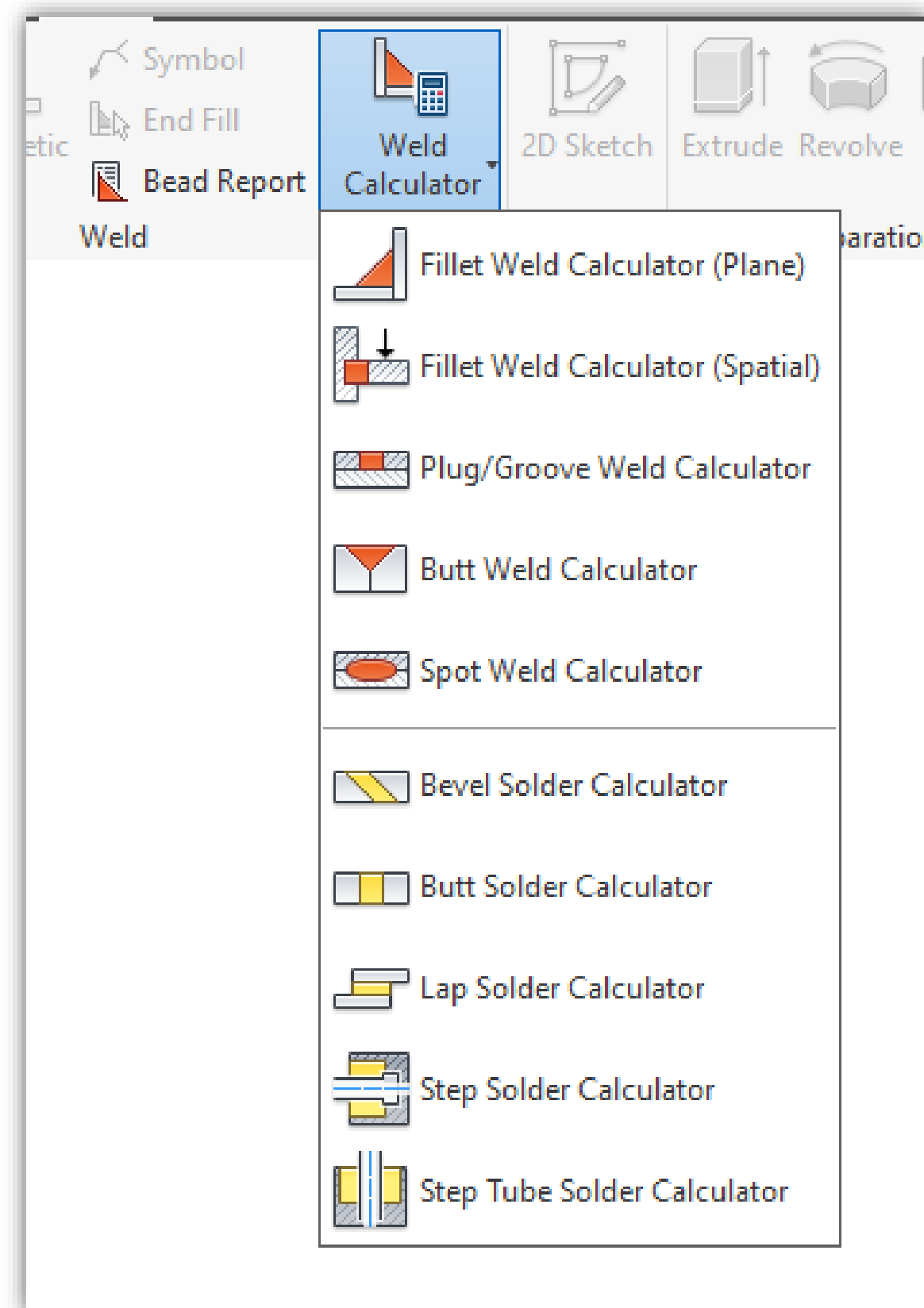


Weld Bead Report



Weld Bead Report.xls - Excel										
File Home Insert References Developer Foxit PDF Autodesk Vault Team Tell me what you want to do...										
Font Paragraph Alignment Number Styles										
Normal Bad Good Check Cell Explanatory ... Input										
B	C	D	E	F	G	H	I	J	K	
ID	Type	Length	UoM	Mass	UoM	Area	UoM	Volume	UoM	
Fillet Weld 17	Fillet	3.7944	in	0.0787	lbmass	5.1294	in^2	0.2771	in^3	
Fillet Weld 19	Fillet	13.2385	in	0.228	lbmass	20.7603	in^2	0.803	in^3	
Fillet Weld 20	Fillet	0.5909	in	0.0117	lbmass	0.9348	in^2	0.0413	in^3	
Fillet Weld 22	Fillet	6.8438	in	0.0568	lbmass	5.026	in^2	0.1999	in^3	
Fillet Weld 24	Fillet	7.0686	in	0.0168	lbmass	3.2537	in^2	0.0593	in^3	
Fillet Weld 25	Fillet	7.0686	in	0.0168	lbmass	3.2537	in^2	0.0593	in^3	
Fillet Weld 26	Fillet	5.076	in	0.0709	lbmass	6.103	in^2	0.2497	in^3	
Fillet Weld 27	Fillet	2	in	N/A		N/A		N/A		
Fillet Weld 28	Fillet	2	in	0.0391	lbmass	2.5883	in^2	0.1376	in^3	
Fillet Weld 29	Fillet	0.9169	in	0.0391	lbmass	3.9583	in^2	0.1378	in^3	
Fillet Weld 30	Fillet	0.9169	in	N/A		N/A		N/A		
Fillet Weld 31	Fillet	1.8236	in	0.0171	lbmass	1.7216	in^2	0.0602	in^3	
Fillet Weld 33	Fillet	3.8338	in	N/A		N/A		N/A		
Fillet Weld 34	Fillet	0.229	in	0.0041	lbmass	0.4908	in^2	0.0143	in^3	

Weld Calculator



Fillet Weld(Connection Plane Load) Calculator

Calculation Fatigue Calculation

Loads

Bending Force F_y 1000.000 lbf >

Force Arm e 7.250 in >

Dimensions

Weld Height a 0.250 in >

Weld Group Height H 2.000 in >

Weld Group Width B 2.000 in >

Weld Form

Calculation of Statically Loaded Weld

☒ Standard Calculation Procedure

☐ Method of Comparative Stresses

☐ Only Active Weld Length is Considered

Weld Loads

Results

τ_A 9360.000 psi

a_{min} 0.197 in

τ 7370.232 psi

F_{ymax} 1269.900 lbf

Joint Material and Properties

☒ Structural Steel A519-1020

Yield Strength S_y 23400 psi >

Ultimate Tensile Strength S_u 39000 psi >

Safety Factor n_s 2.500 ul >

Allowable Stress S_{al} 9360.000 psi >

Calculation of Fatigue Loaded Weld

☒ General Method

☐ Calculation according to CSN

Calculation of Allowable Stress

☒ From Yield Strength

☐ Manually

Calculate OK Cancel <<

Objective 3:

Tips for modelling
welds - even the
tricky ones

Tid Bits



- You can NOT pattern or array Welds
- You can NOT Control Visibility of individual welds – All or Nothing
- You can suppress individual welds but can not tie suppression to a View Rep.
- Funky welds may have to be done with combination of welds.
- Don't expect 100% accurate welds – Give visual of where weld should be – let 3D symbol specify the size



More Tid Bits

- Welds do Bog down Models
- Save welds until Design is Mature
- Suppress welds when tweaking design, constrains or replacing parts.

Objective 4:

Deliver your weld data
to the production floor.

Without Paper

Deliver your weld data to the production floor

- Shared Views

- Inventor does **not** allow shared views of weldments

<https://knowledge.autodesk.com/support/inventor/troubleshooting/caas/sfdcarticles/sfdcarticles/Shared-View-cannot-be-created-from-a-Weldment-Assembly-in-Inventor.html>

- Vault **does** allow shared views of weldments
- Any device anywhere...just need URL
- Shows whatever View Rep was active in Inventor when saved and checked in
- 30 day default expiration
- A single file
- Quick and easy
- Weld MBD Annotations do show up, but

Weld Symbols DO NOT



- Publish a dwf or 3D pdf

- email it
- Requires Design Review or 3D pdf viewer
- Almost any device anywhere
- Actually sending file.

- Fusion Team (Upload to Cloud in Vault)

- Any device anywhere as long as you have the URL
- Manual upload
- Uploads all files in assembly
- No expiration
- Weld MBD Annotations do show up, but

Weld Symbols DO NOT



Deliver your weld data to the production floor

- Vault Thick or Thin Client

- Files ready to use, no publish or upload of dwf. Vault manages files.
- Windows based system and Design Review
- Clunky on larger assemblies
- Graphics less than favorable.
- **MBD weld symbols do show up**

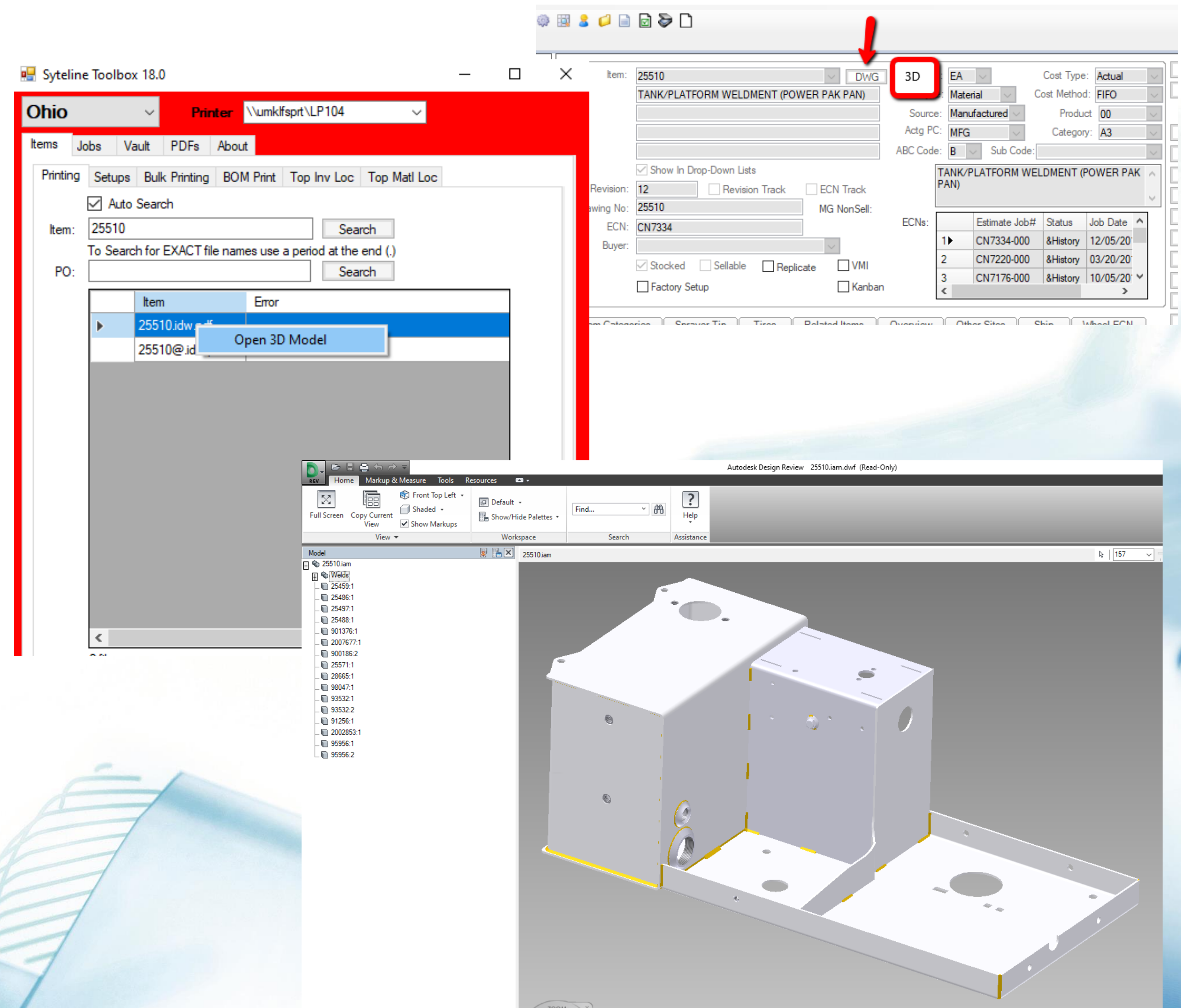
- Forge

- Something we are currently exploring.
- Item goes to Released or Obsolete state in Vault, 3D model is published
- dwf or pdf URL or file location is then noted in our ERP/MRP system where it can be accessed with a click of a button right in our ERP/MRP system.
- Hoping to use LMV
- No moving/sending of file...just the URL

Deliver your weld data to the production floor

- Home-Brewed App

- App allows us to access dwf of .iam from application once item in Vault hits Released or Obsolete state
- Still uses Design Review
- Passing filestore location, not actually file
- Windows Device
- Clunky on large assemblies
- Must be inside our firewall



In Closing

- Get parts welded as intended
- Spend less time interpreting and communicating welds
- Spend More time Welding
- Spend More time Designing
- Build consistent products out the door
- As you leave - Get modeling those welds and...



Get Your Welders and Designers Connected



Got An Idea? Share it!

- Share your idea directly with the Autodesk Development Team
- Community can support ideas to surface the most relevant



AUTODESK® VAULT

<https://autode.sk/vaultidea>



AUTODESK® INVENTOR®

<https://autode.sk/inventoridea>



We gave you 20 + Tips

We also give you

15 Lovely Weld Wishes

Awaiting your Vote on the Inventor Ideas

(See class handout for links to them)

Get involved with the Inventor & Vault product teams!

Help shape and define the future of the Inventor & Vault products!

Our Feedback Communities serve as our portal into our engagement program. Get access to insider builds through Alpha/Beta. Be included in exclusive online sharing sessions. Stay current on product roadmaps. Interact directly with members of the product teams.

Your thumb print on product direction is just a click away!



<https://autode.sk/VaultFeedback>



<https://autode.sk/InventorFeedback>

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