

Feed Clearance ... the place where forms happen

January 2015
Scott Tacheny

Feed Clearance



What is it?

Strength. Performance. Innovation.

Feed Clearance



What is it?

Where is it measured?

Strength. Performance. Innovation.

Feed Clearance



What is it?

Where is it measured?

What is its role in production planning?

Strength. Performance. Innovation.



Strength. Performance. Innovation.

But first...why this topic?

Why this topic?



One of the most common questions I'm asked is, "can I make this form in my machine...will it fit?"

Strength. Performance. Innovation.

Why this topic?



One of the most common questions I'm asked is, "can I make this form in my machine...will it fit?"

The answer is directly related to your machine's feed clearance, which ranges from under 1/2" to 3".

Why this topic?



One of the most common questions I'm asked is, "can I make this form in my machine...will it fit?"

The answer is directly related to your machine's feed clearance, which ranges from under 1/2" to 3".

Having the ability to confidently answer this question for yourself can cut hours off a quote turn-around.

Feed Clearance



What is it?

Where is it measured?

What's its role in planning production?

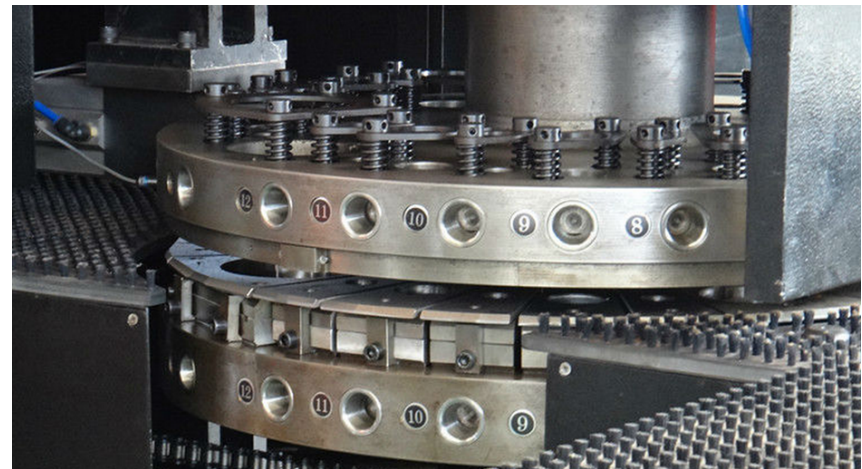
Strength. Performance. Innovation.

Feed Clearance



It's the machine's allowable workspace.

- The area in which your sheet and its forms are created and travel.



Strength. Performance. Innovation.

Feed Clearance



What is it?

Where is it measured?

What's its role in planning production?

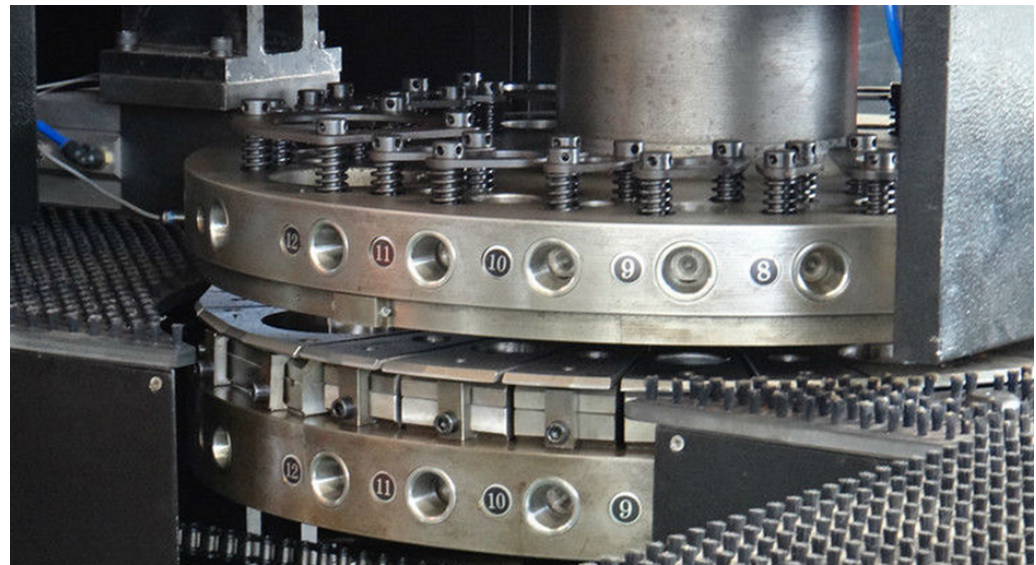
Strength. Performance. Innovation.

Where is feed clearance measured?



It ***is not*** measured between the upper & lower turrets.

- A common misunderstanding



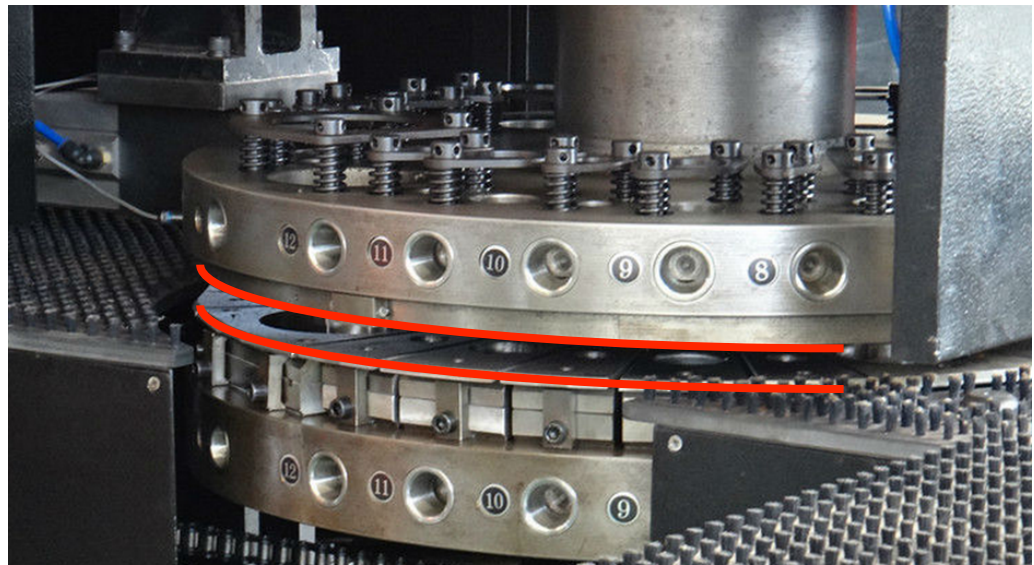
Strength. Performance. Innovation.

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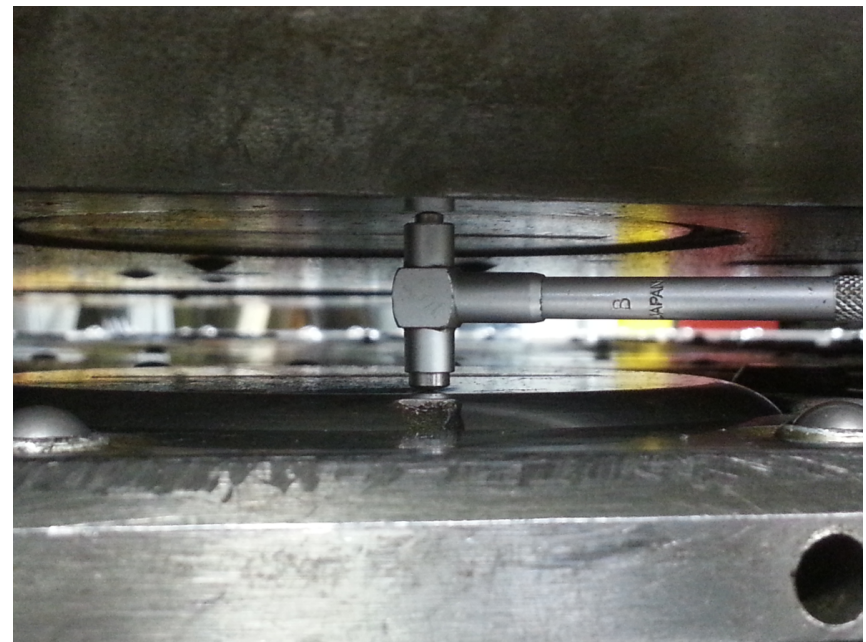


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Where is feed clearance measured?

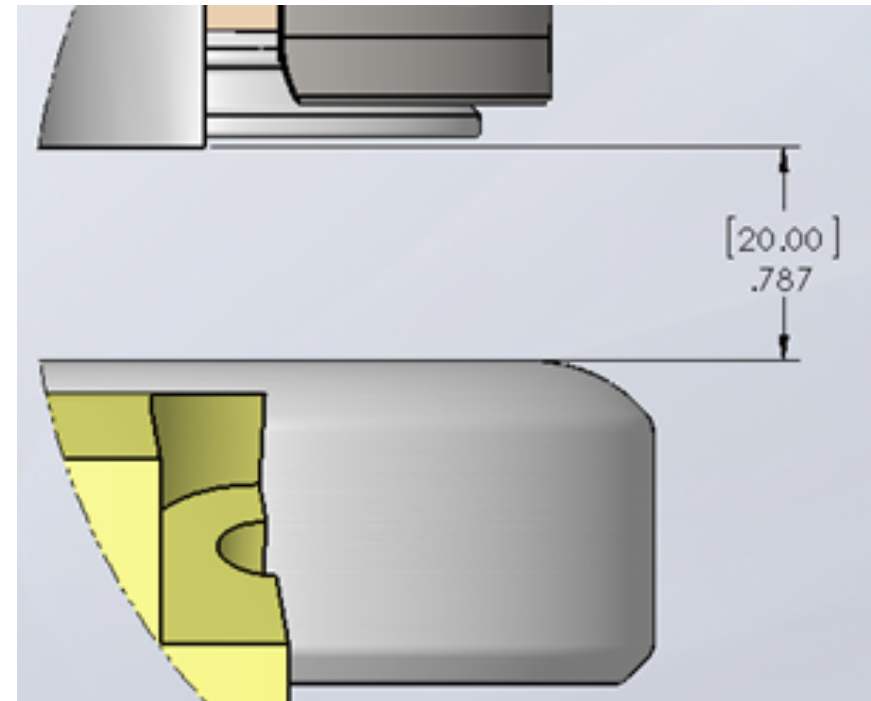
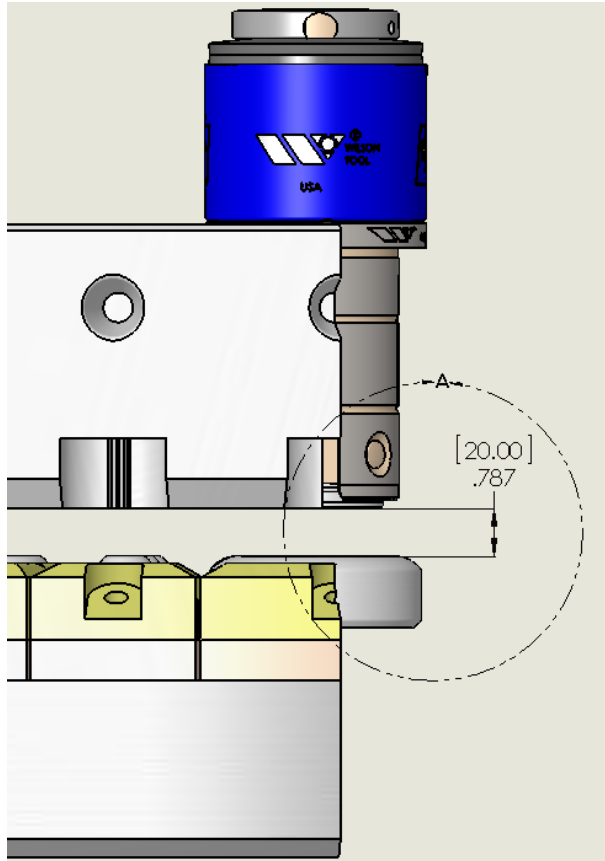


It's the distance between an upper turret and a piercing die



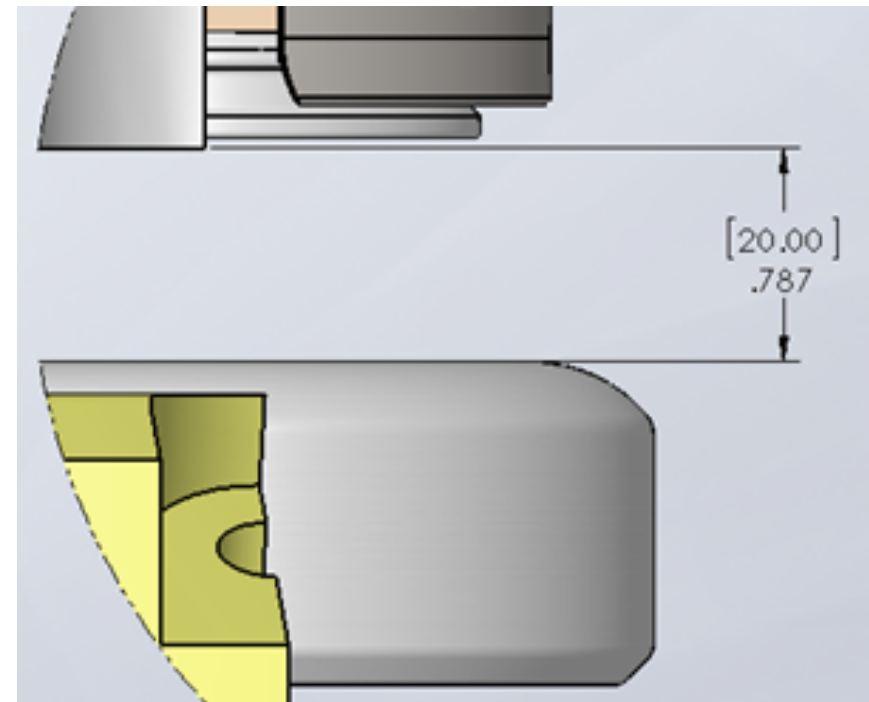
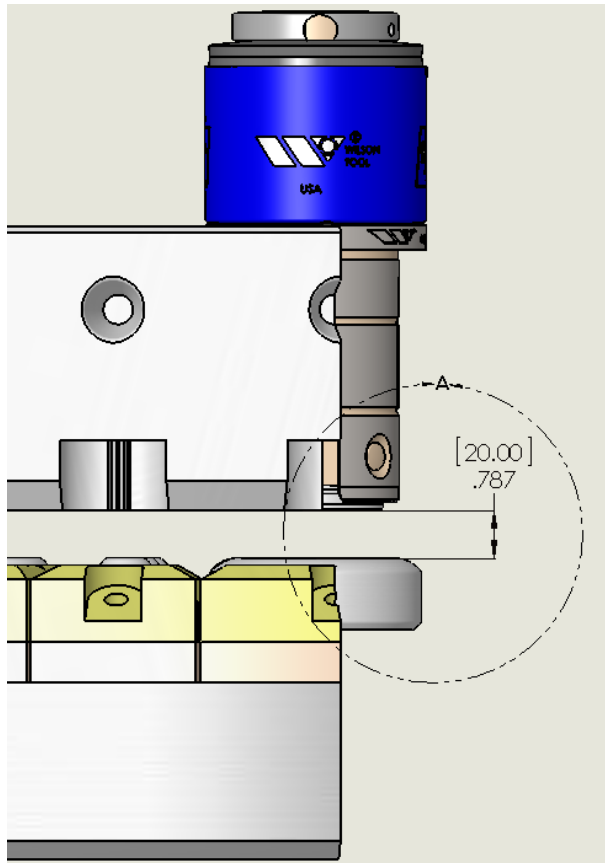
Strength. Performance. Innovation.

This machine has a feed clr. of 0.787 [20mm]



Strength. Performance. Innovation.

This machine has a feed clr. of 0.787 [20mm]



Generally, stripper plates are slightly recessed.

Strength. Performance. Innovation.

Poll Question



What is your machine's feed clearance?

1. I'm not sure
2. Less Than 1/2" [12.5mm]
3. 0.75 [19mm]
4. 0.787 [20mm]
5. 0.984 [25mm]
6. > 0.984 [25mm]

Feed Clearance



What is it?

Where is it measured?

What is its role in production planning?

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Feed Clearance's Role in Production Planning



- It is used to “check” whether or not you can make a form in the punch press.

i.e. It answers the question,

“can I make this form
in my machine...**will it fit?**”

The Feed Clearance Must Accommodate

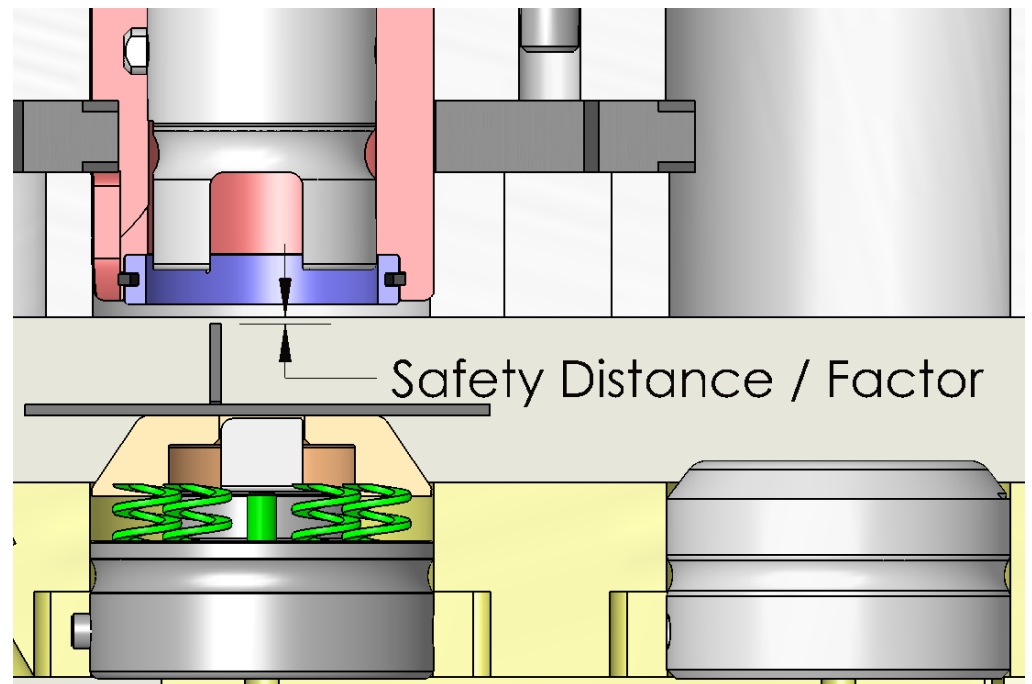


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The Feed Clearance Must Accommodate



- Safety Factor / Safety Distance

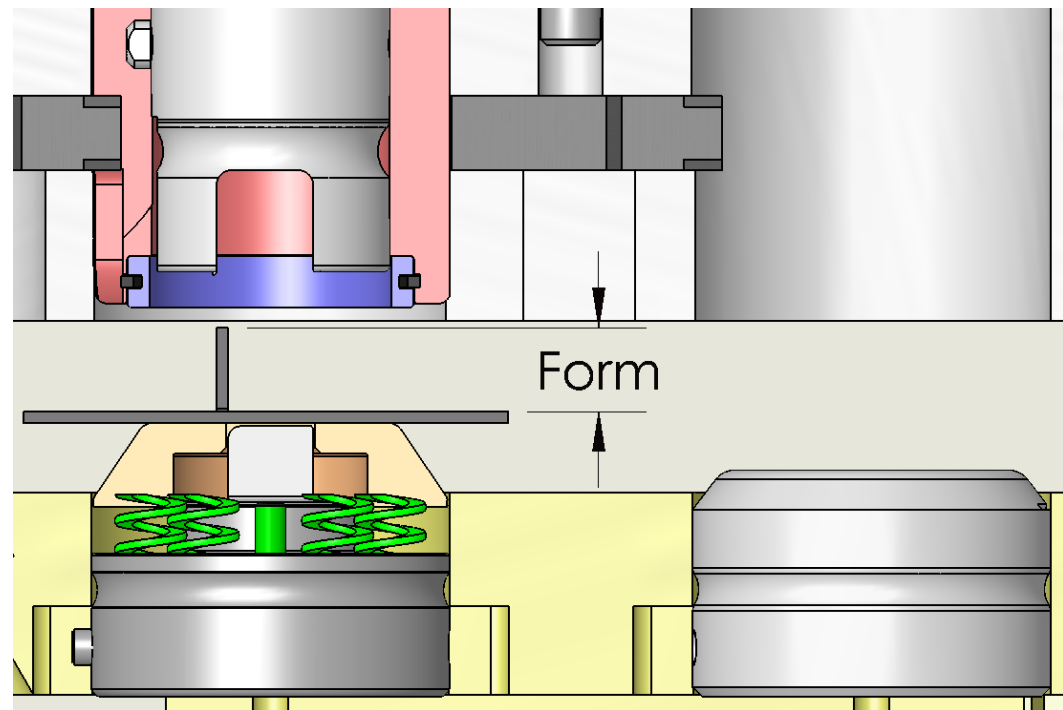


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The Feed Clearance Must Accommodate



- Safety Factor / Safety Distance
- Form

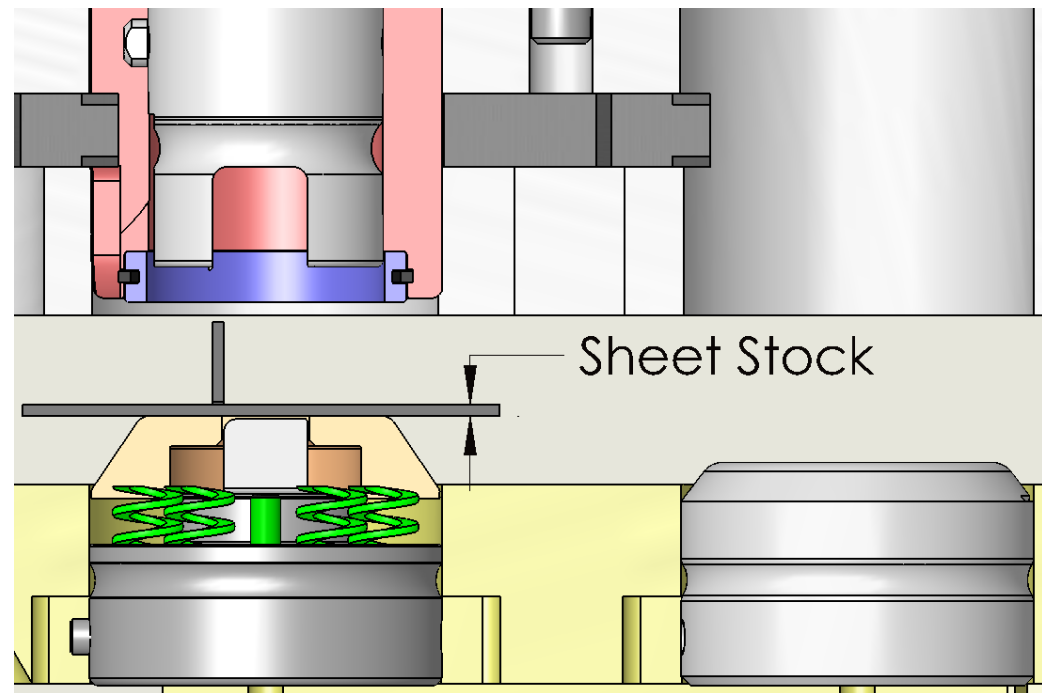


Strength. Performance. Innovation.

The Feed Clearance Must Accommodate



- Safety Factor / Safety Distance
- Form
- Sheet Stock

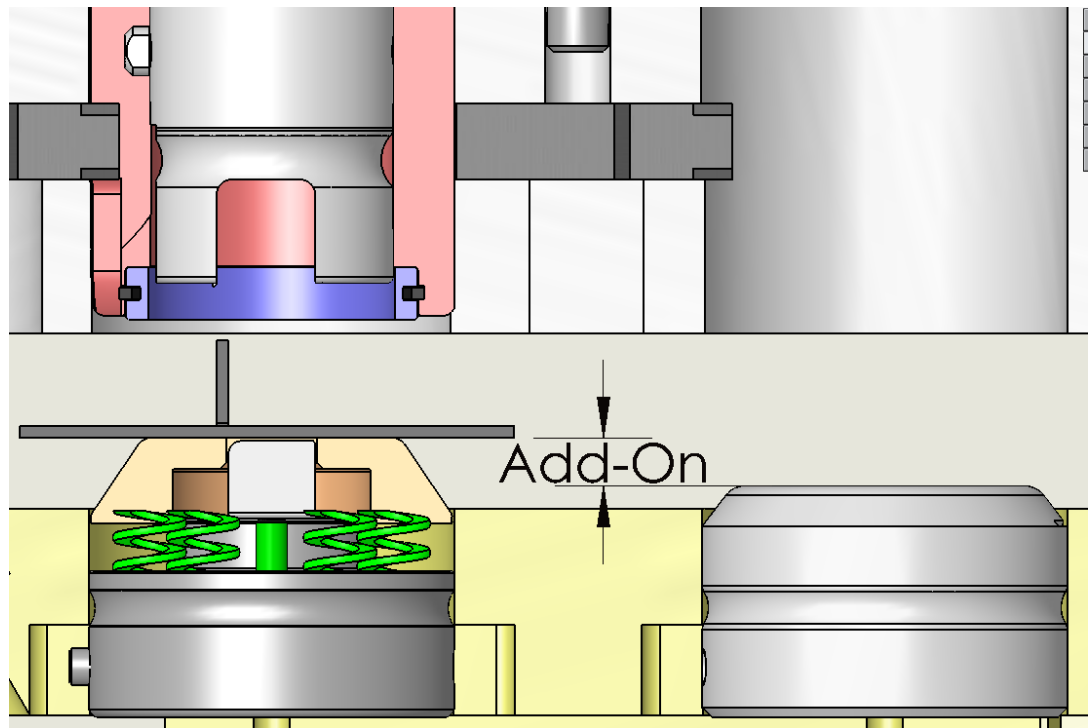


Strength. Performance. Innovation.

The Feed Clearance Must Accommodate



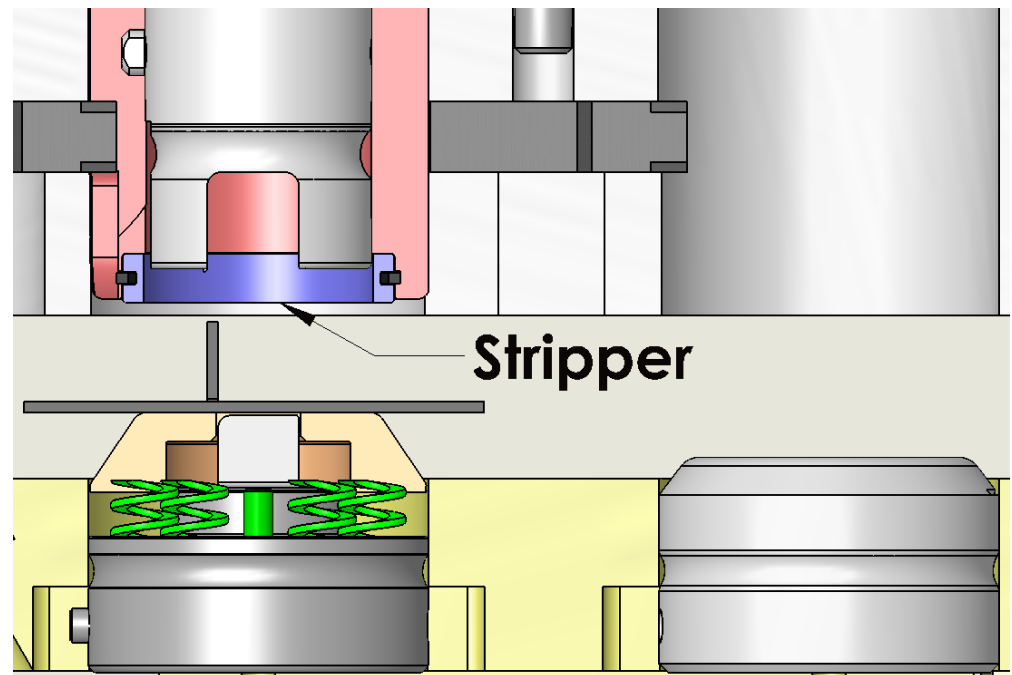
- Safety Factor / Safety Distance
- Form
- Sheet Stock
- Taller Die
 - Die Add-On



The Feed Clearance Must Accommodate



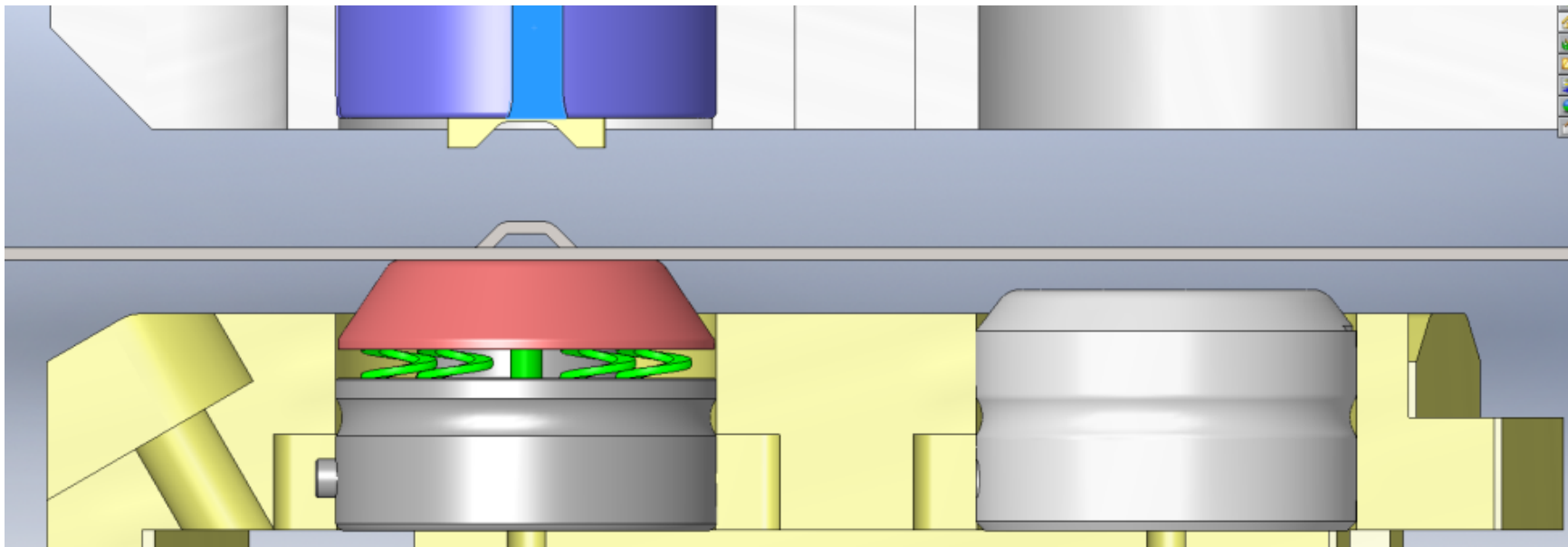
- Safety Factor / Safety Distance
- Form
- Sheet Stock
- Taller Die
 - Die Add-On
- Extra Thick Strippers
 - Often used when relief is needed



What about accommodating ejectors?



- Ejectors that may hang down into the feed clearance zone can usually be ignored because the sheet/form can be moved sideways or around the heels.

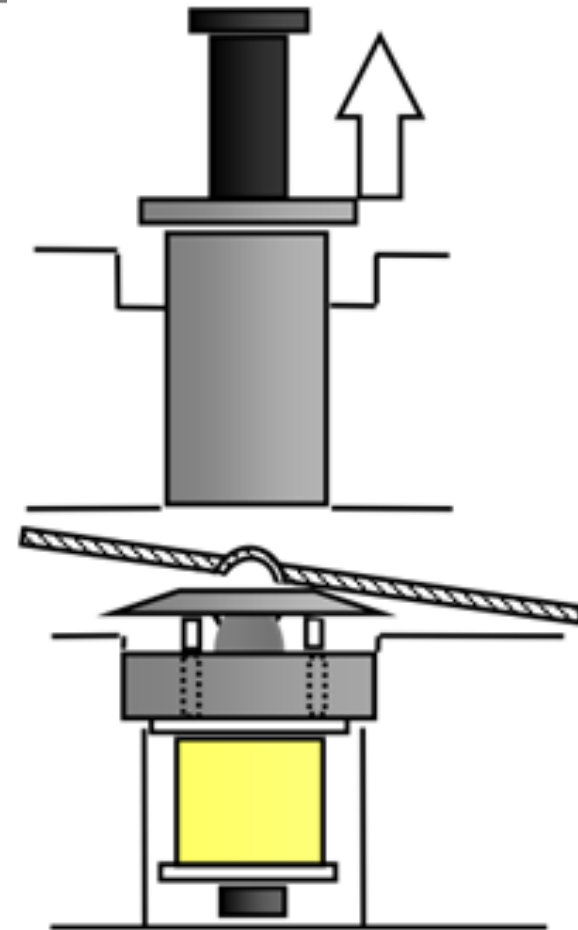


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Why a Safety Factor/Distance?



- It accommodates some sheet distortion as well as the effects a taller die can have on the sheet.
 - As shown, the sheet does not sit flat.

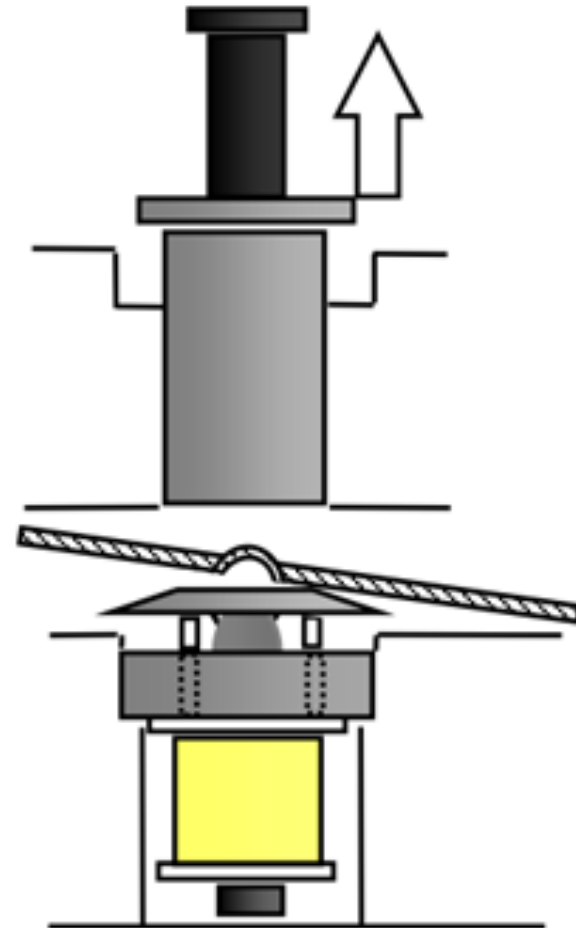


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Safety Factor/Distance



- Suggested Safety Distance is 0.12 [3mm]

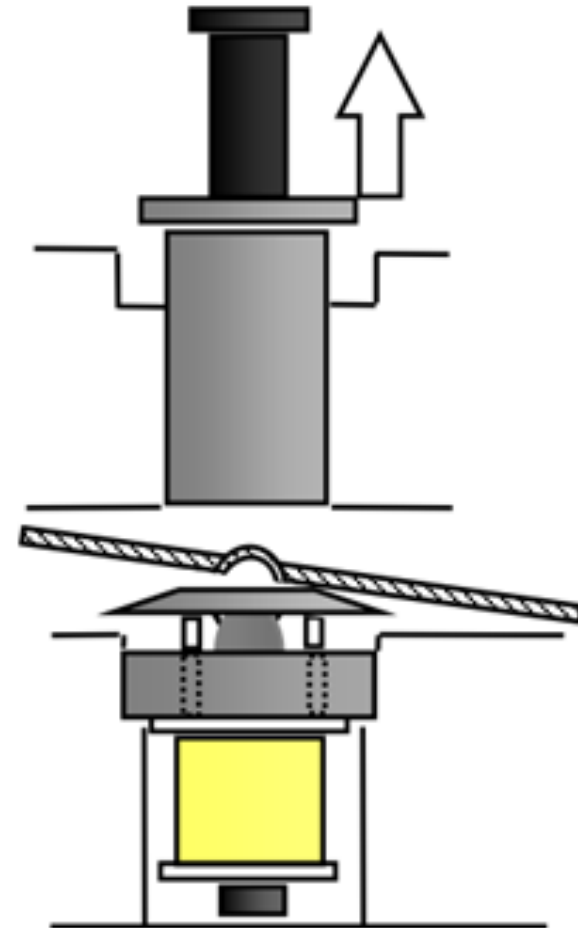


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Safety Factor/Distance



- Suggested Safety Distance is 0.12 [3mm]
- **Bare Minimum** Safety Distance is 0.060 [1.5mm]

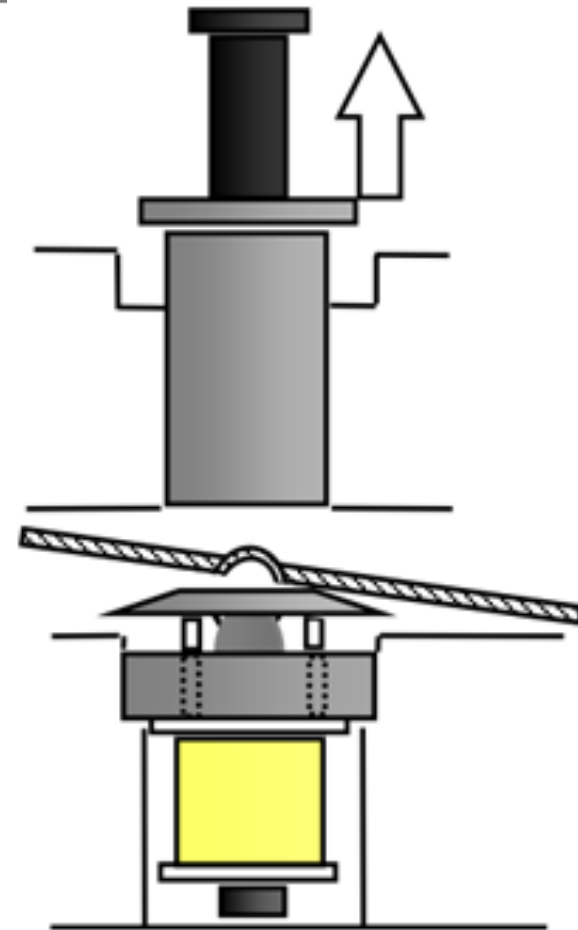


Strength. Performance. Innovation.

Special machine functions that overcome this



- Retractable Die Station
- Active Die
- Forming Stations





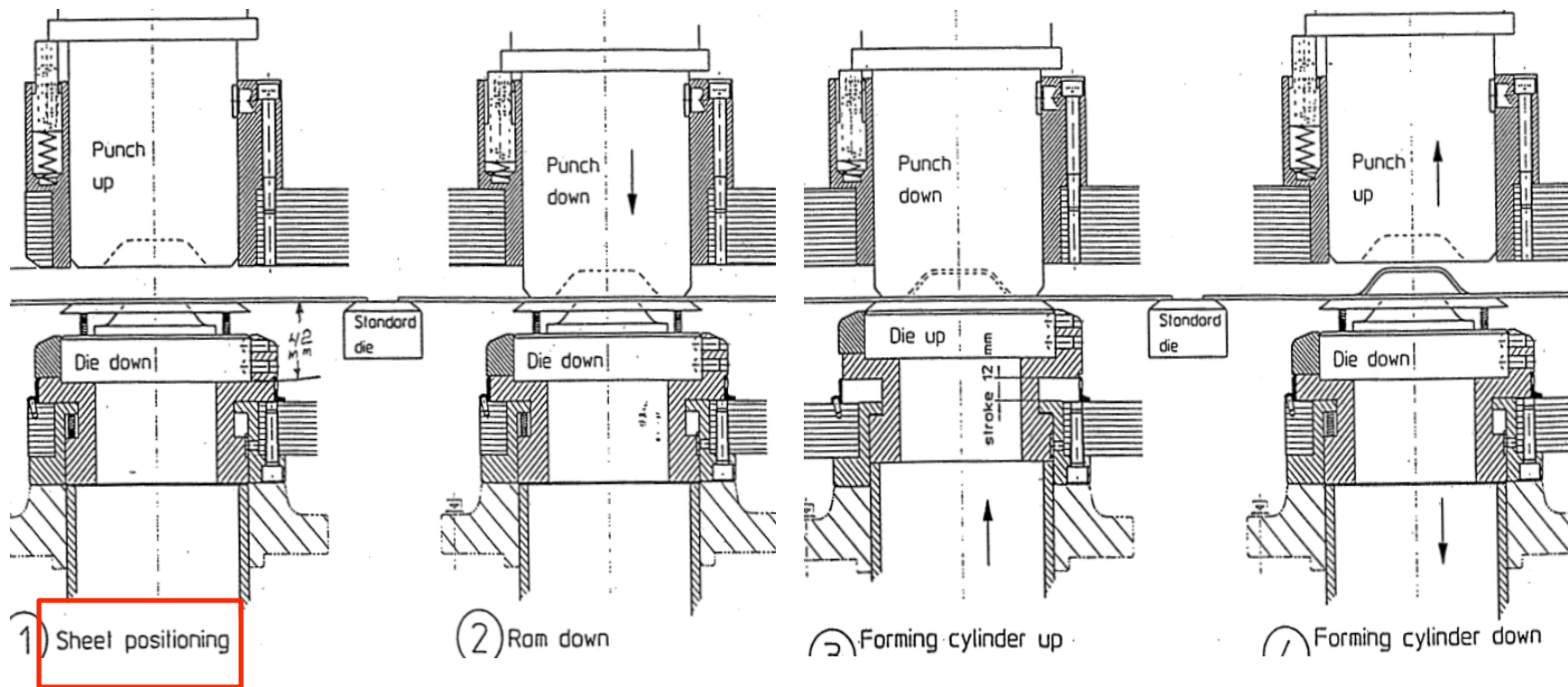
Strength. Performance. Innovation.

Forming Station Sidebar

Finn Power Retractable Die Stations



Sheet stays level

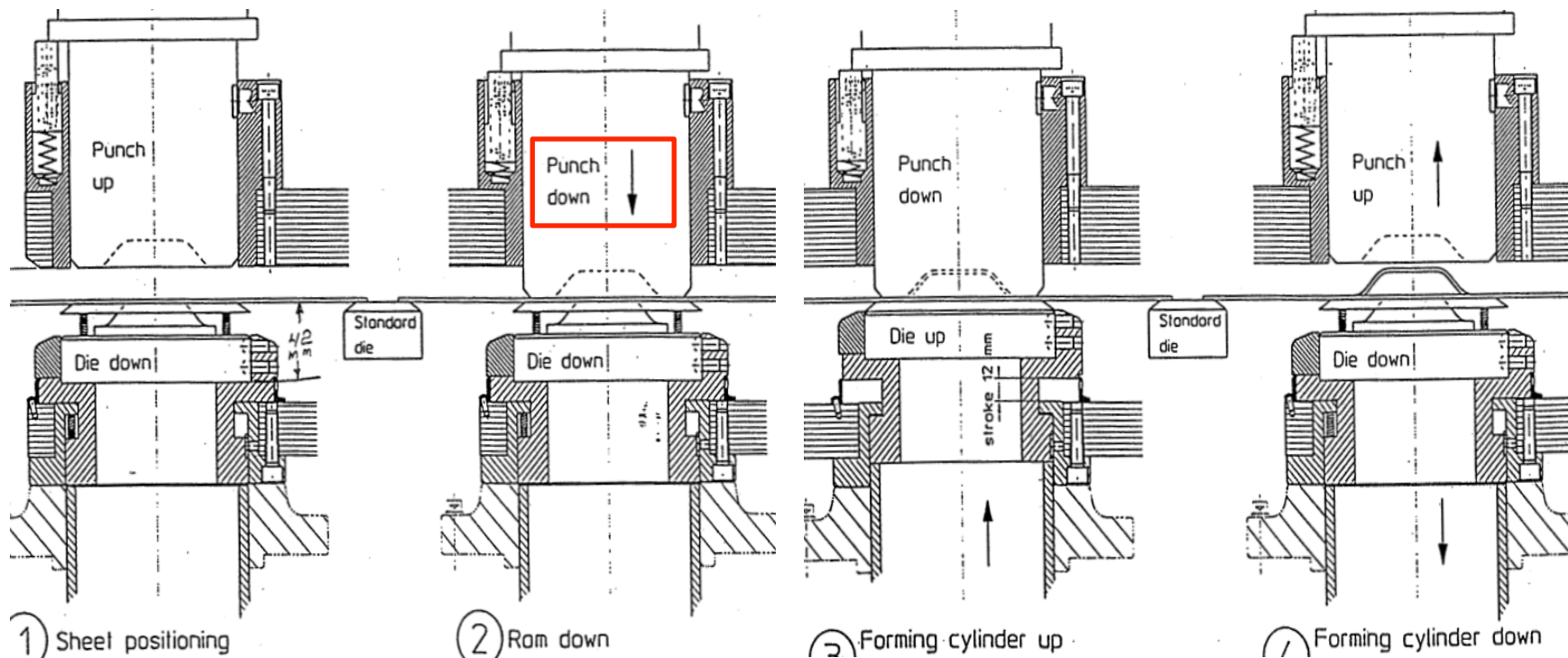


Strength. Performance. Innovation.

Finn Power Retractable Die Stations



Sheet stays level

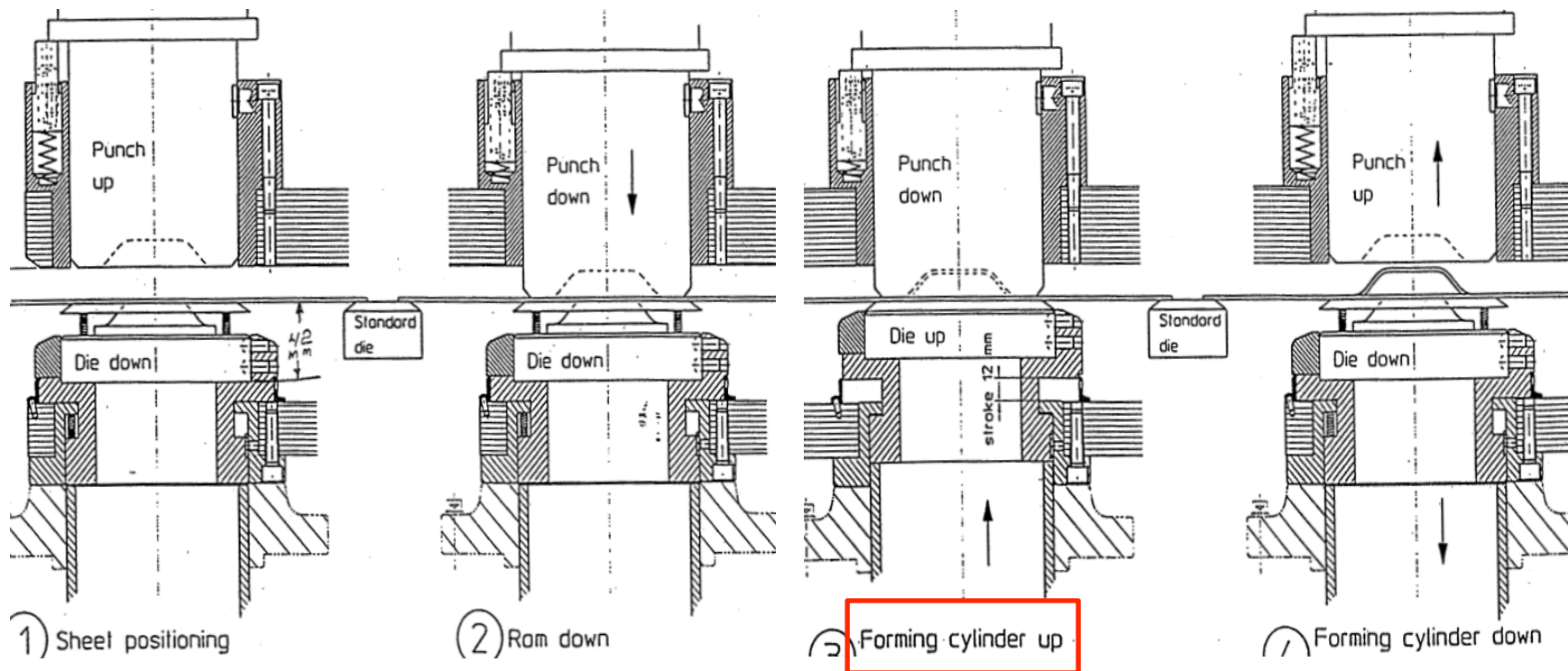


Strength. Performance. Innovation.

Finn Power Retractable Die Stations



Sheet stays level

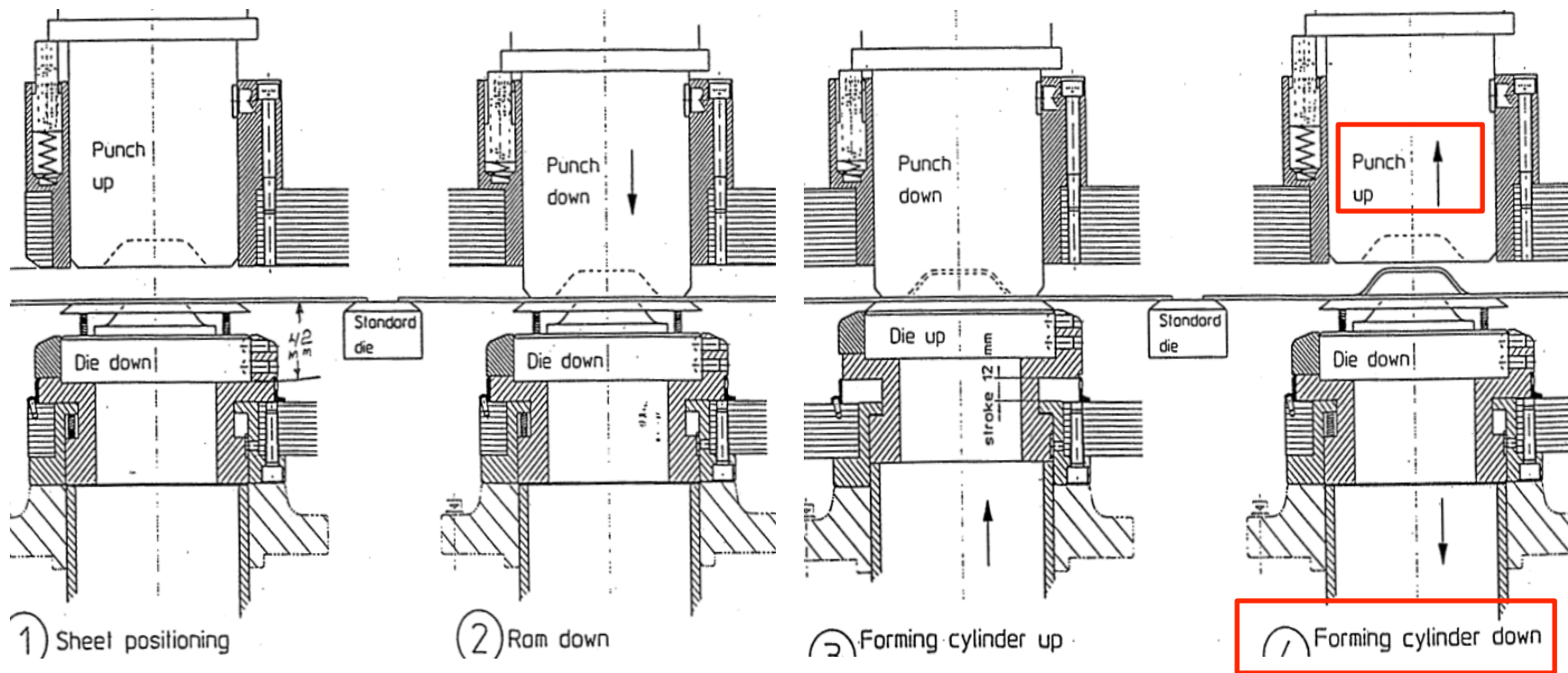


Strength. Performance. Innovation.

Finn Power Retractable Die Stations



Sheet stays level

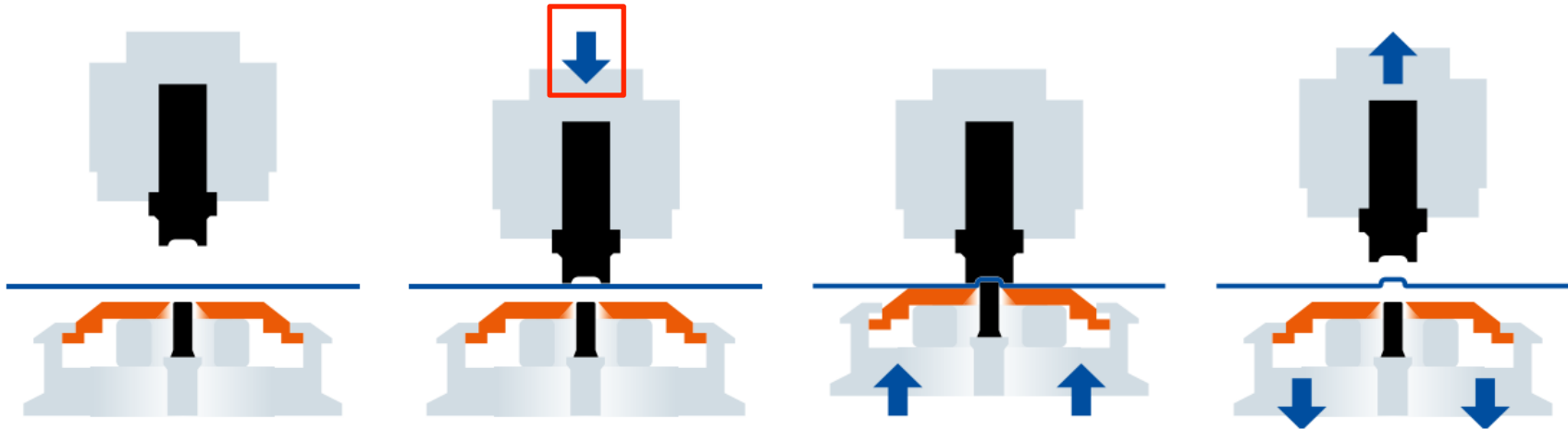


Strength. Performance. Innovation.

Trumpf Active Die System



Sheet stays level

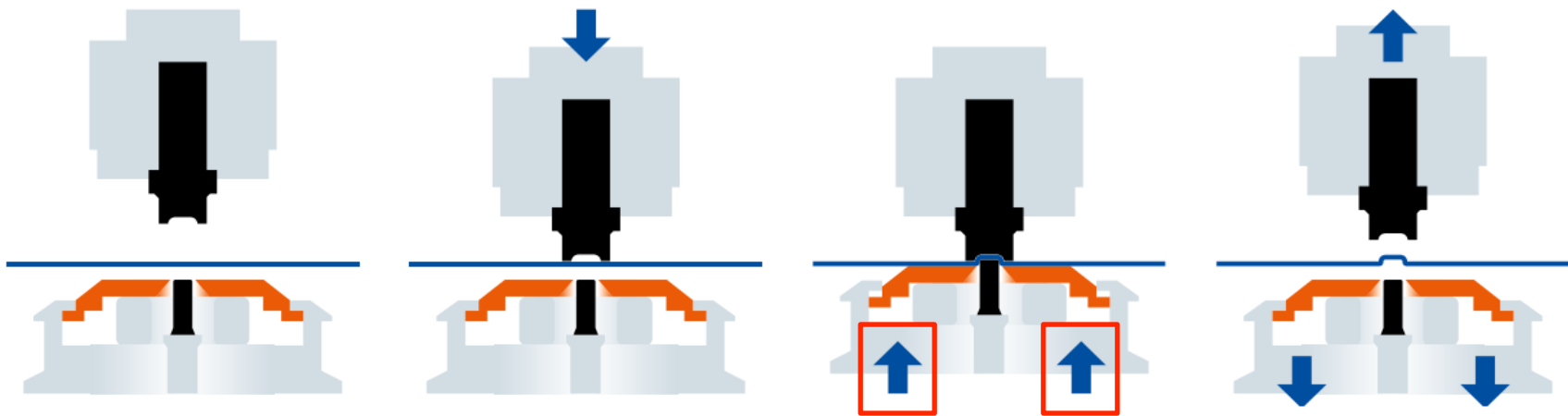


Strength. Performance. Innovation.

Trumpf Active Die System



Sheet stays level

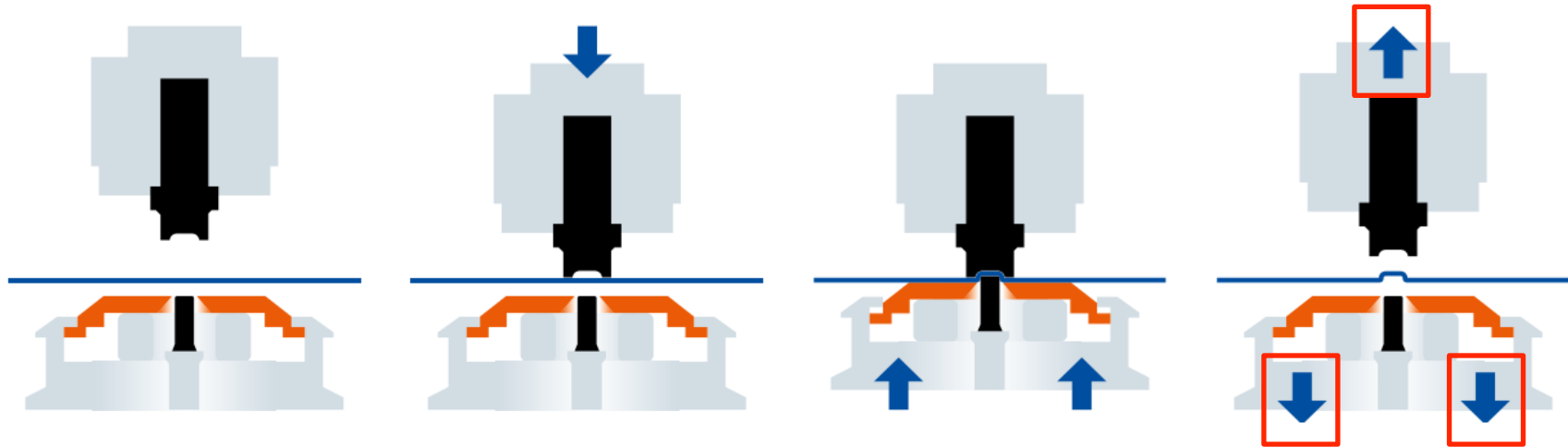


Strength. Performance. Innovation.

Trumpf Active Die System



Sheet stays level

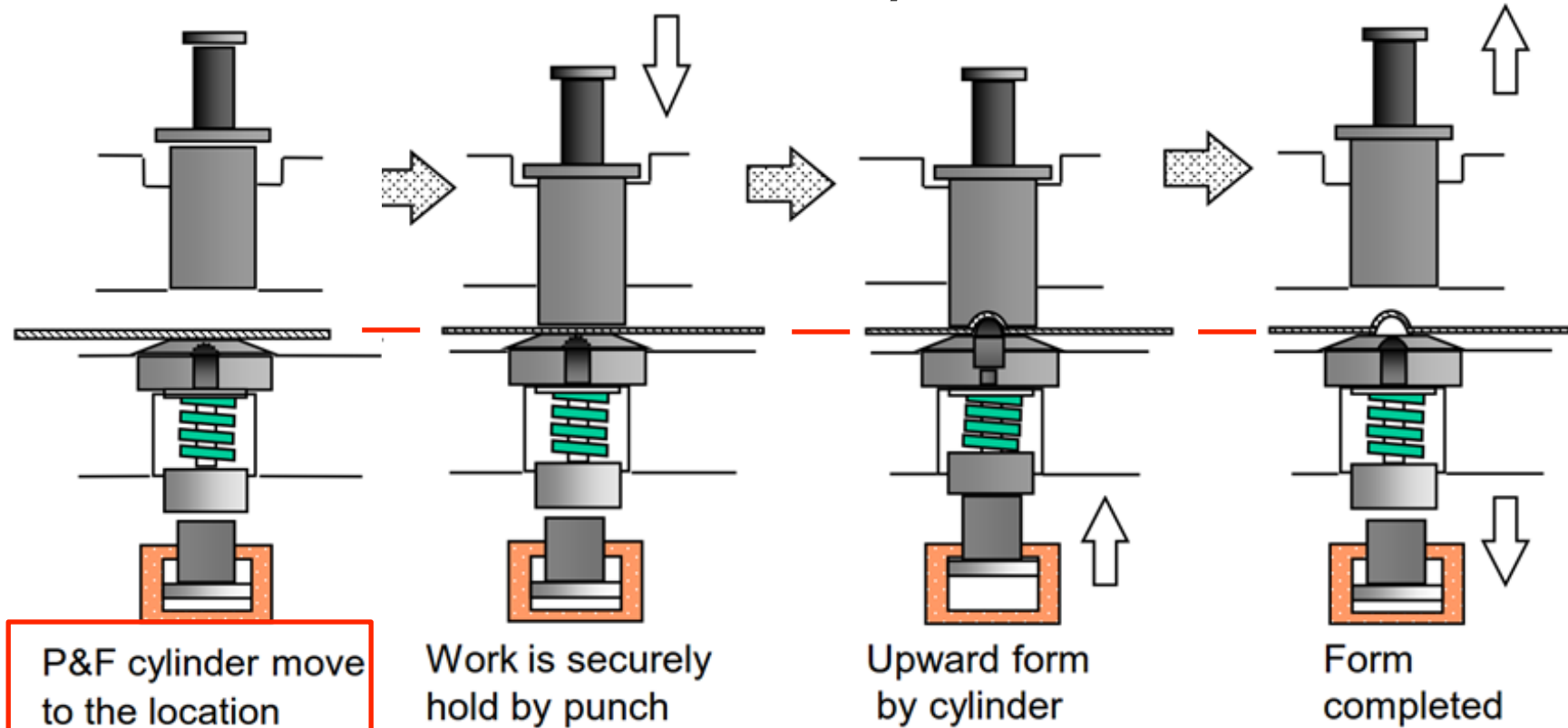


Strength. Performance. Innovation.

Amada Forming Stations (aka P&F)



Sheet stays level

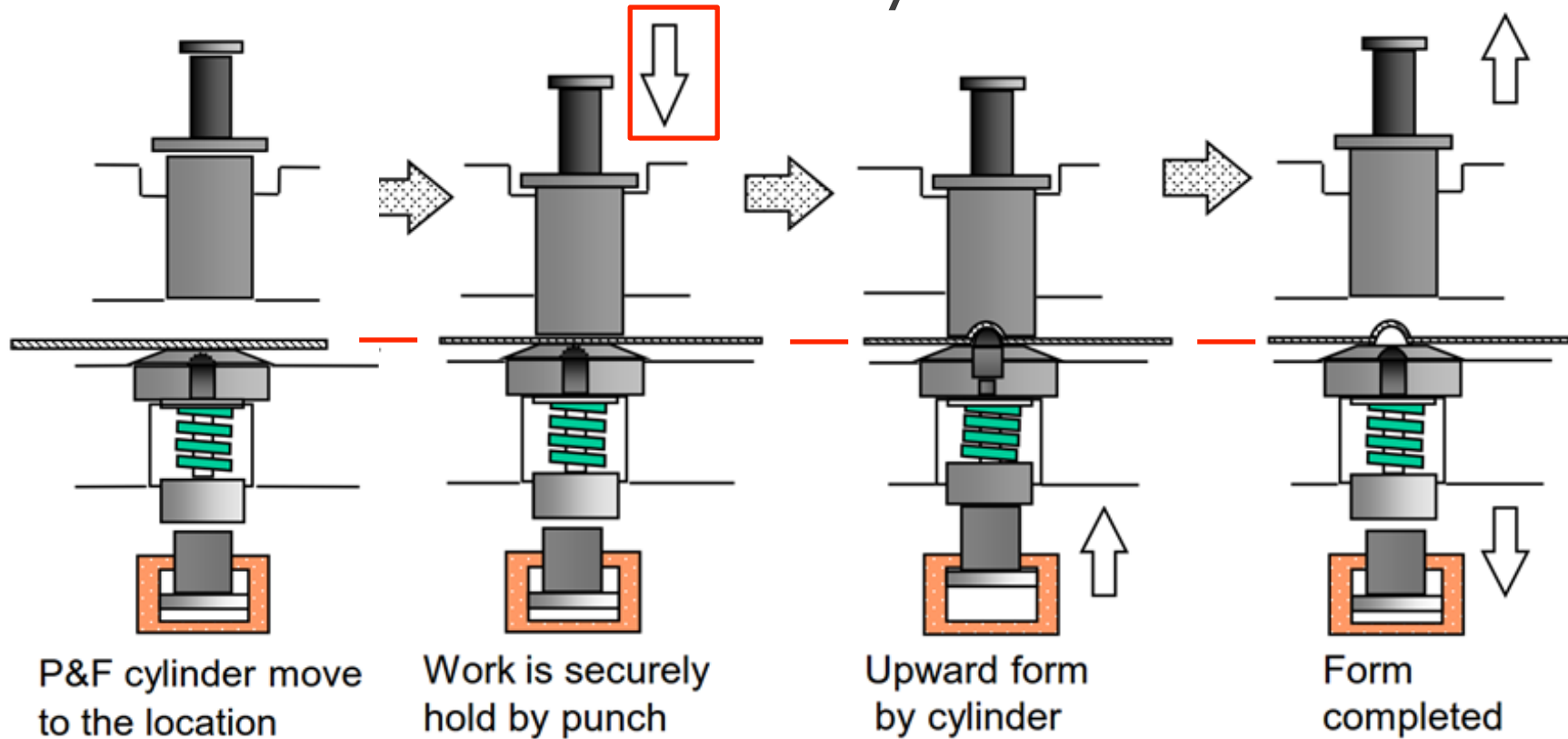


Strength. Performance. Innovation.

Amada Forming Stations (aka P&F)



Sheet stays level

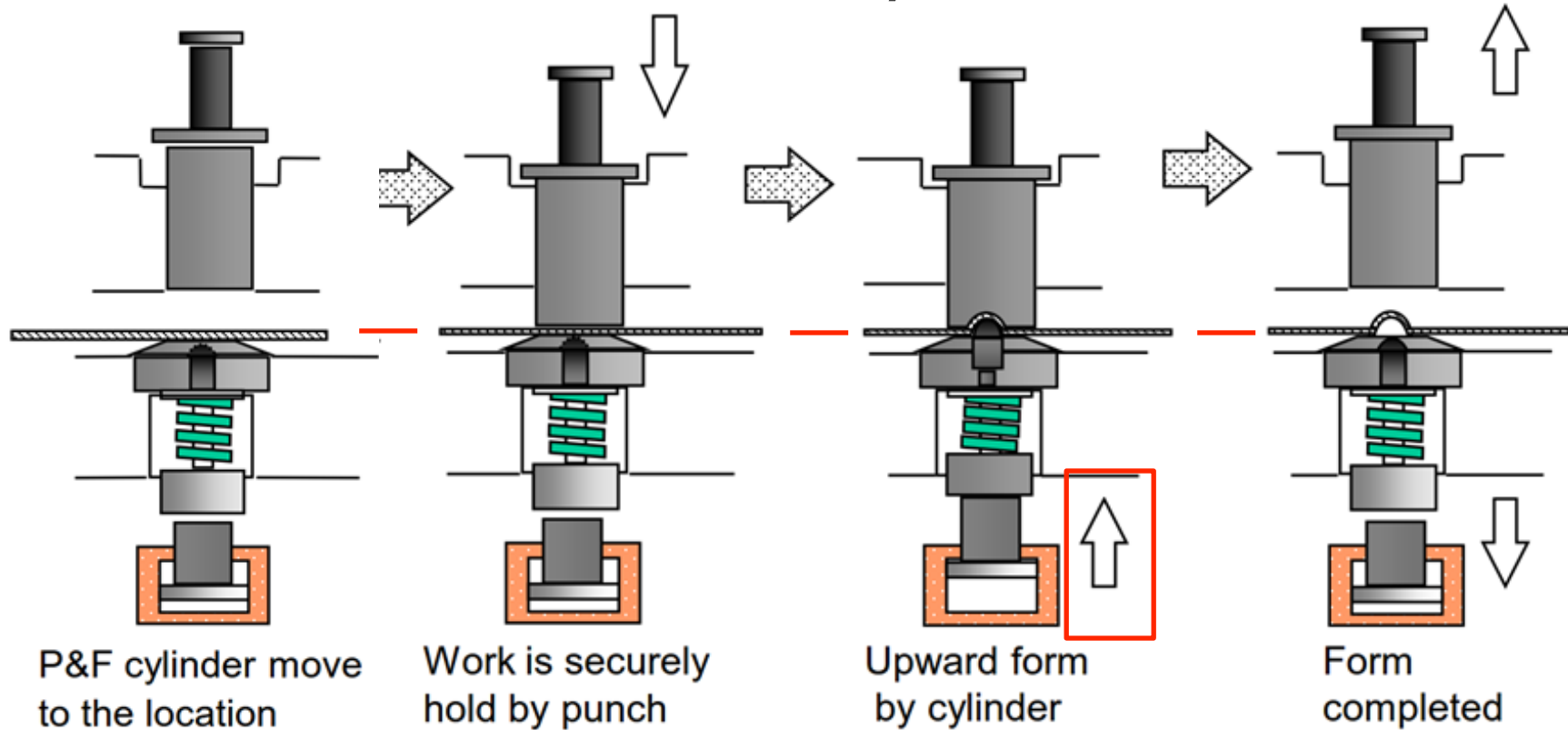


Strength. Performance. Innovation.

Amada Forming Stations (aka P&F)



Sheet stays level

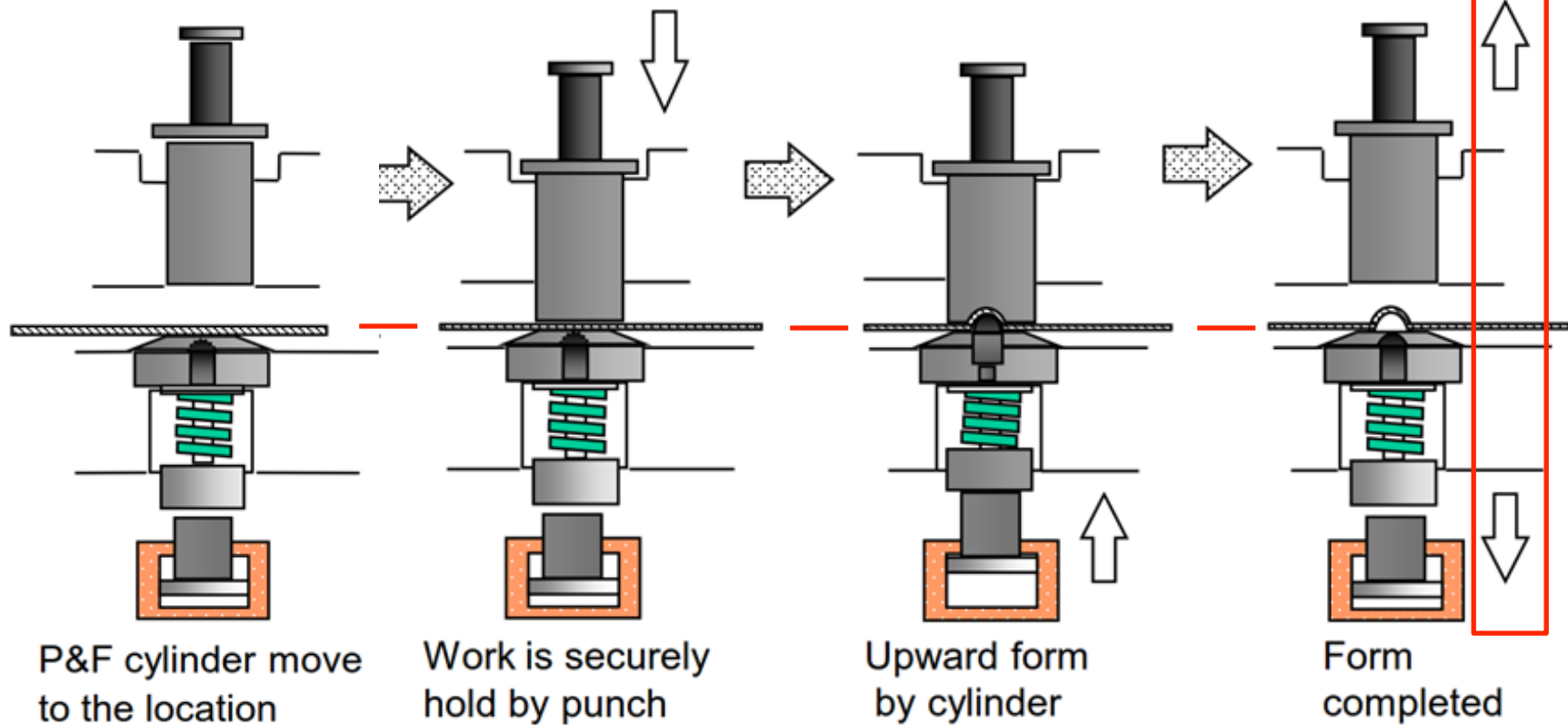


Strength. Performance. Innovation.

Amada Forming Stations (aka P&F)



Sheet stays level



Strength. Performance. Innovation.

Poll Question



Do you use any of these systems?

1. Yes
2. No
3. I'm not sure
4. We don't have any of these systems



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If you have one of these stations....
use it, you will not regret it.

Back to our topic...

What's the role of feed clearance in production planning?

Feed Clearance's Role in Production Planning



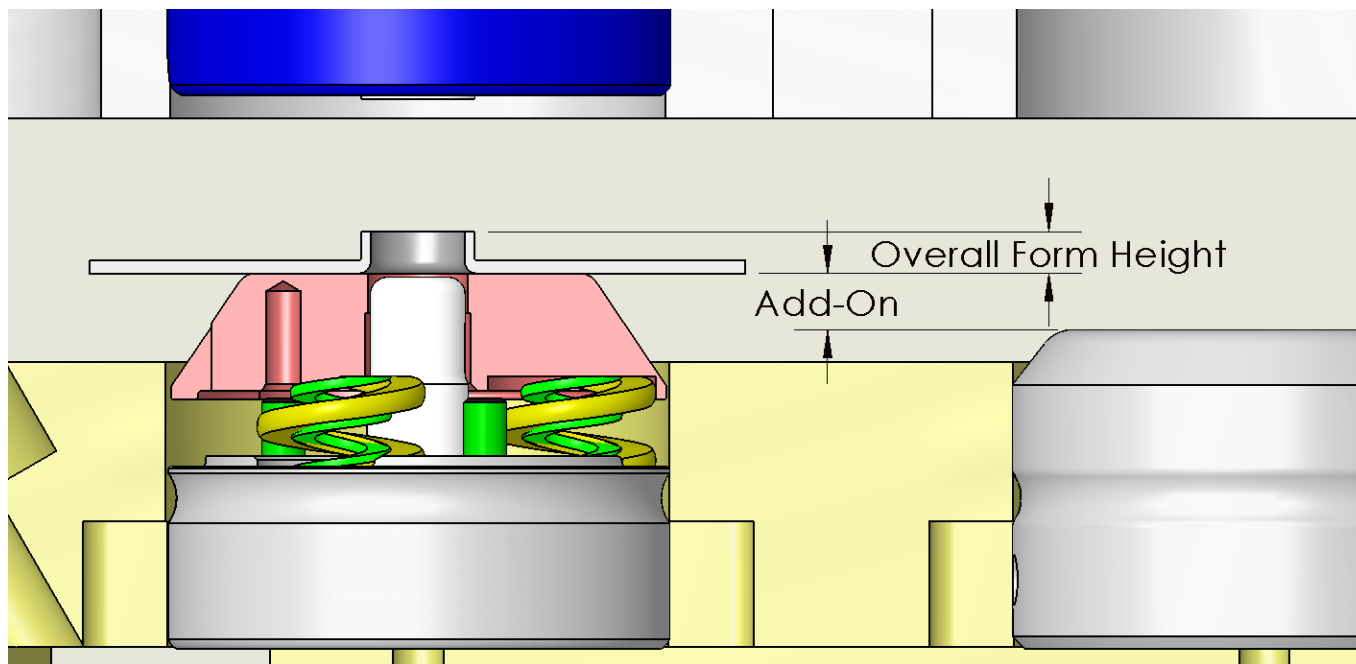
It needs to accommodate everything!

- Safety Factor / Safety Distance
- Form
- Sheet Stock
- Taller Die
 - Die Add-On
- Extra Thick Strippers
 - Often used when relief is needed

What is Die Add-On?



The amount a forming die is taller than a piercing die



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How do I know what the Die Add-On is?



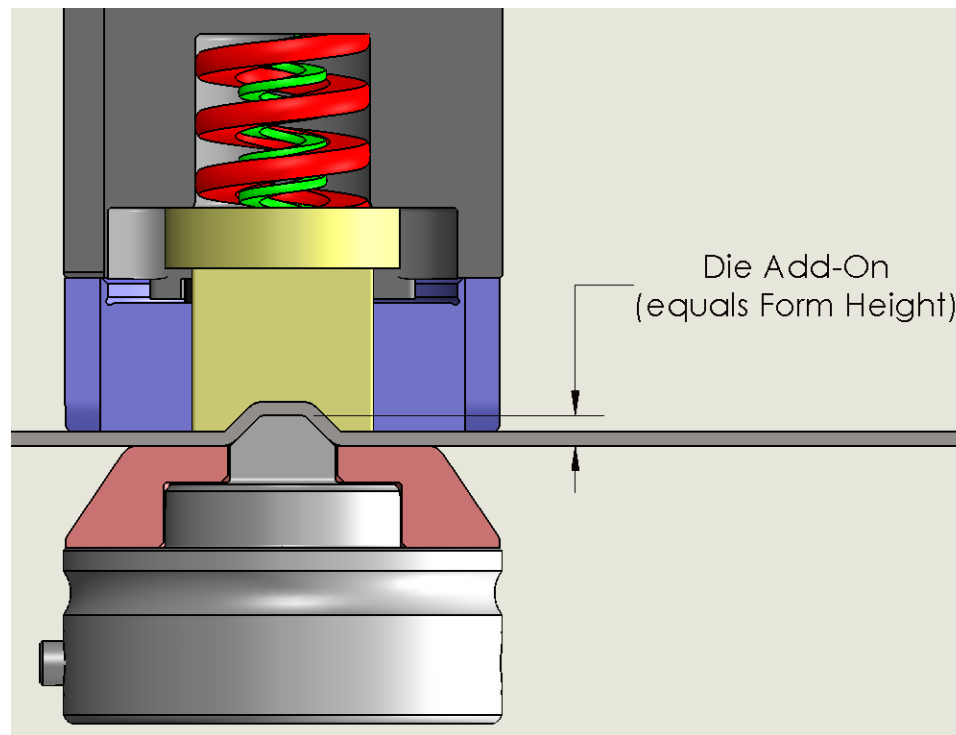
Most forms fall into one of three tool designs, which dictates the die add-on.

- Positive forms
- Pass-thru/Pass-by forms
- Wipe-up 90° forms

Positive Forms



Die Add-On = Form Height

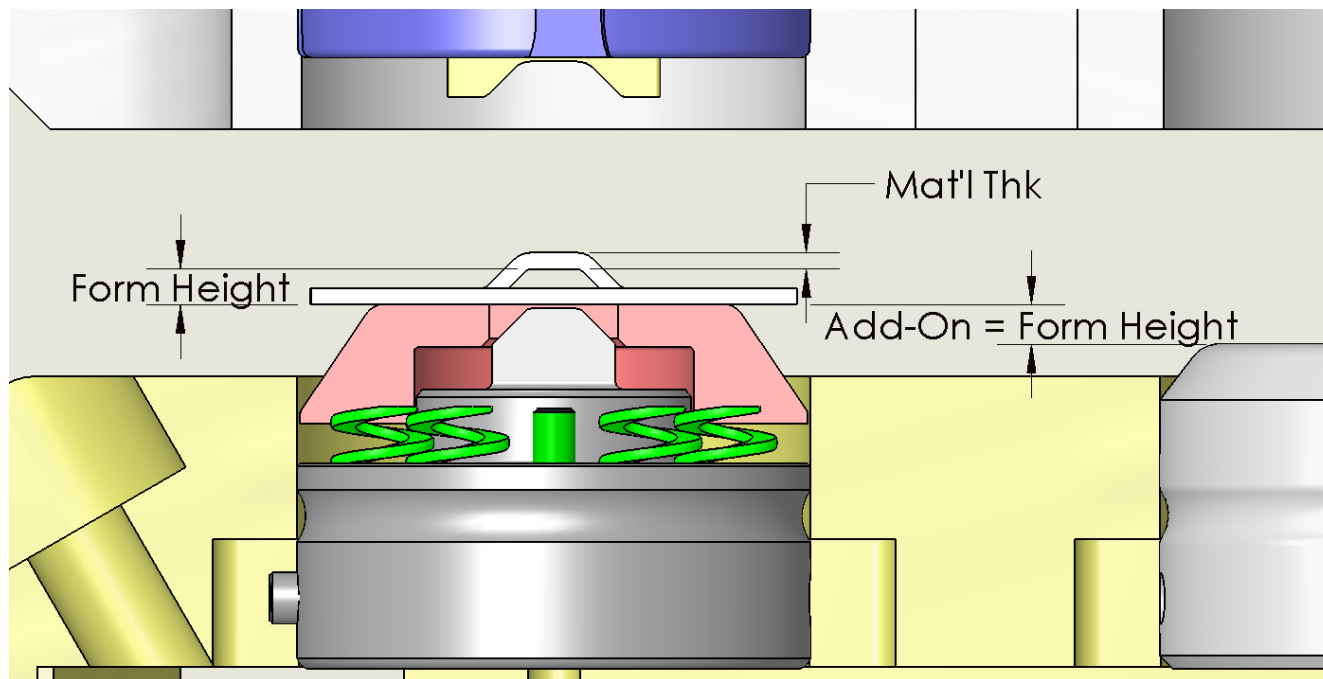


Strength. Performance. Innovation.

Min. Feed Clearance of Positive Forms



$$\text{MFC} = \text{Safety Factor} + [2 \times \text{Form Height}] + \text{Mat'l}$$



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Positive Forms



Bridge

Emboss

EKO

Dimple

Half shear

Lance & form

- Up & over only

Louvers (most)

- Rare cases get shortened

Ribs

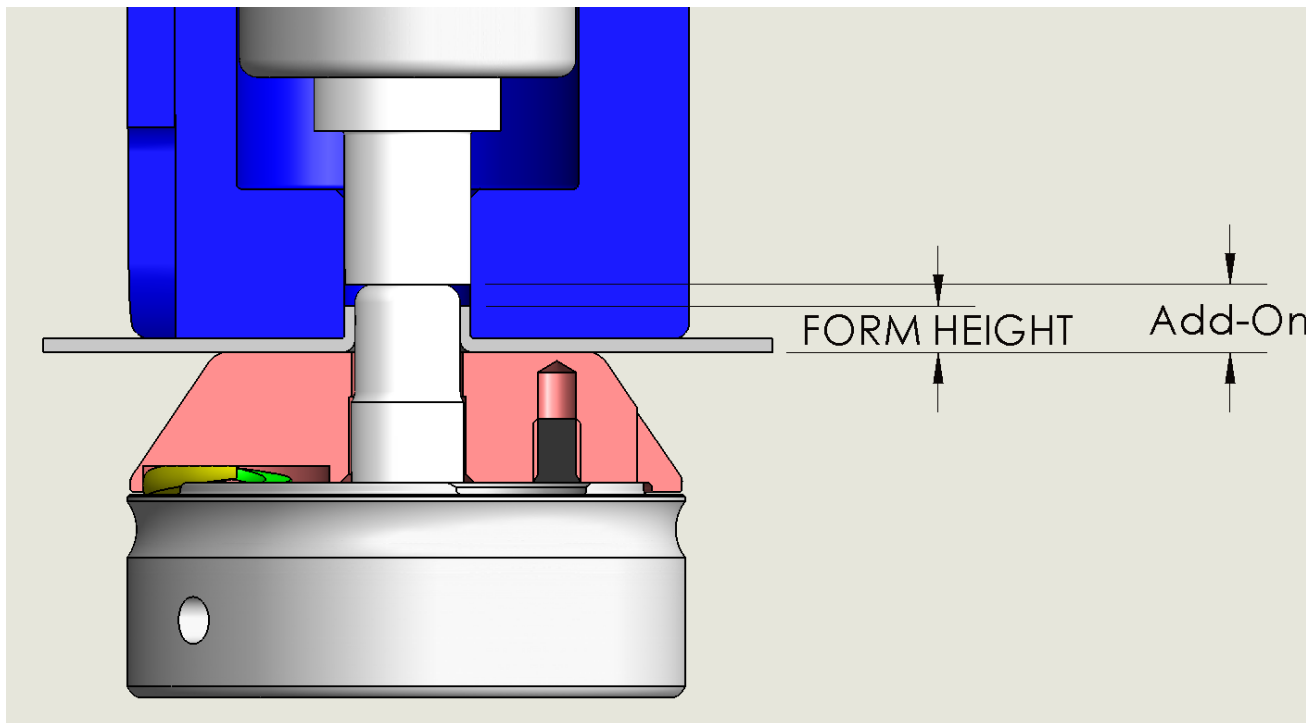
Thread forms

Wheel Tools

Pass-thru / Pass-by Forms



Die Add-On > Form Height

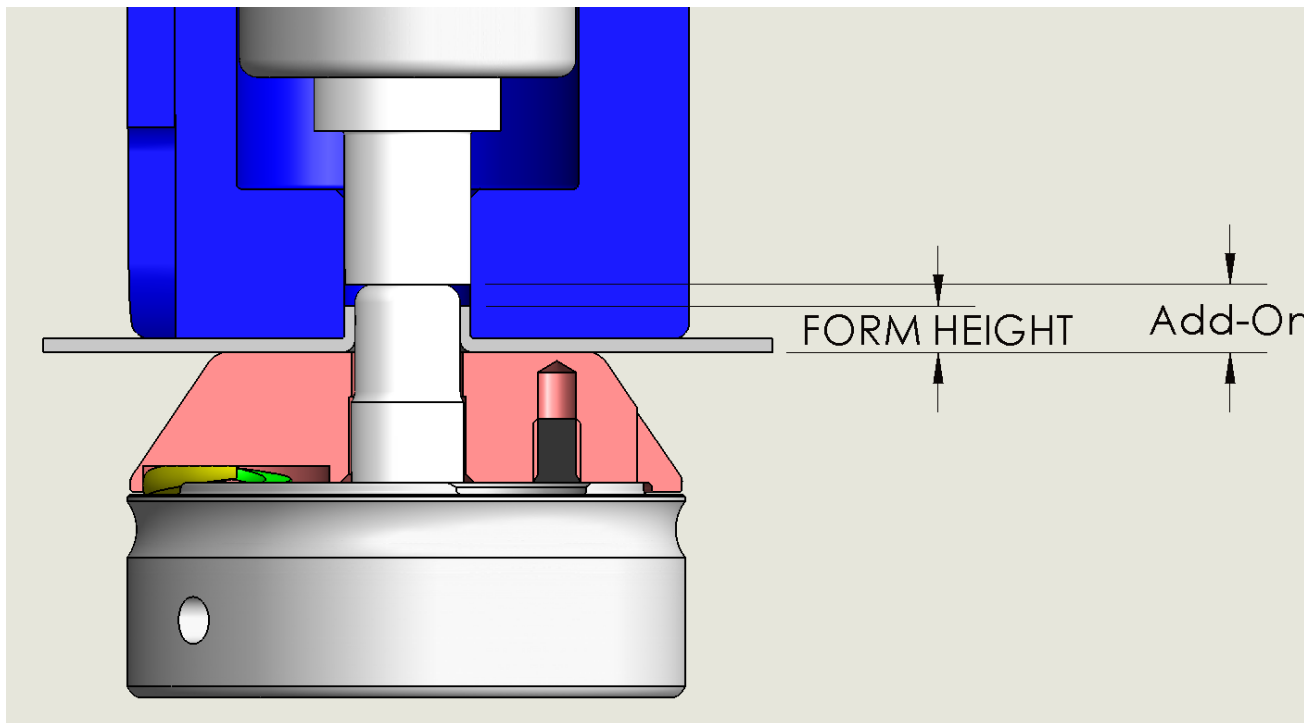


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Pass-thru / Pass-by Forms



Rule of Thumb: Radius on Tool = Mat'l

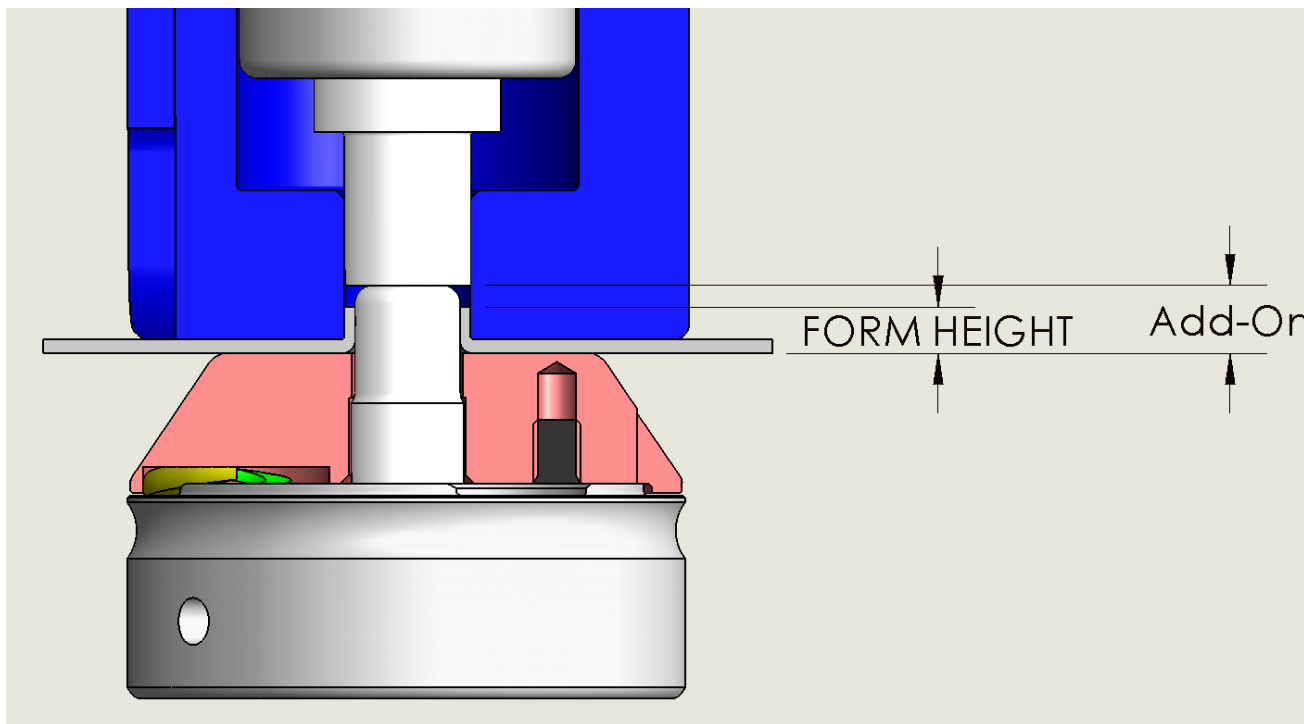


Strength. Performance. Innovation.

Pass-thru / Pass-by Forms



Rule of Thumb: Radius on Tool = Mat'l

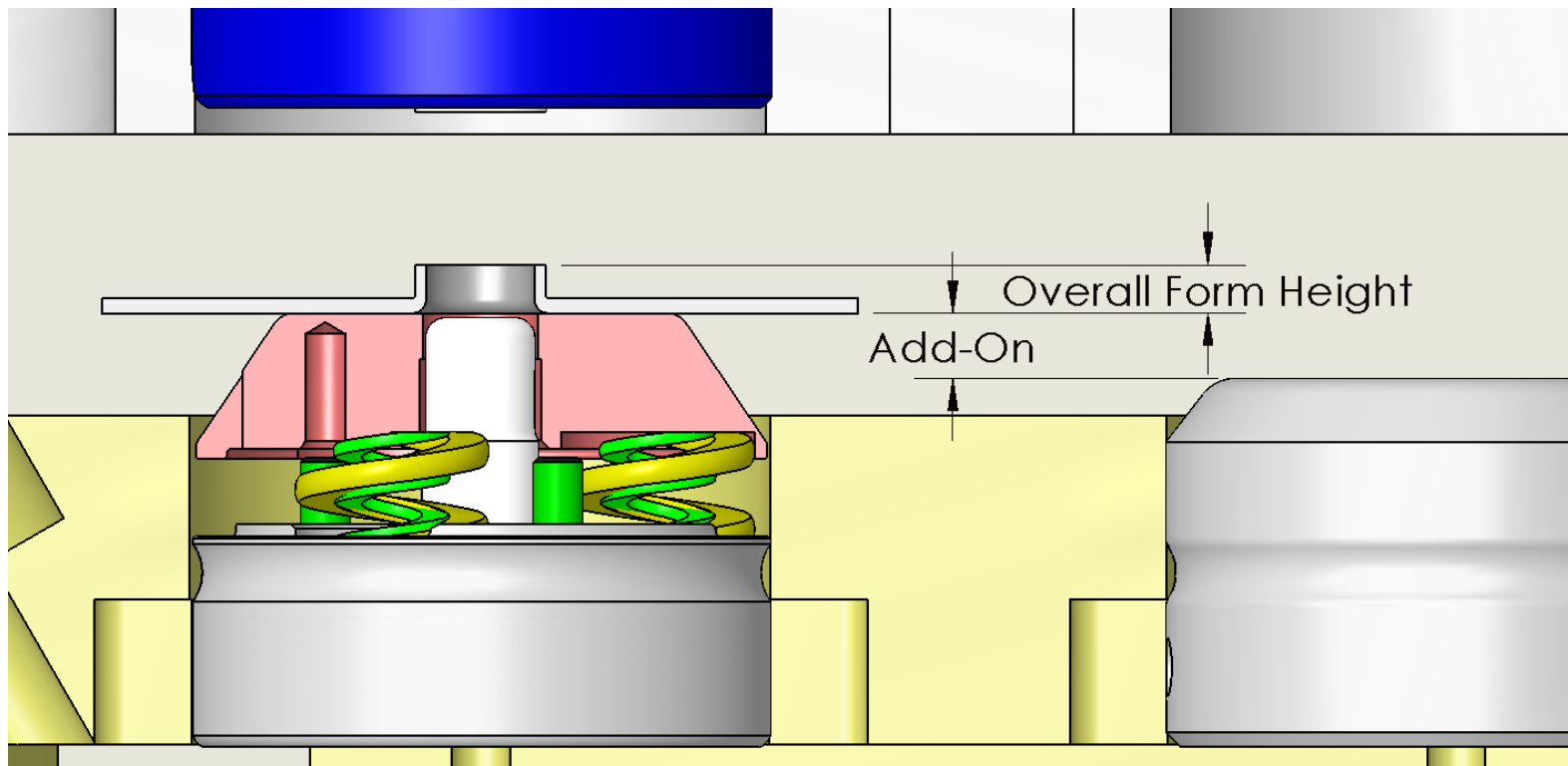


\therefore Die Add-On = Form Height + Mat'l

Min. Feed Clearance of Pass-by Forms



$$\text{MFC} = \text{Safety Factor} + [2 \times \text{Form}] + \text{Mat'l}$$



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Pass-thru / Pass-by Forms



Card guides

Coins

Extrusion

Form only
(countersink)

Lance & form

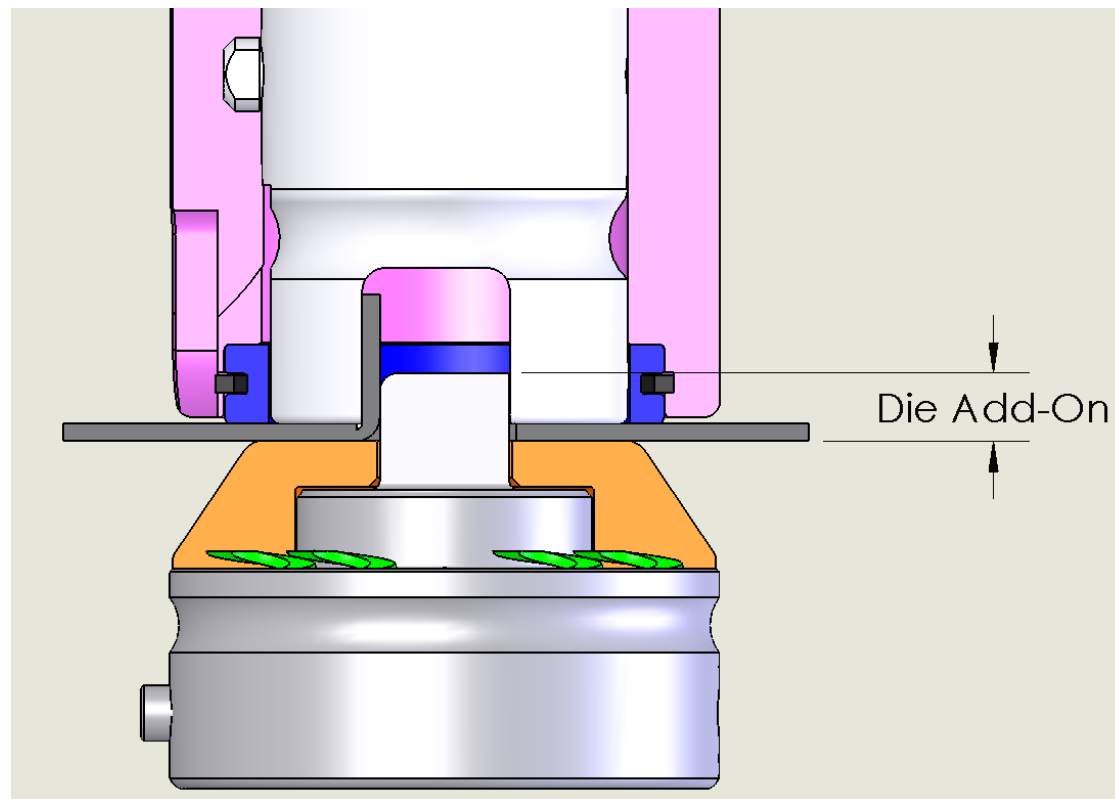
– Up 90 with straight
sides

Progressive edge form

Wipe-Up 90°(in a category by itself)



Die Add-On < Form Height

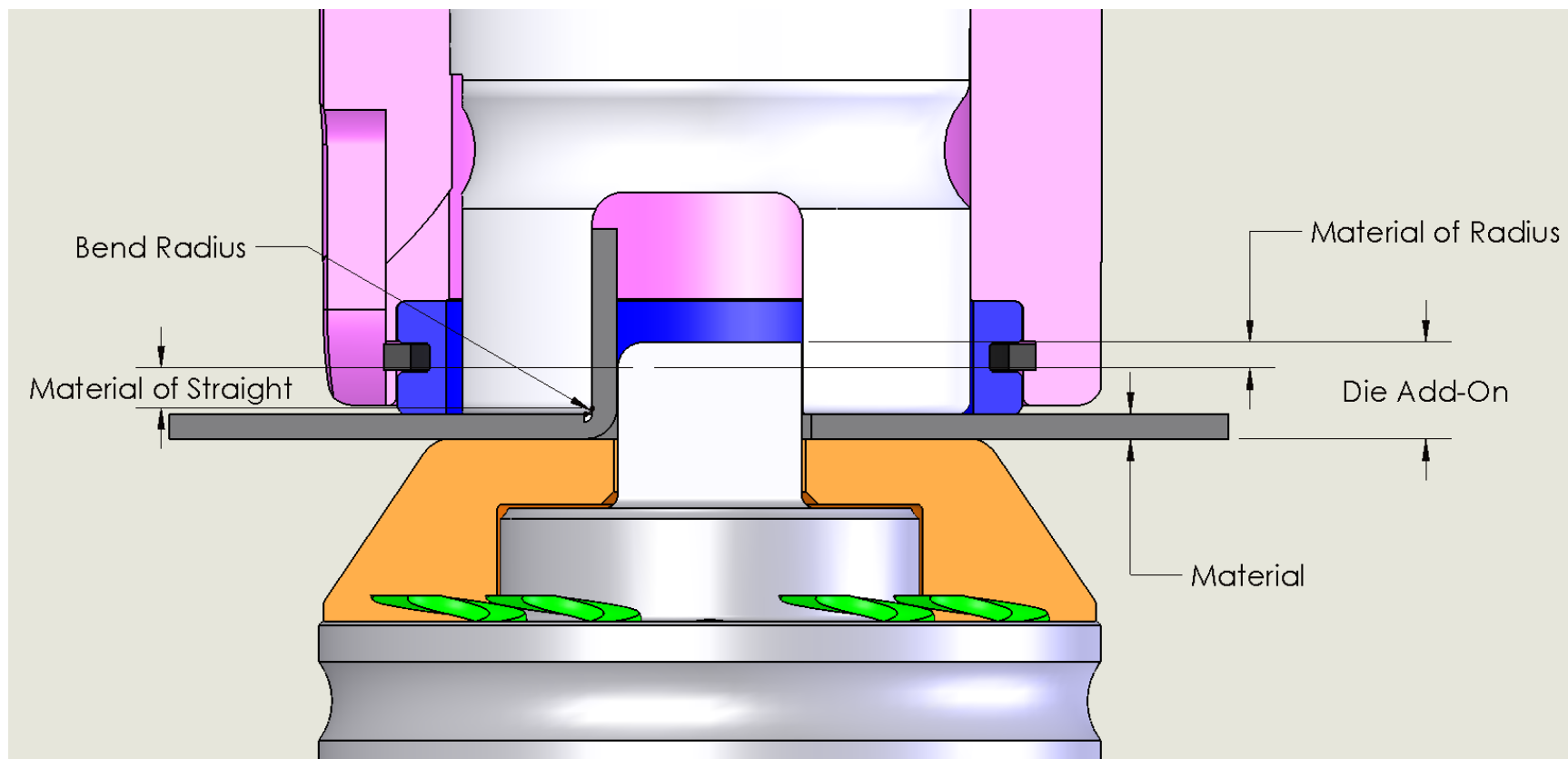


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Wipe-Up 90°



Rule of Thumb: Radius on Die = Mat'l

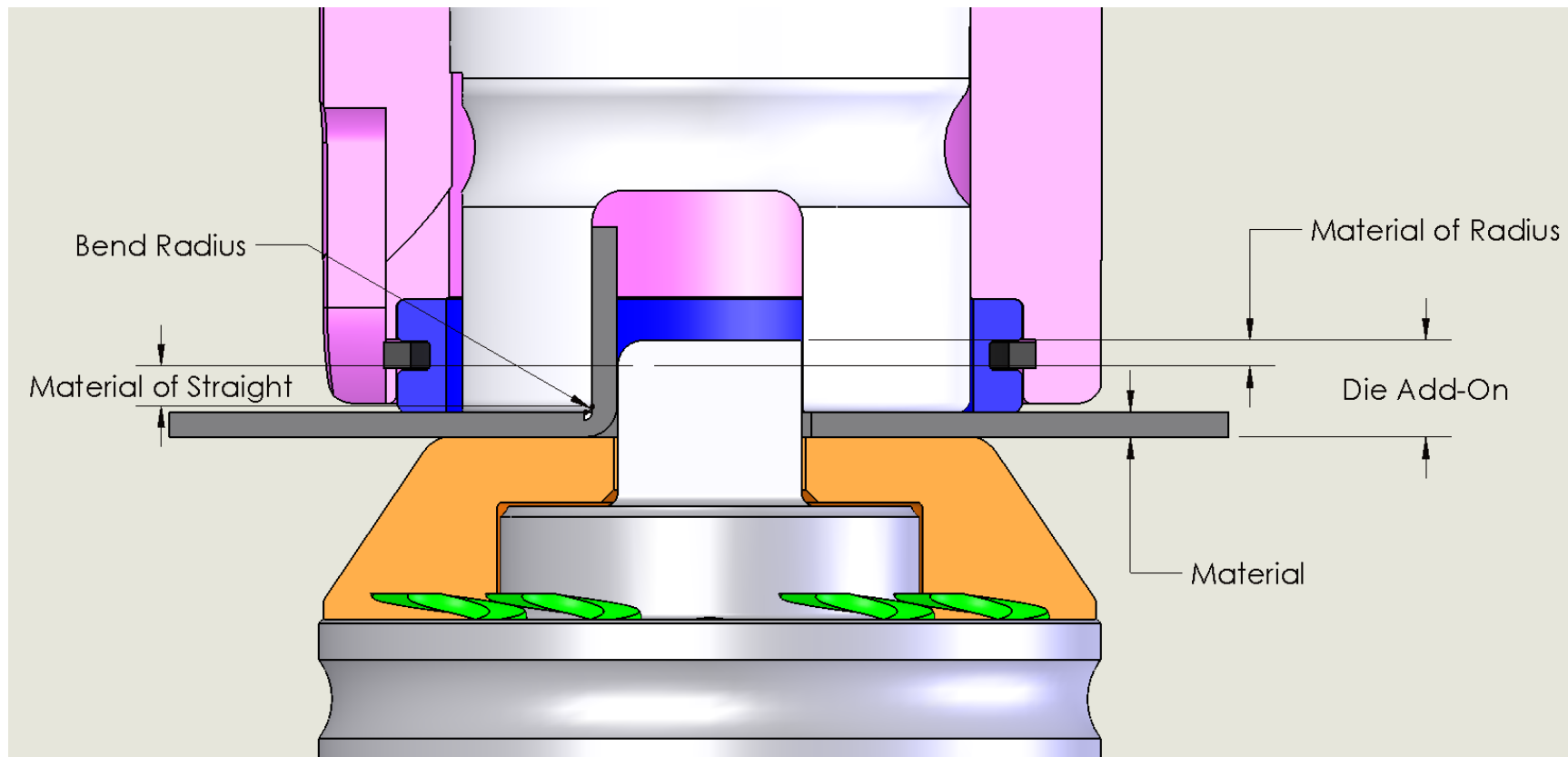


Strength. Performance. Innovation.

Wipe-Up 90°



Rule of Thumb: "Straight" wipe = Mat'l

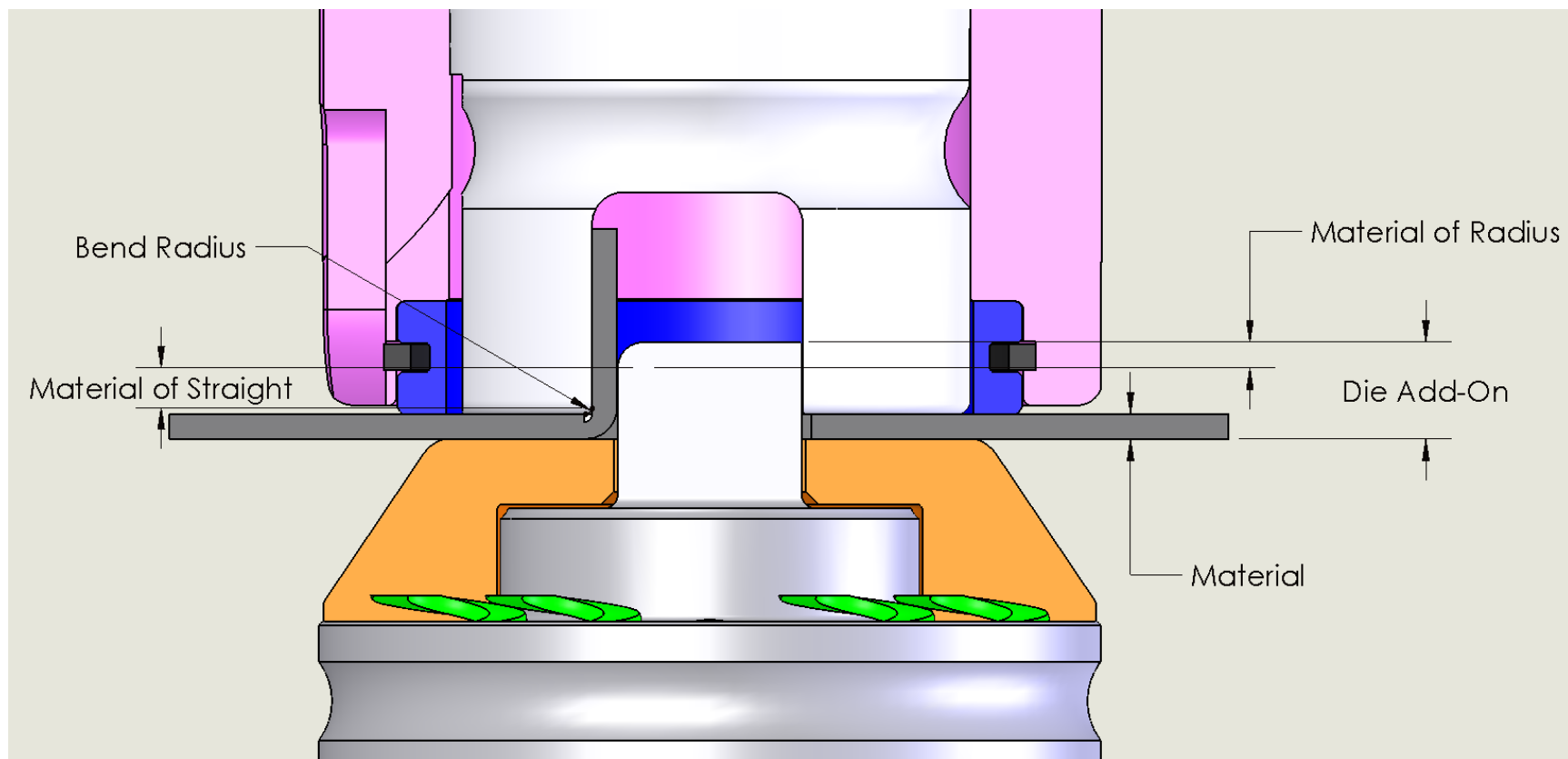


Strength. Performance. Innovation.

Wipe-Up 90°



Die Add-On = 3x Material Thickness + Bend Radius

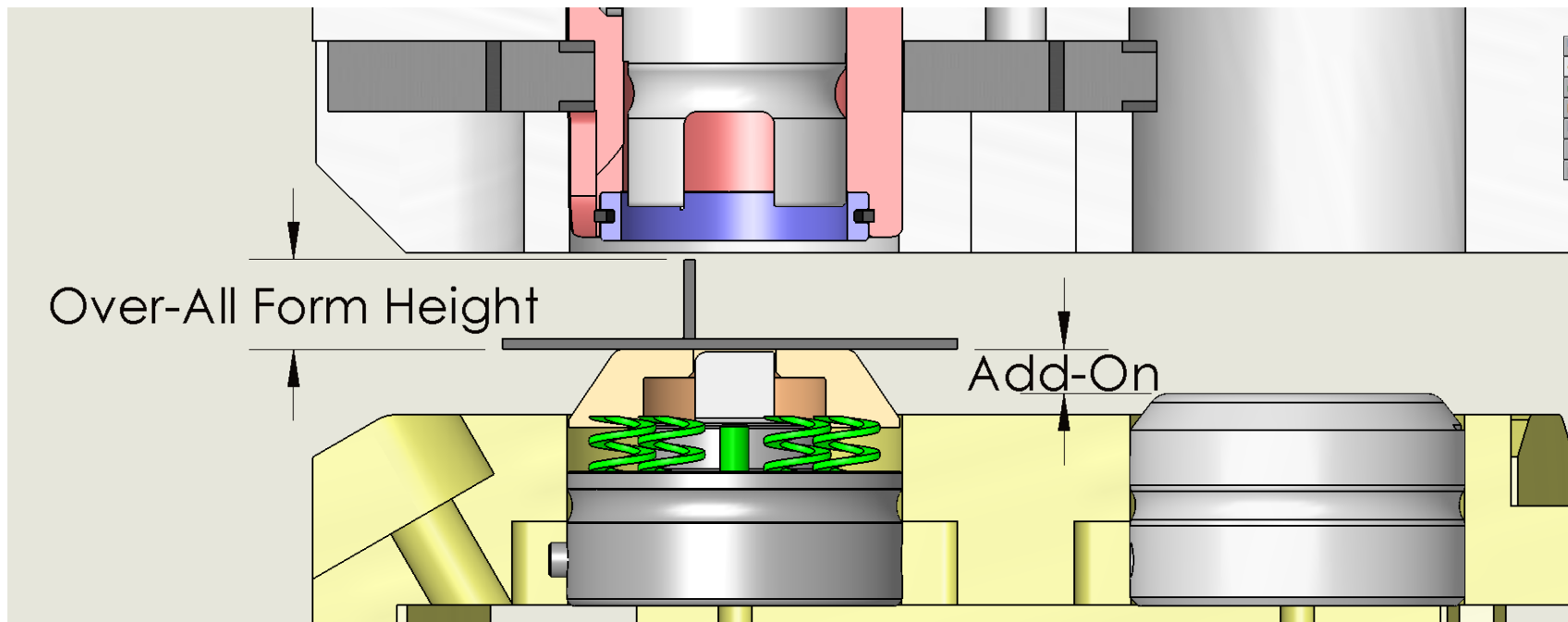


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Min. Feed Clearance of Wipe-Up 90°



$$\text{MFC} = \text{Safety} + \text{OAH} + [3 \times \text{Mat'l} + \text{Bend Radius}]$$

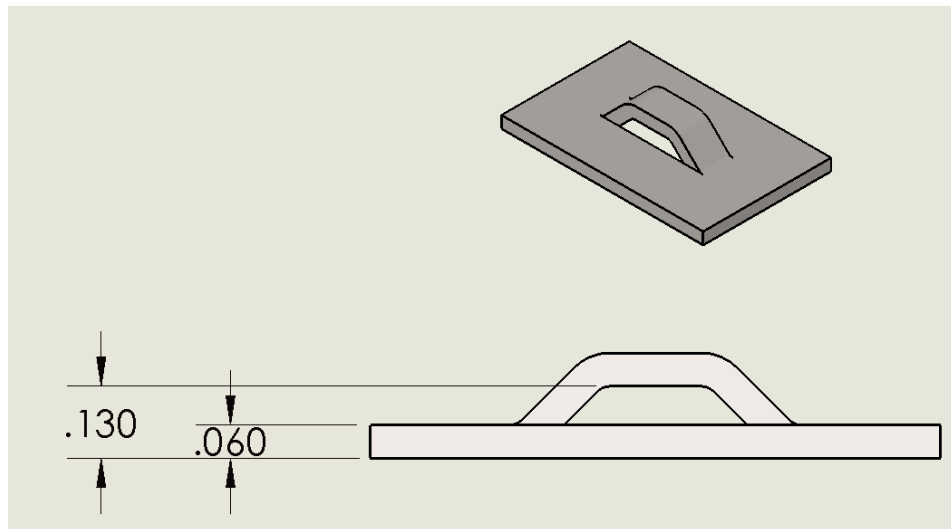


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What's the MFC of this bridge?



It's a positive form.



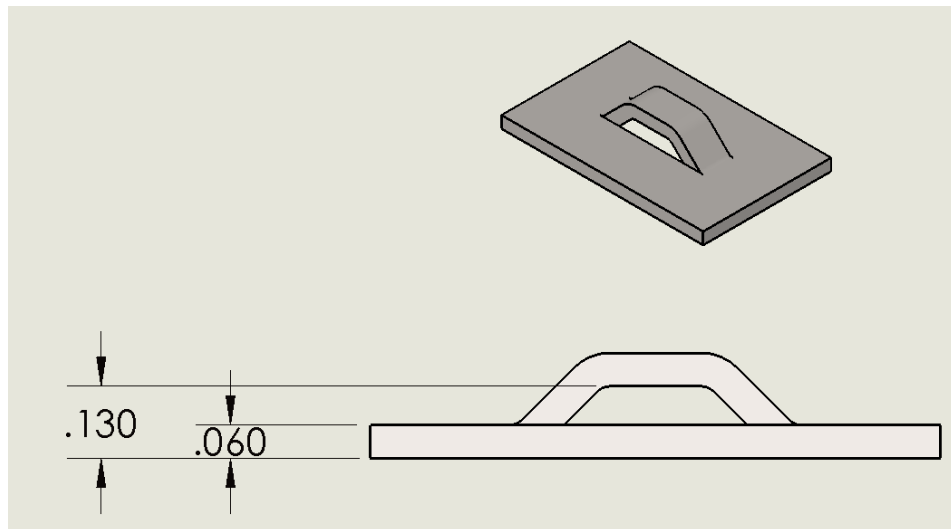
Strength. Performance. Innovation.

What's the MFC of this bridge?



It's a positive form.

MFC = Safety Factor [2 x Form Height] + Material



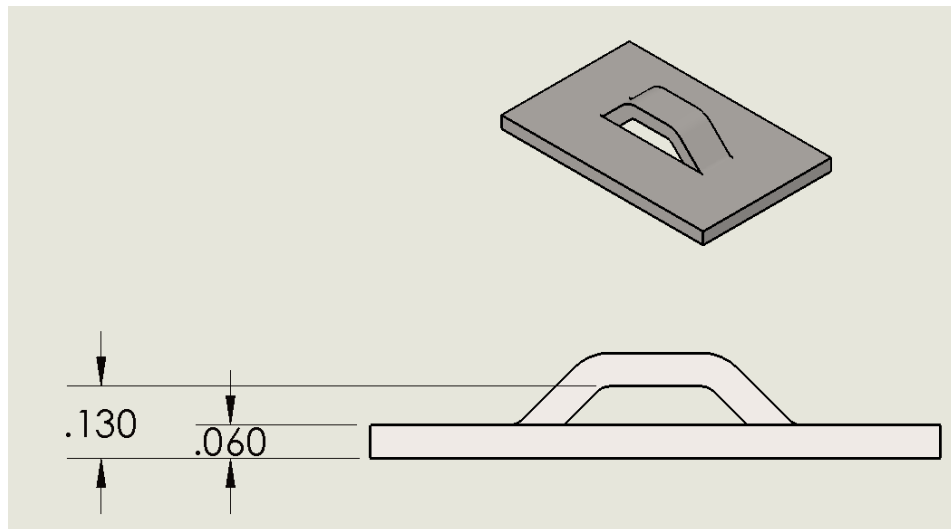
Strength. Performance. Innovation.

What's the MFC of this bridge?



It's a positive form.

MFC = Safety Factor [2 x Form Height] + Material



$$\text{MFC} = (0.12) + (2 \times 0.130) + (0.060)$$

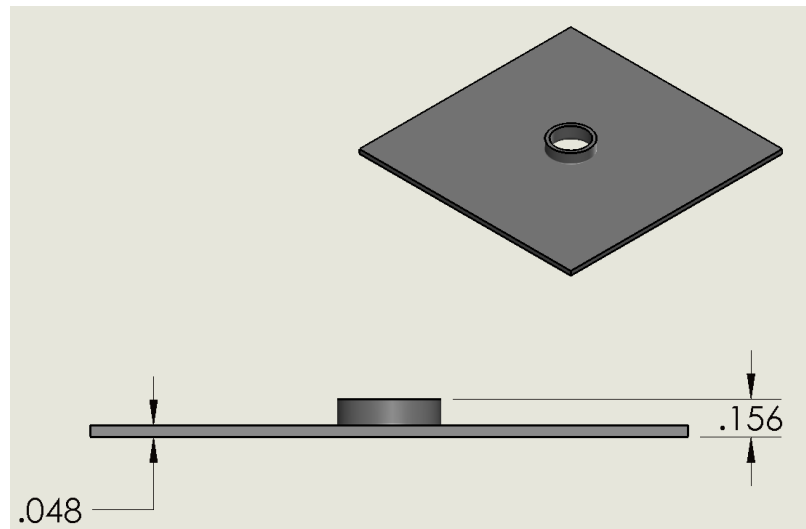
$$\text{MFC} = 0.44''$$

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What's the MFC of this extrusion?



It's a pass-thru form.



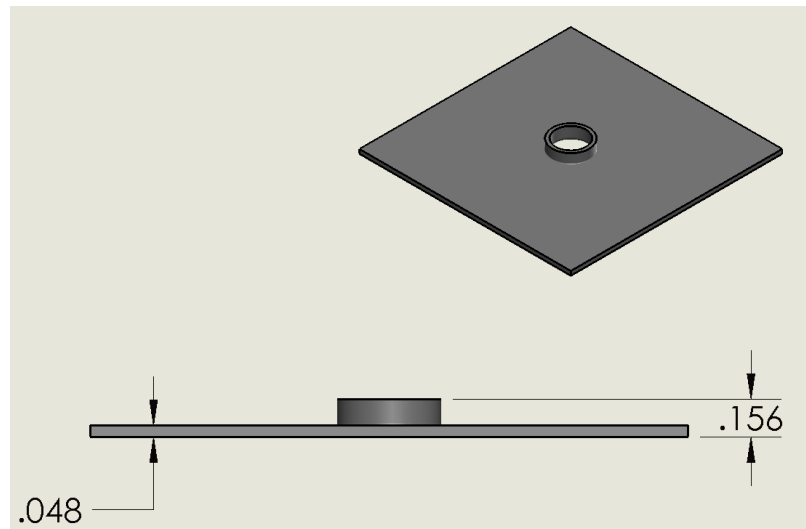
Strength. Performance. Innovation.

What's the MFC of this extrusion?



It's a pass-thru form.

MFC = Safety Factor + [2 x Form] + Mat'l



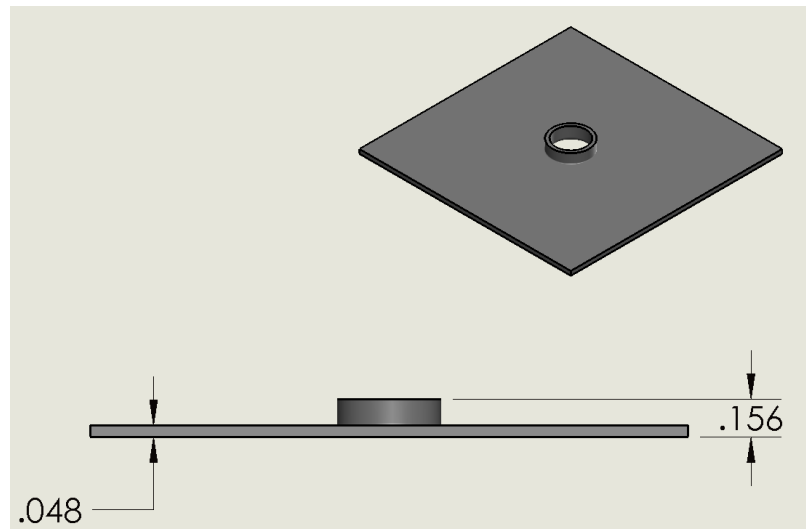
Strength. Performance. Innovation.

What's the MFC of this extrusion?



It's a pass-thru form.

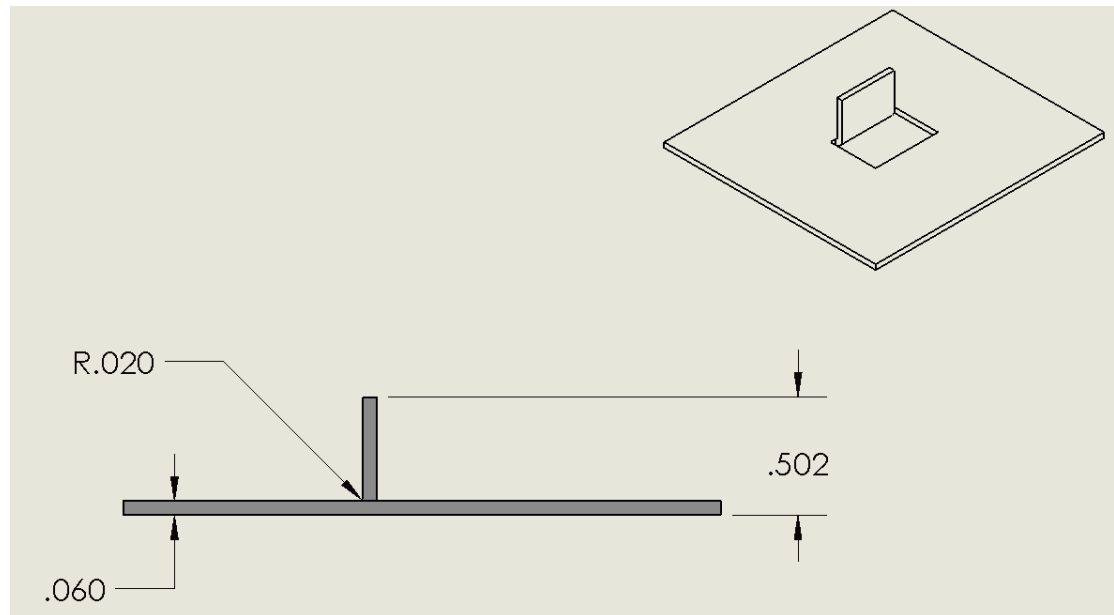
$$\text{MFC} = \text{Safety Factor} + [2 \times \text{Form}] + \text{Mat'l}$$



$$\text{MFC} = (0.12) + (2 \times 0.156) + .048$$

$$\text{MFC} = 0.48$$

What's the MFC of this wipe-up 90°?

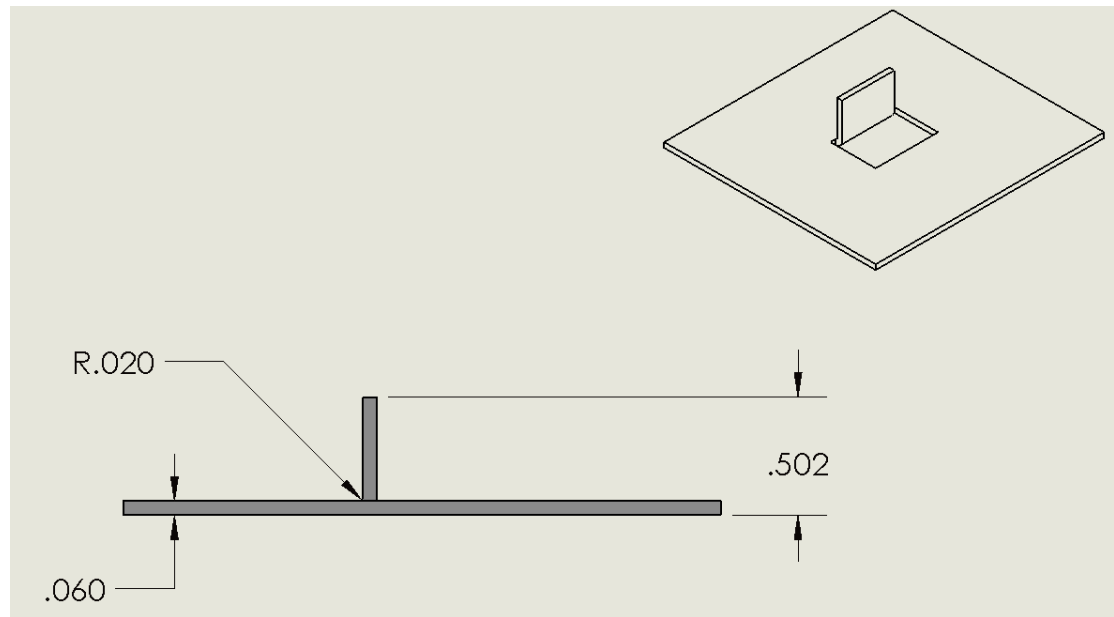


Strength. Performance. Innovation.

What's the MFC of this wipe-up 90°?



$$\text{MFC} = \text{Safety} + \text{OAH} + [3 \times \text{Mat'l} + \text{Bend Rad}]$$

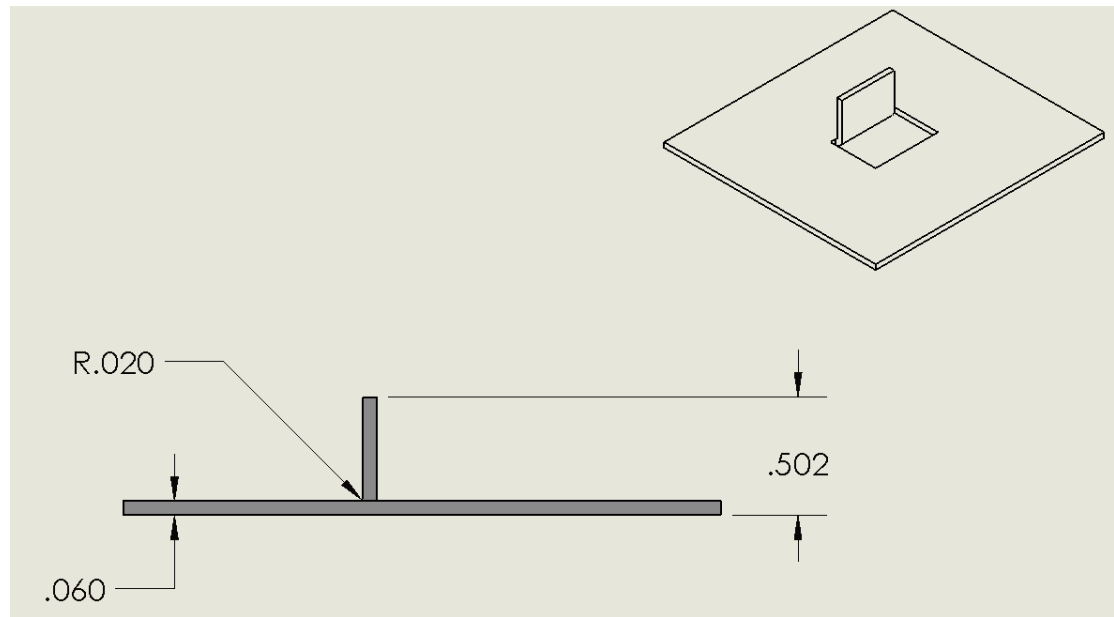


Strength. Performance. Innovation.

What's the MFC of this wipe-up 90°?



$$\text{MFC} = \text{Safety} + \text{OAH} + [3 \times \text{Mat'l} + \text{Bend Rad}]$$



$$\text{MFC} = 0.12 + 0.502 + [3 \times 0.06] + 0.020$$

$$\text{MFC} = 0.822$$

Strength. Performance. Innovation.

So now you know...



- what “feed clearance” is.
 - It’s the machine’s allowable workspace.
- where it is measured.
 - Between a piercing die and the upper turret.
- what its role is in planning production.
 - It is used to “check” whether or not the form can fit in you punch press.

So now you can...



- Calculate an estimated minimum feed clearance.

- Positive forms

$MFC = \text{Safety Factor} + [2 \times \text{Form Height}] + \text{Material}$

- Pass-thru forms

$MFC = \text{Safety Factor} [2 \times \text{OAH}] + \text{Material}$

- Wipe-up 90°

$MFC = SF + \text{OAH} + \text{Bend Radius} + 3 \times \text{Material Thickness}$

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Which allows you...



to determine if your machine has the physical capacity to fit your form.