



**Design for
Manufacturability
Guide**

WHO WE ARE

Short-to-medium run metal stamping manufacturer

Annual volume of 250 to 300,000 per part number

We serve a very diversified mix of customers & markets

Our niches:

- Product start-ups
- “Legacy” products
- Low-to-medium volume product lines



ADVANTAGES TO STAMPING

Single-hit blank/pierce

- Continuous part edges
- No nibble marks
- Dimensions die controlled
- All burrs on same side of part

Repeatability

Low cost alternative to fabrication



WHAT WE ARE NOT

Progressive die stamping house

- We do not use coil material
- We cannot use tooling made at other companies

Metal fabricator

- No lasers
- No turret presses
- No press brakes

Prototype shop



WHAT MAKES WINCO STAMPING UNIQUE

Technology driven manufacturing processes

Quick-change tooling for fast set-ups

Low cost customer & part dedicated tooling

Vision inspection equipment

**Tooling & processes assure part quality
conformance**

Focus on our capability niche

Commitment to 100% service & on-time deliveries

J.B.R. - Just-Be-Ready manufacturing philosophy



TOOLING

One-time engineering charge

Low cost – typically \$300-\$2000 per part

100% built in-house

Dedicated for each part

Hardened A2 tool steel

Maintained by Winco for life-of-part

No common or shared tooling between parts or customers

Unique and proprietary to Winco

Quick-change technology utilized



THE TYPICAL WINCO PROCESS

Shear sheet material to strips

Blank – pierce

Machine features – tap, countersink, etc. (if applicable)

Timesaver sand deburr

Form

Finish (if applicable)

PEM or assembly (if applicable)

Pack



MATERIALS

Cold Rolled Steel

- .0149" (28 gage) to .1345" (10 gage)

Hot Rolled Steel

- .1495" (9 gage) to .1945" (6 gage)

Pre-galvanized Steel

- .0157" (30 gage) to .1681" (8 gage)

Annealed Spring Steel

- 1074/1075, 1050 and 1095 usually requiring post heat treatment

Aluminum (1100, 2024, 3003, 5052 & 6061)

- Various tempers – up to .190" thick



MATERIALS (CONTINUED)

Stainless Steel

- 301, 304, 316, 430
- Annealed only – up to .090” thick

Brass (mostly CA-260)

- Up to .187” thick

Copper (mostly CA-110)

- Various tempers – up to .187” thick

Stampable Plastics

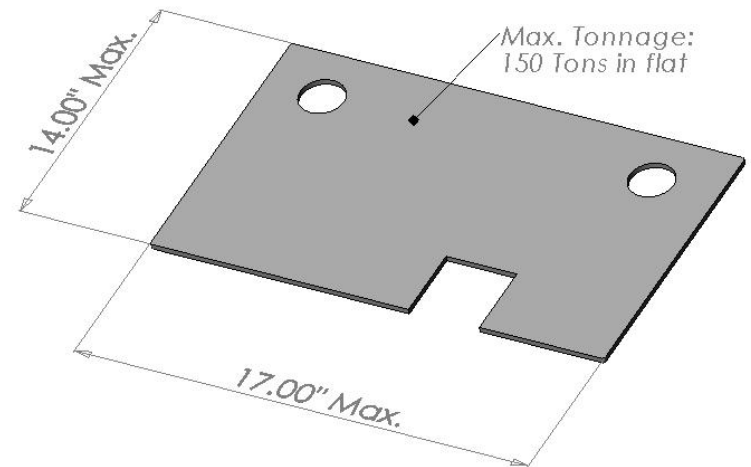
- e.g. UHMW, HDPE & Nylon 6/6



BLANKING REQUIREMENTS

Unfolded flat blank

- Ideal – less than 10" x 10" in the flat
- Visual image – size of an 8½" x 11" sheet of paper
- Maximum up to 14" x 17" in the flat
- Limitation – 150 ton blanking presses
 - See tonnage formula on next page
- Blanking radii (inside and outside)
 - ½ material thickness ideal
 - .015" minimum



CALCULATING TONNAGE

(Cutting edge inches) x (material thickness) x (material constant)

*Cutting Edge inches to include internal hole features

Material Constants:

Carbon Steel: 25

Annealed Stainless Steel: 50

5052 Aluminum: 12

6061 Aluminum: 15

2024 Aluminum: 20

½ Hard Copper & Brass: 22

Full Hard Copper & Brass: 28

1050 Annealed Spring Steel: 41

1074/1075 Annealed Spring Steel: 45

1095 Annealed Spring Steel: 50

Example: A 3" x 4" rectangular part made from .059" carbon steel

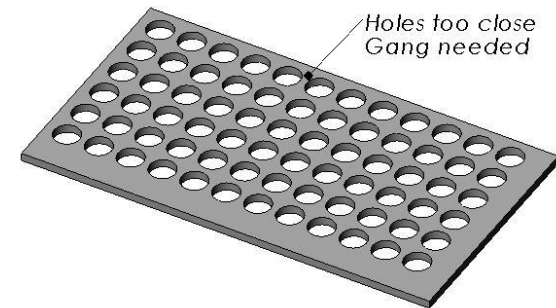
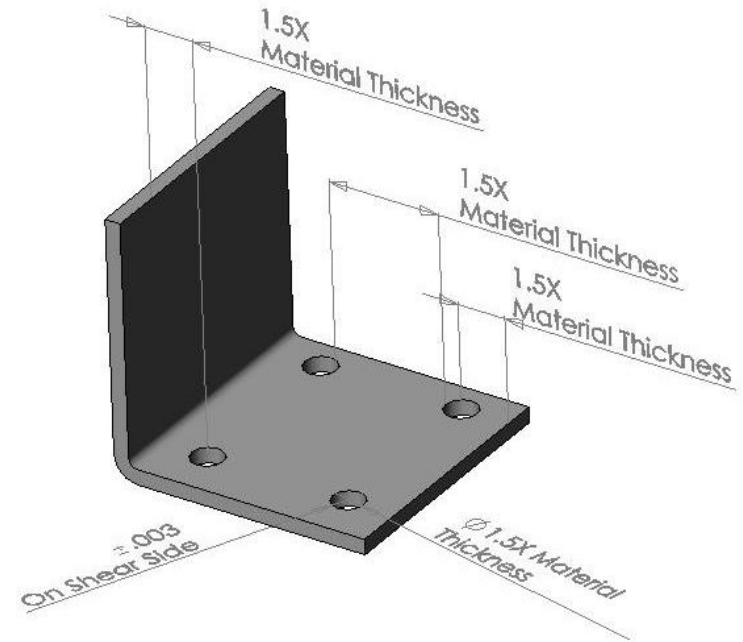
$3 + 4 + 3 + 4 = 14$ cutting edge inches

$14 \text{ (CEI)} \times .059 \text{ (material thickness)} \times 25 \text{ (constant)} = 20.65 \text{ tons}$



PART DESIGN CONSIDERATIONS

- Hole diameters – $1 \frac{1}{2}$ x material thickness minimum (smaller holes require machining at extra cost)
- Web between holes – $1 \frac{1}{2}$ x material thickness minimum (smaller webs require extra operations at extra cost)
- Edge of part to edge of hole – $1 \frac{1}{2}$ x material thickness (holes closer require extra operations at extra cost)
- Bend line to edge of hole – $1 \frac{1}{2}$ x material thickness (holes closer require extra operations at extra cost)
- Class A & B holes require the tolerance to be held through the entire hole. This will require additional machining at extra cost.



PART DESIGN CONSIDERATIONS (CONTINUED)

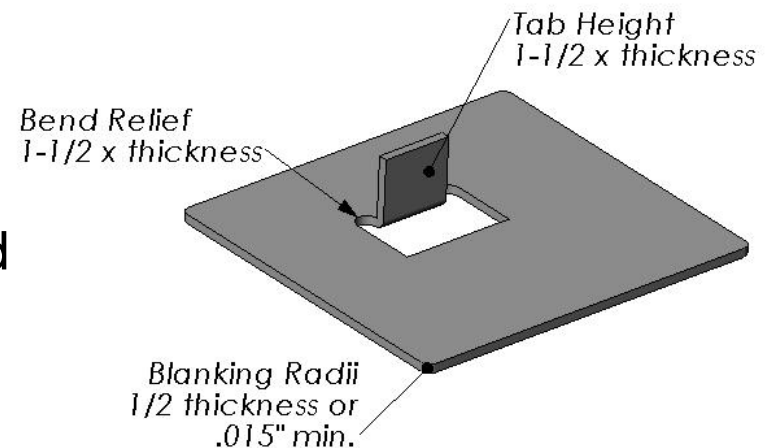
Bend reliefs or undercuts – 1 ½ x material thickness minimum

Tabs

- 1 ½ x material thickness minimum
- If interior to part, bend relief required

Blanking burr

- Typically less than 10% of material thickness
- Sand deburring will remove



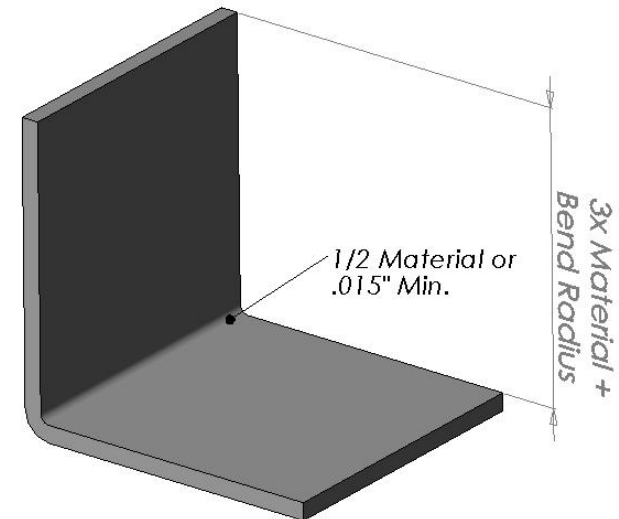
PART DESIGN CONSIDERATIONS (CONTINUED)

Forming (bending)

- Inside bend radii
 - $\frac{1}{2}$ x material thickness is best
 - $\frac{1}{64}$ " minimum depending on material thickness
- Flange height (measured to inside) 3 x material thickness + bend radius
- Holes too close to bends distort

Special forming

- Requires discussion with tooling engineers



PART DESIGN CONSIDERATIONS

Embossing

- Example – ribs
- Height
 - Maximum of 2x material thickness, over material thickness
 - Depends upon material thickness

Bend Gussets

- Reference dimensions preferred for size & location
- 45° by 2x material thickness, over material thickness

Drawing

- Round best - 1/2" height maximum
- Irregular shapes – requires discussion with tooling engineers



SECONDARY PROCESSES PERFORMED IN-HOUSE

Machining of part features

- Tapping of threaded holes
- Countersinking of holes
- Counterbored holes
- Reaming of holes
- Milling



SECONDARY PROCESSES PERFORMED IN-HOUSE (CONTINUED)

Assembly

- PEM insertion
- Orbital riveting
 - Solid
 - Semi-tubular
 - Custom screw machine parts
- Mechanical fastening, e.g. screws



SECONDARY PROCESSES PERFORMED IN-HOUSE (CONTINUED)

Kitting

- Hardware
- Instructions
- Labeling
- Bagging
- Boxing



OUTSOURCED PROCESSES

Welding

Special machining

Heat treating

Tumble deburring

Finishing:

- Painting
- Plating
- E-coating
- Anodizing



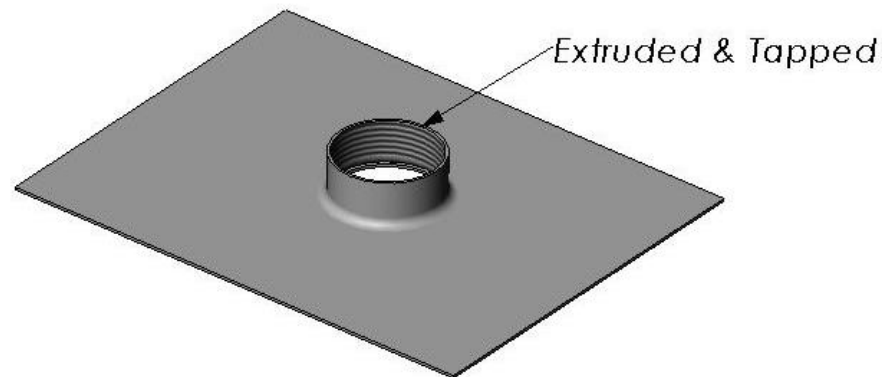
PART DESIGN CONSIDERATIONS (CONTINUED)

Extruded holes

- Pre-pierce minimum of material thickness
- Height – typically enough for 2 ½ threads if tapped
- No reduced material wall thicknesses

Stenciling

- Part numbers
- Identification
- Logo
- Symbols

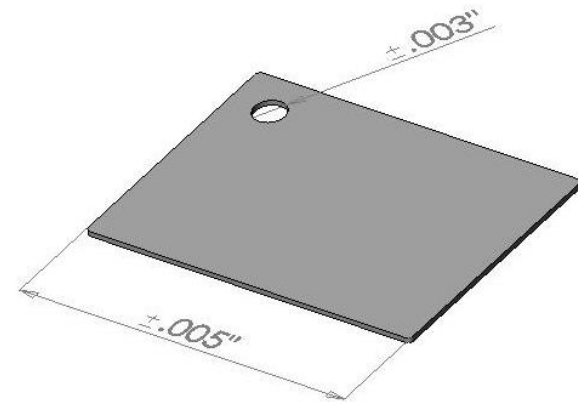


DIMENSIONING, TOLERANCING & MEASURING FEATURES

Blank dimensions are measured on the
shear side of the part

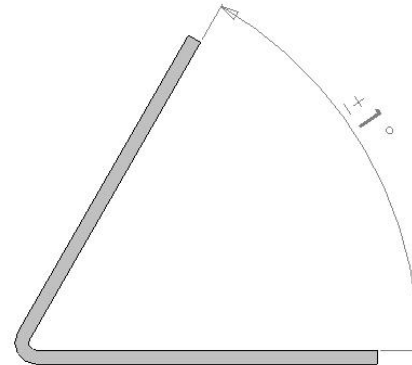
Hole diameters $\pm .003''$

Blank linear dimensions $\pm .005''$



Flatness – typical $.005''$ per inch

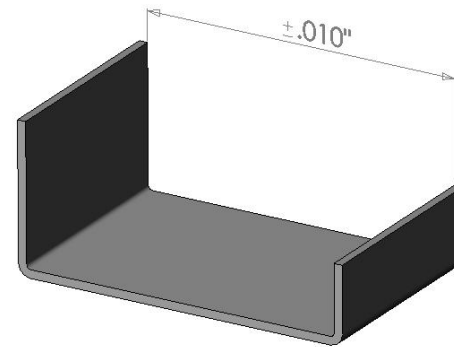
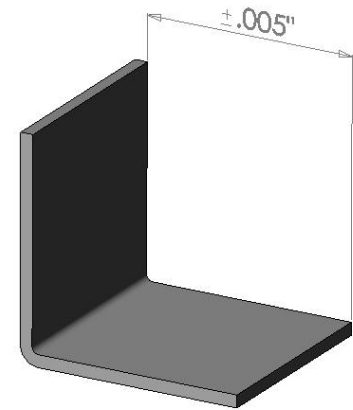
Formed angles ± 1 degree



DIMENSIONING, TOLERANCING & MEASURING FEATURES

Formed dimensions, edge-to-hole & form-to-hole

- One bend $\pm .005''$ measured to inside of material
- Multiple bends $\pm .010''$ depending on material thickness

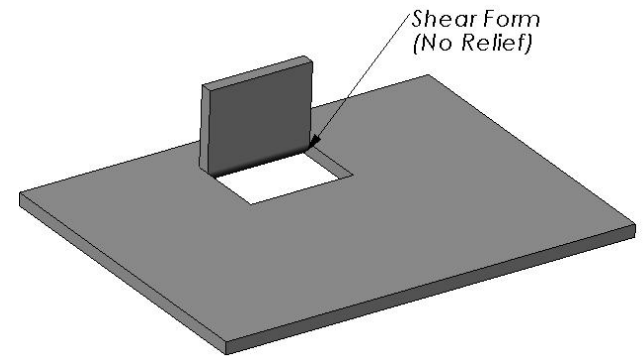
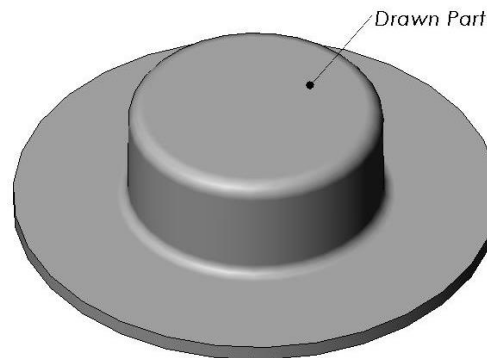
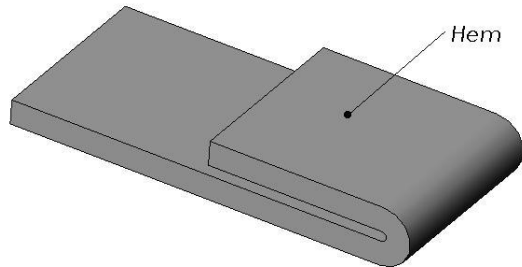


WHAT WE DON'T DO

Hems – where material is folded over on itself

Shear forms

Drawn parts > 1/2" deep



CAD FILE TYPES

WINCO SOFTWARE

Prefer 2D drawings rather than 3D models

File types - .dxf or .dwg

Files compatible with AutoCAD LT2000

