



**Design for  
Manufacturability  
Guide**

# WHO WE ARE

**Full range metal stamping manufacturer**

**Annual volume of 1,000 to 500,000 per part number**

**We serve a very diversified mix of customers & markets**

## **Our niches:**

- Engineering support
- Low Maintenance supplier
- On-time shipping pledge



# 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 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**

**Provide our customers with weekly real-time open sales order report**



# TOOLING

**One-time engineering charge**

**In-house tooling capabilities**

**Dedicated for each part**

**Hardened A2 tool steel**

**Maintained by Winco for life-of-part**

**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 – 200 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**



## CALCULATING TONNAGE (CONTINUED)

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

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

**14 (CEI) x .059 (material thickness) x 25 (constant) = 20.65 tons**



# PART DESIGN CONSIDERATIONS

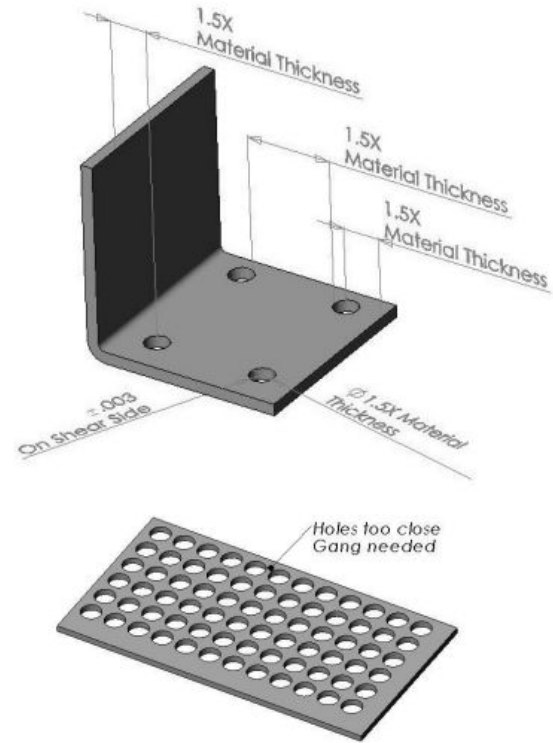
Hole diameters – 1 ½ x material thickness minimum (smaller holes require machining at extra cost)

Web between holes – 1 ½ x material thickness minimum (smaller webs require extra operations at extra cost)

Edge of part to edge of hole – 1 ½ x material thickness (holes closer require extra operations at extra cost)

Bend line to edge of hole – 1 ½ 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)

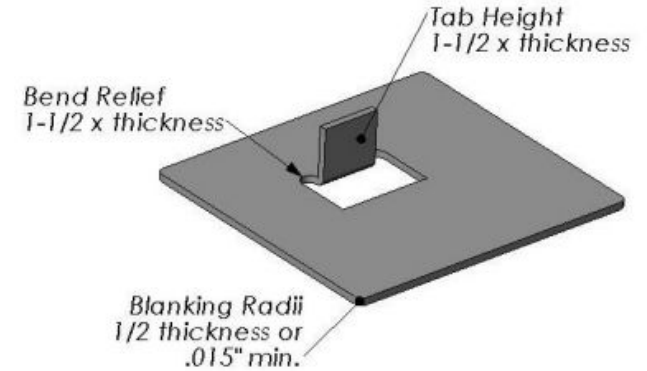
**Bend reliefs or undercuts – 1 ½ x material thickness minimum**

## **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



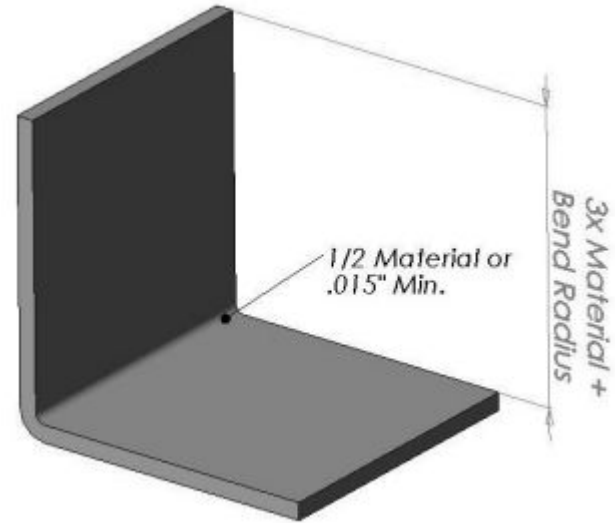
# PART DESIGN CONSIDERATIONS (CONTINUED)

## 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 (CONTINUED)

## Embossing

- Example – ribs
- 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 - ½” 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**

**Finishing:**

- Painting
- Plating
- E-coating
- Anodizing



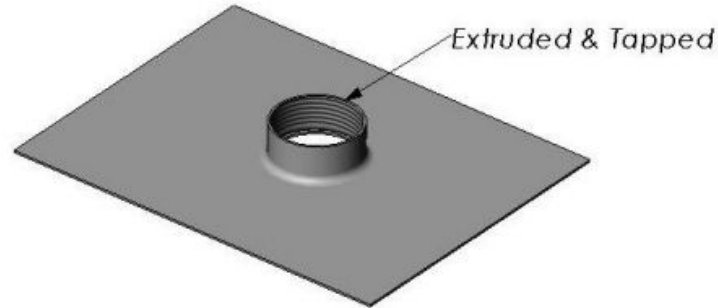
# PART DESIGN CONSIDERATIONS (CONTINUED)

## 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

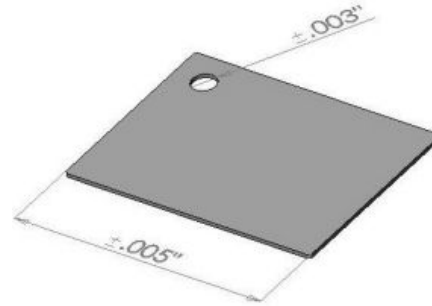
**Blank dimensions are measured on the shear side of the part**

**Hole diameters  $\pm .003''$**

**Blank linear dimensions  $\pm .005''$**

**Flatness – typical  $.005''$  per inch**

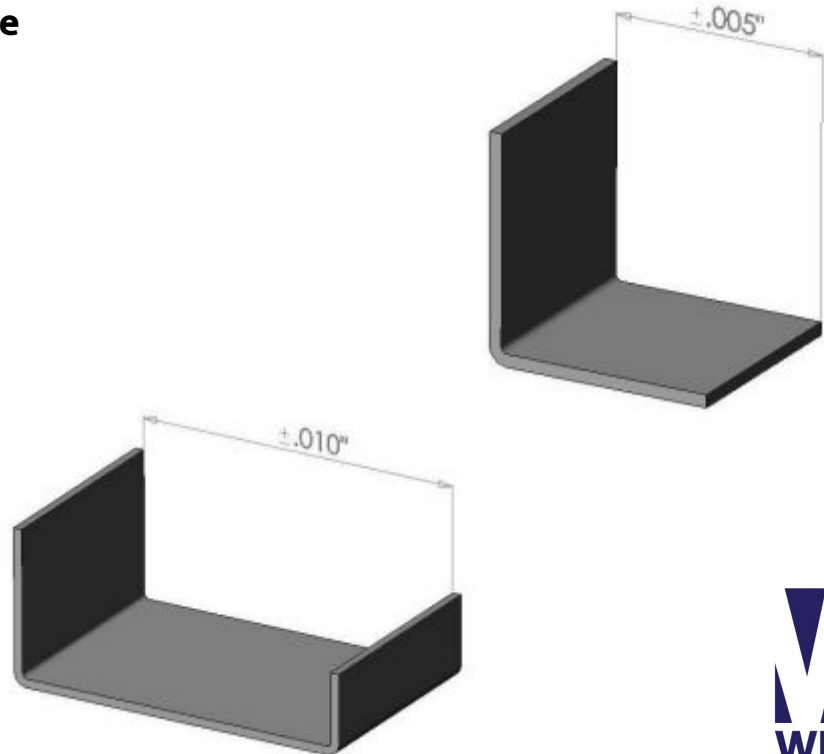
**Formed angles  $\pm 1$  degree**



# DIMENSIONING, TOLERANCING & MEASURING FEATURES

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

- One bend  $\pm .005''$  measured to inside of material
- 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

