Design for Manufacturability Guide
WHO WE ARE

Short-to-medium run metal stamping manufacturer
Annual volume of 1,000 to 100,000 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 $150-$1500 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 (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.
Bend reliefs or undercuts – $1 \frac{1}{2} \times$ material thickness minimum

Tabs
- $1 \frac{1}{2} \times$ 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
  - $\frac{1}{2} \times$ material thickness is best
  - $\frac{1}{64}''$ minimum depending on material thickness

- Flange height (measured to inside) $3 \times$ 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 - 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

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 +/- .003”

Blank linear dimensions +/- .005”

Flatness – typical .005” per inch

Formed angles +/- 1 degree
DIMENSIONING, TOLERANCING & MEASURING FEATURES

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

- One bend +/- .005” measured to inside of material
- Multiple bends +/- .010” depending on material thickness
WHAT WE DON’T DO

Hems – where material is folded over on itself
Shear forms
Drawn parts > $\frac{1}{2}$” deep