Guideline for Material Selection

Material Type	*Manufacturing Ease* ← Materials Selection → *Manufacturing Difficulty*			
	Category 1	Category 2	Category 3	Category 4
Carbon Steel Low Carbon (C1006 - C1020)	Rb 45-75, T3-T5	Rb 70-85, T2	Rb 85-90, T1 up to 8 mm tk.	Rb 85-90, T1 above 8 mm tk.
Carbon Steel (Annealed) Medium Carbon (C1025 - C1035)		Rb 75-85		
Carbon Steel (Spherodized Annealed) High Carbon (C1036 - C1075) Spring Steel (C1095 Rb 80-90)			up to 6mm tk. up to 3mm tk.	above 6mm tk. above 3mm tk.
Alloy Steel (Spherodized Annealed) 8620, 8630, 4130, 4140, 4340, 5120, 5120H	up to 6mm Tk.	6mm - 10mm Tk.	10mm - 12mm Tk.	
High Strength Steel (HSLA) 040, 050, 060, 090	up to 6mm Tk.	6mm - 10mm Tk.	10mm - 12mm Tk.	
Stainless Steel (Annealed) 200, 300, and 400 Series	up to 6mm Tk.	6mm - 10mm Tk.	10mm - 12mm Tk.	
Aluminum 1100 3003 5052 2024, 6061, 7075	 O, H2, H4 O, H2 O T0	 H6 H4 H2, H4 T3	 H8 H6, H8 H6, H8 T4	 T6
Brass & Bronze	1/4 & 1/2 hard	3/4 hard	spring hard	
Copper	Rb 45-75, soft		Rb 88-95, 1/2 hard	Rb 96+, hard

Guideline for Presence of Die-Roll

Contour Feature	Expected Die-Roll Expressed as Percent of Thickness	Rules of Thumb
Corners on Inside Contours Straight Contours Curved Contours on Large Holes 90 Degree Corners Acute Corners (< 90 degrees)	2% - 4% 4% - 8% 6% - 12% 15% - 25% 20% - 30%	Die-roll is slightly curved contour on the edge of one side of a component, created by a pull down as the component is extruded into the die plate. Die-roll is increased as corner angles decrease as corner radii decrease and with softer material.

Guideline for Corner Radii Allowance

Type of Corner	Radius Requirement Expressed as Percent of Thickness	Rules of Thumb
90 Degree Corners Acute Corners (< 90 degrees) Obtuse Corners (> 90 degrees)	10% - 15% 15% - 20% 5% - 10%	Larger radii results in: less tool wear less corner tearing less die-roll Harder material requires larger radii

Guideline for General Tolerances

Material Thickness	External Contours	Internal Contour Spacing	Internal Contour Hole Diameters and Contours
less than 1mm	+/- 0.007mm	+/- 0.01mm	+/- 0.007mm
1mm - 1.75mm	+/- 0.01mm	+/- 0.015mm	+/- 0.01mm
1.76mm - 3.2mm	+/- 0.015mm	+/- 0.02mm	+/- 0.013mm
3.3mm - 4.75mm	+/- 0.02mm	+/- 0.025mm	+/- 0.015mm
4.76mm - 6.4mm	+/- 0.025mm	+/- 0.03mm	+/- 0.02mm
greater than 6.4mm	from +/- 0.038mm	from +/- 0.038mm	from +/- 0.025mm
less than 0.04"	+/- 0.0003"	+/- 0.0004"	+/- 0.0003"
0.041" - 0.07"	+/- 0.0004"	+/- 0.0006"	+/- 0.0004"
0.07" - 0.125"	+/- 0.0006"	+/- 0.0008"	+/- 0.0005"
0.126" - 0.187"	+/- 0.0008"	+/- 0.001"	+/- 0.0006"
0.188" - 0.250"	+/- 0.001"	+/- 0.0012"	+/- 0.0008"
greater than 0.25"	from +/- 0.0015"	from +/- 0.0015"	from +/- 0.001"

Tolerance range is influenced by material thickness, tensile strength of material, material structure, and configuration of the part.

Tolerances on internal contours are easier to maintain than on outer contours.

As material gage increases, taper condition must be taken into consideration when applying tolerances. Thinner material will enable tighter tolerances to be achieved.

Lower material tensile strength will enable tighter tolerances to be achieved.
tolerances to be achieved.

Guideline for Flatness Tolerance

	Rules of Thumb
0.01mm - 0.02mm per cm (0.001" - 0.002" per inch)	The degree of flatness is affected by the condition of input material, configuration of the component, grain direction of material, and coil crown. Grinding processes following fineblanking can improve flatness, parallelism, and improve surface finish conditions.