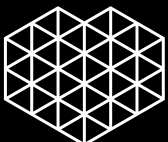
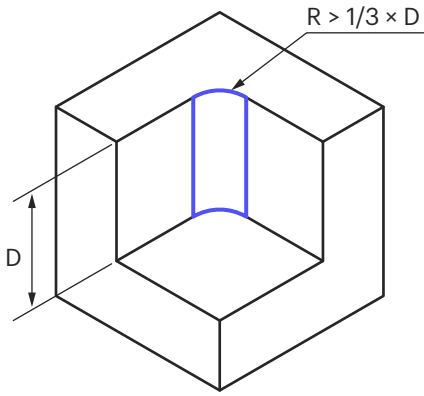


The Essential CNC Cost Reduction Checklist

15 practical design tips to minimize the
cost of your CNC machined parts



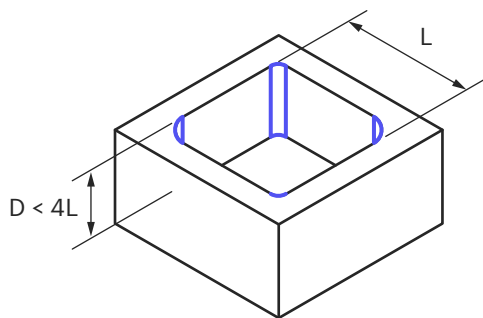


1. ADD LARGE FILLETS TO ALL INTERNAL VERTICAL EDGES

Add a radius $> 1/3 \times$ the depth of the cavity - the larger the better


Use the same radius in all internal vertical edges

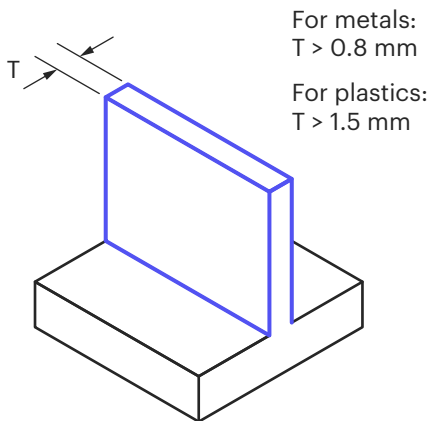
On cavity floors, add a small fillet (0.5 or 1 mm radius) or leave it sharp



2. LIMIT THE DEPTH OF ALL CAVITIES

Recommended max. cavity depth: $4 \times$ their width

For deeper cavities, use a stair-step design: 

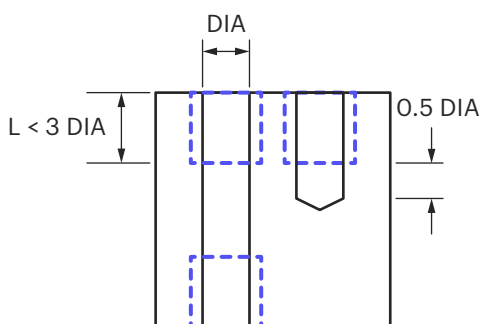


3. INCREASE THE THICKNESS OF THIN WALLS

For metal parts: minimum wall thickness > 0.8 mm

For plastic parts: minimum wall thickness > 1.5 mm

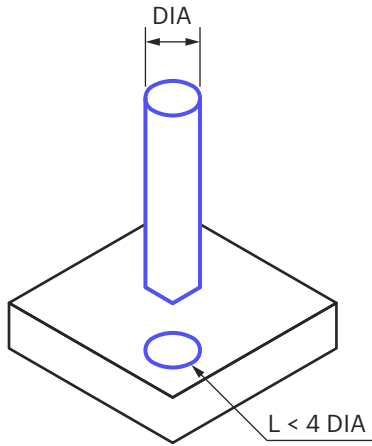
The thicker a section the better the achievable accuracy



4. LIMIT THE LENGTH OF THREADS

Recommended max. thread length: $3 \times$ the nominal diameter

For threads in blind holes: add a min. unthreaded length of $1.5 \times$ the nominal diameter at the bottom



5. DESIGN HOLES WITH STANDARD SIZE AND LIMIT THEIR LENGTH

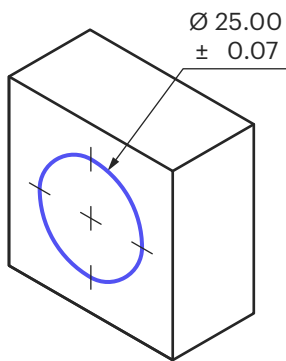
For metric, specify a diameter in increments of:

- 0.1 mm up to $\varnothing 10$ mm
- 0.5 mm above $\varnothing 10$ mm

For inches, use conventional fractions of an inch or refer to a fractional-inch [drill bit sizes table](#)

Recommended max. hole depth: $4 \times$ their diameter

Recommended min. hole diameter: 1 mm ($3/64$ ")

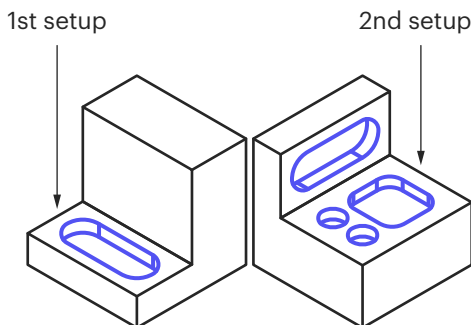


6. SPECIFY TOLERANCES ONLY WHERE NECESSARY

DO NOT OVER-TOLERANCE

Use a single datum as a reference for all dimensions (for example, the cross section of two edges)

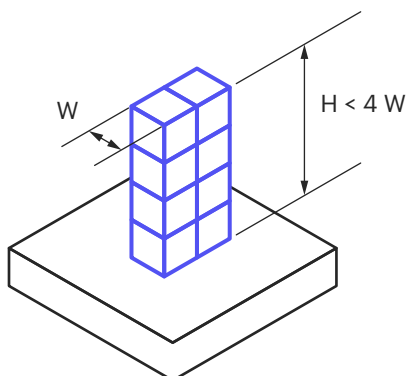
If not defined, the standard tolerance is ± 0.125 mm



7. MINIMIZE THE NUMBER OF MACHINE SETUPS

Design parts that can be machined in only one setup on a 3-axis [CNC milling](#) machine or a [CNC lathe](#)

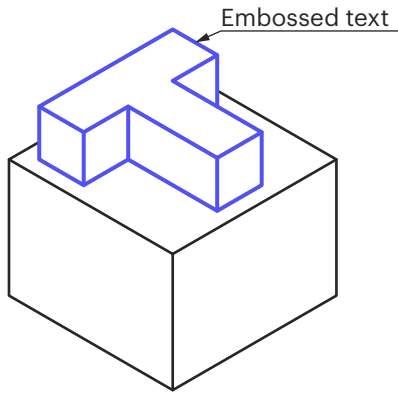
For complex parts, consider separating the geometry into multiple components that can be assembled later



8. AVOID SMALL FEATURES WITH HIGH ASPECT RATIO

Recommended max. aspect ratio: $4 \times$ width-to-height

To improve stiffness of small features, add bracing support or connect them to a thicker section



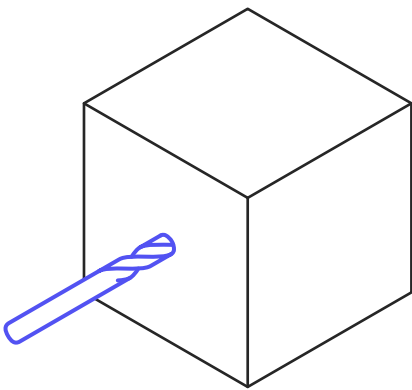
9. REMOVE ALL TEXT & LETTERING



Remove all text and lettering from your CNC machined parts

If text is needed, prefer engraved over embossed letters and use a font size of at least 20-points

Consider secondary operations instead for adding text, like silk screening



10. CONSIDER THE MACHINABILITY OF THE MATERIAL

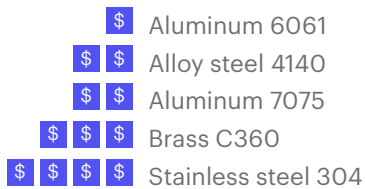


For 100+ parts, select an easy-to-machine material

The easiest to machine metals: Brass, Aluminum alloys

The easiest to machine plastics: POM (Delrin), ABS

Metals

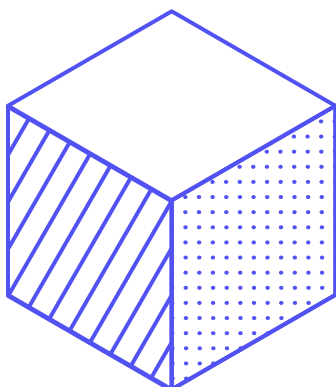
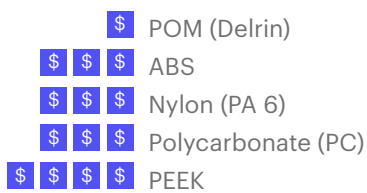


11. CONSIDER THE COST OF THE BULK MATERIAL



Each \$ in the reference table (left) represents roughly a 25% price increase in material cost

Plastics



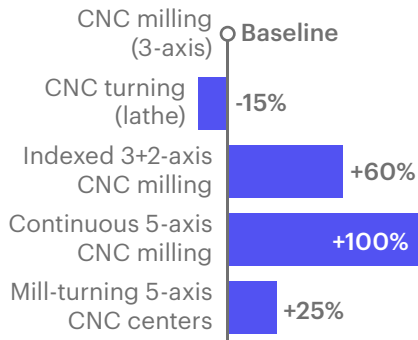
12. AVOID (MULTIPLE) SURFACE FINISHES



For the lowest cost possible, select the “as-machined” [surface finish](#)

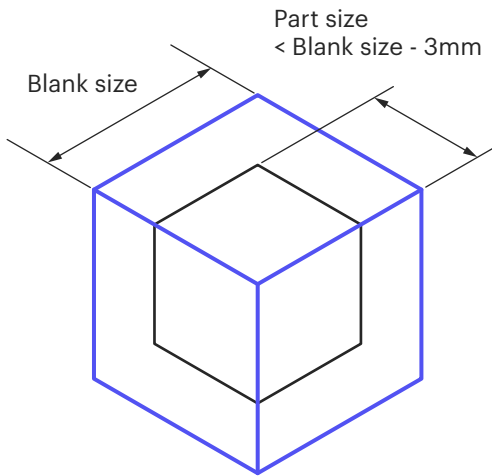
Only request multiple surface finishes on the same part when absolutely necessary

Machining cost comparison



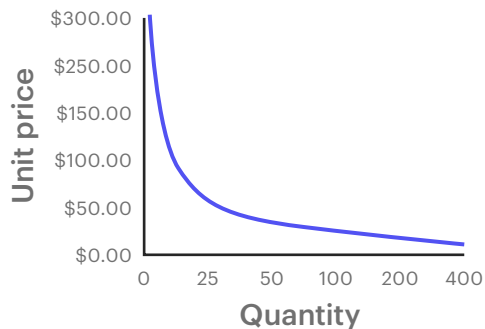
13. DESIGN PARTS WITH AXIAL SYMMETRY

Parts machined on a [lathe](#) or a [mill-turning](#) center are more economical than parts machined on a 3-axis or [5-axis CNC milling](#) machine



14. THINK BLANK SIZE

Design parts with bounding dimensions 3 mm smaller than a [standard blank size](#)



15. TAKE ADVANTAGE OF ECONOMIES OF SCALE

Larger volumes almost completely eliminate the effect of startup costs on the unit price

Increasing the quantity from 1 to 5 can decrease the unit price by more than 50%

Thank you HUBS.COM for summarizing this information.



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