# S&S Machine, LLC

# CNC Machined Part Design
## for Manufacturing

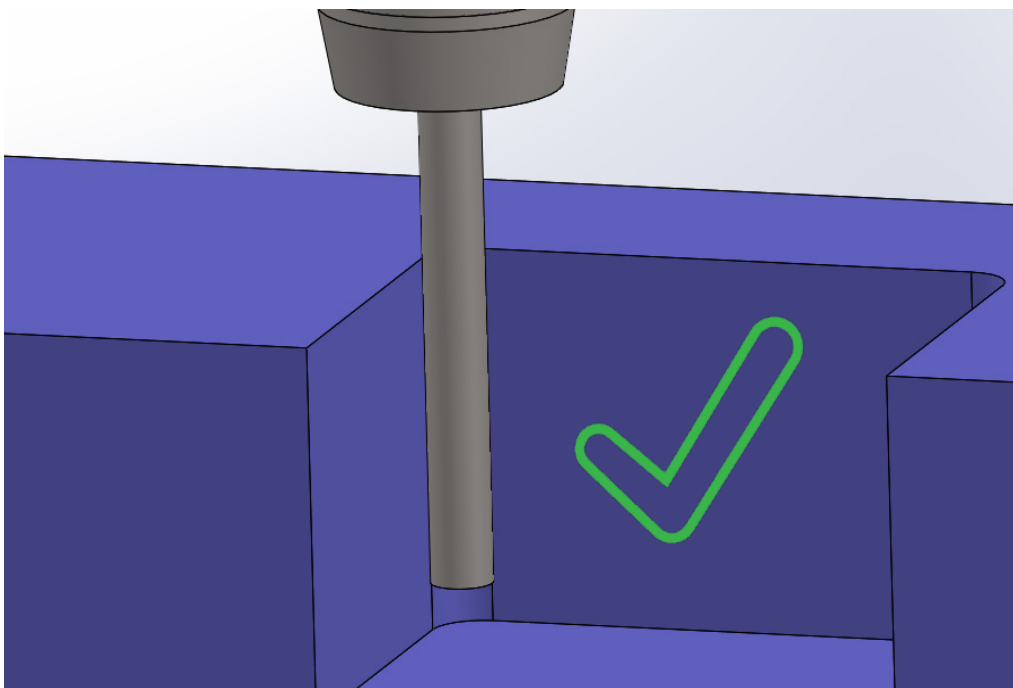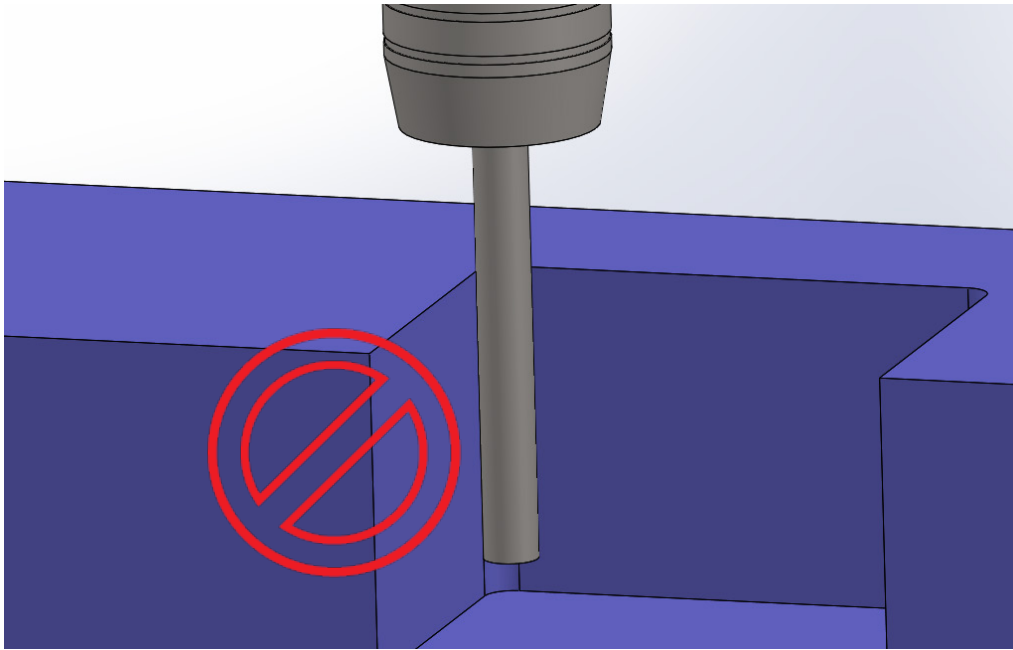**EBOOK**

# CNC Machined Part Design for Manufacturing

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# INTERIOR FILLETS

Interior fillet size less than 3:1 length to diameter ratio requires a small tool to cut. A larger radii uses a larger tool which may result in a better surface finish and tighter tolerances.

## SHARP INSIDE CORNERS

Only inside radii or inside corners from a perpendicular direction of the round tool need to have fillets. Avoid sharp square inside corners.
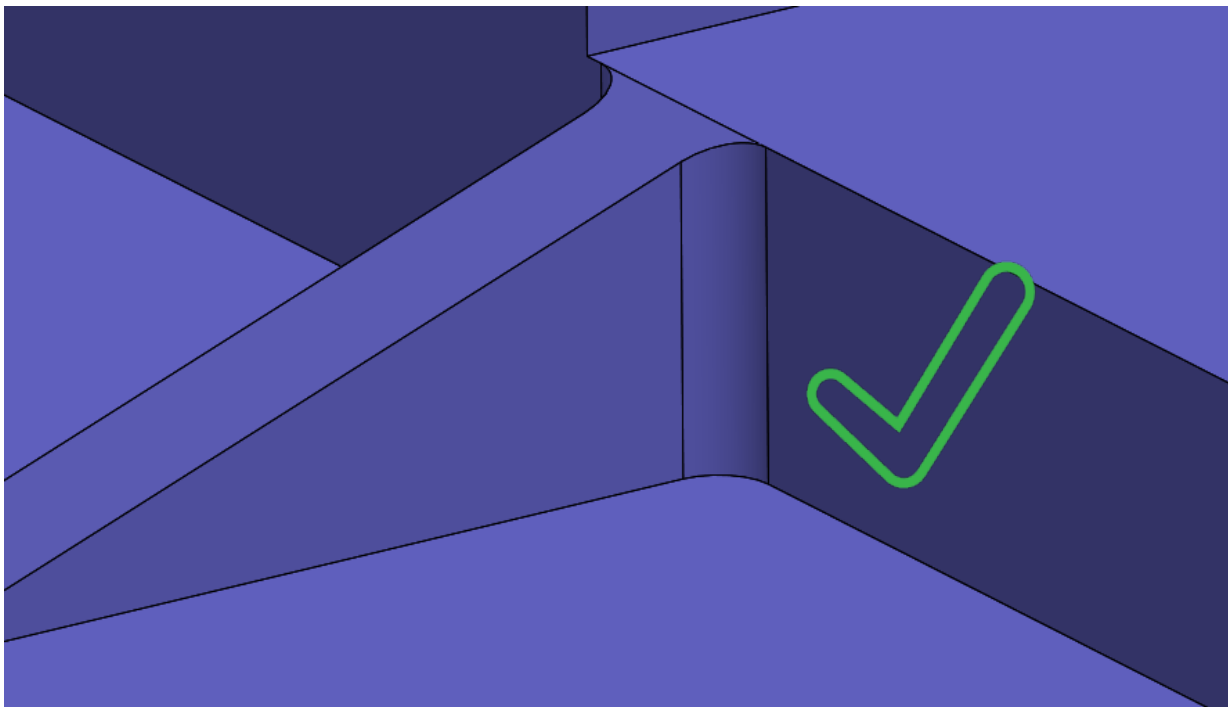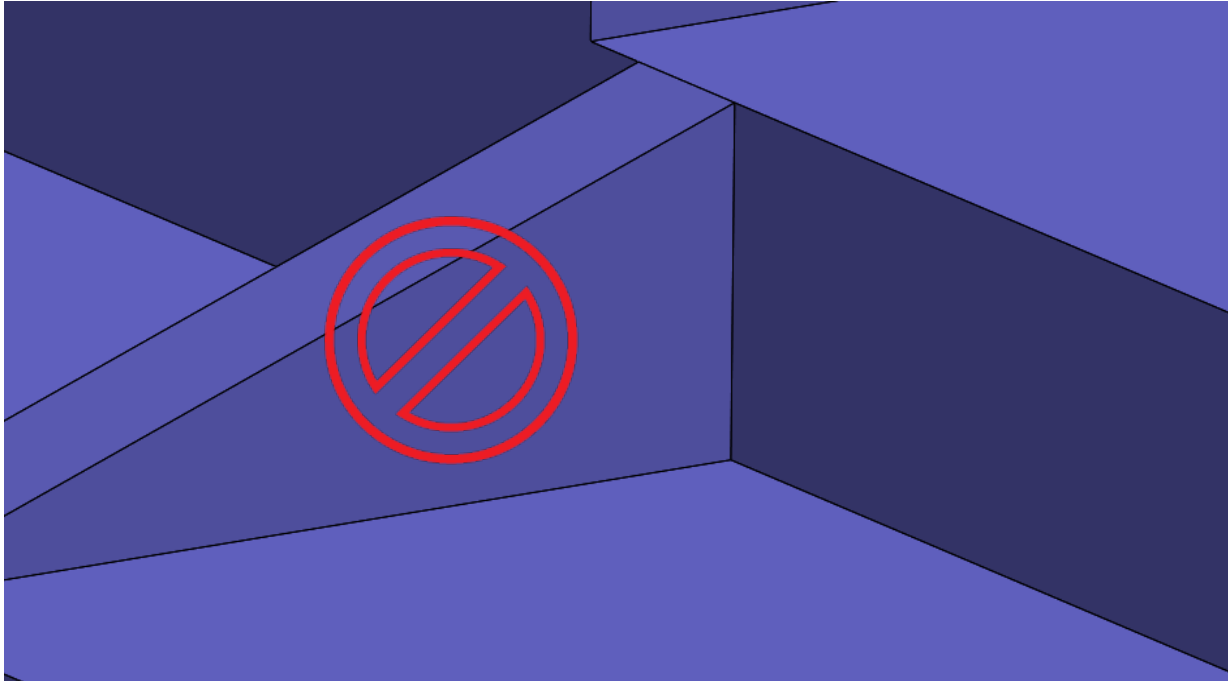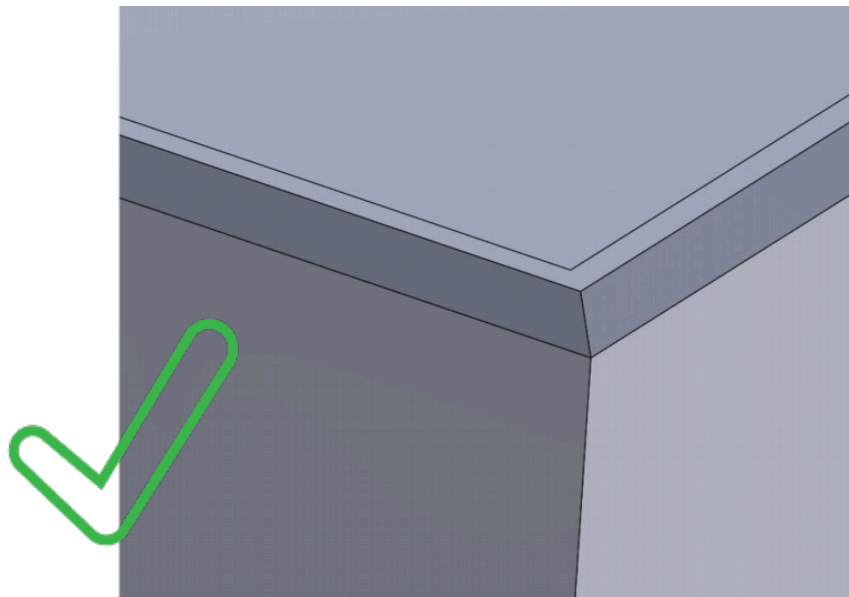
# DEEP POCKETS

Pockets deeper than 2.00" may require longer tooling which creates chatter (tool vibration) resulting in potential surface finish and tolerance issues. If deep pockets are required and you have clearance, creating a step down will allow the manufacturer to use shorter tooling which will reduce cost.
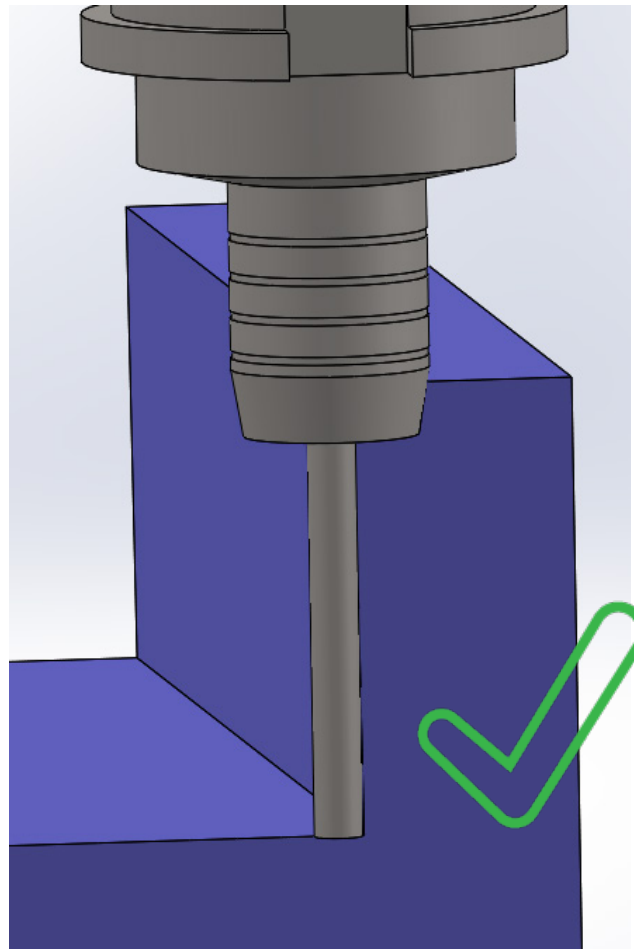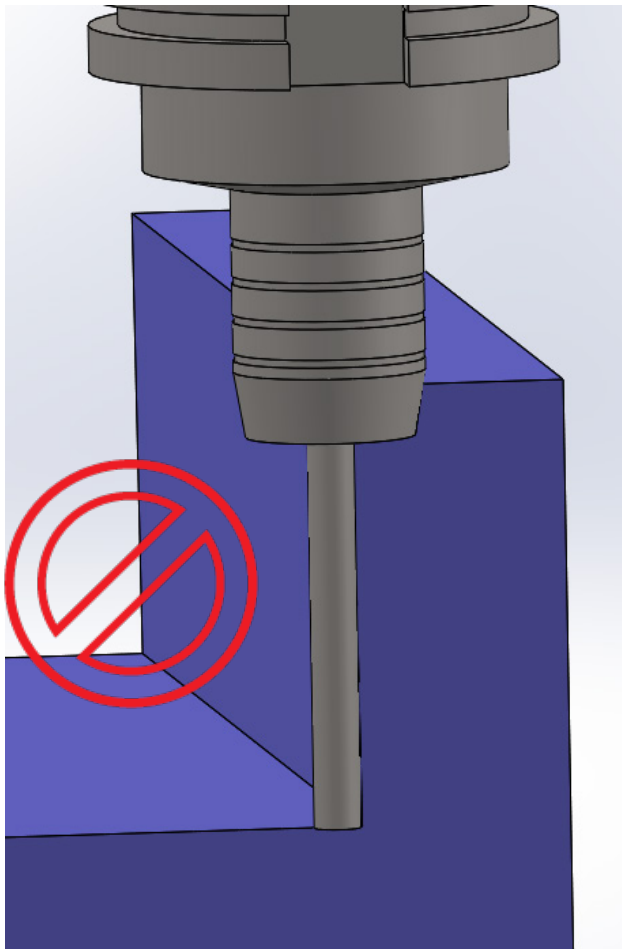
## OUTSIDE CORNERS

For outside corners, chamfers are preferable over radii, as shown below. An outside radius requires a form-relieved cutter and a precise setup, or surface machining of the radius. Both are expensive.

# THREADED HOLES

Threaded holes deeper than 4x the diameter will increase machining time and therefore increase cost. Threaded holes should only be as deep as necessary for your application. Some alternatives include 1) creating a larger hole, 2) creating a through hole and only tapping a short depth from either side, or 3) tapping a short depth on either side.

# HOLE DEPTH
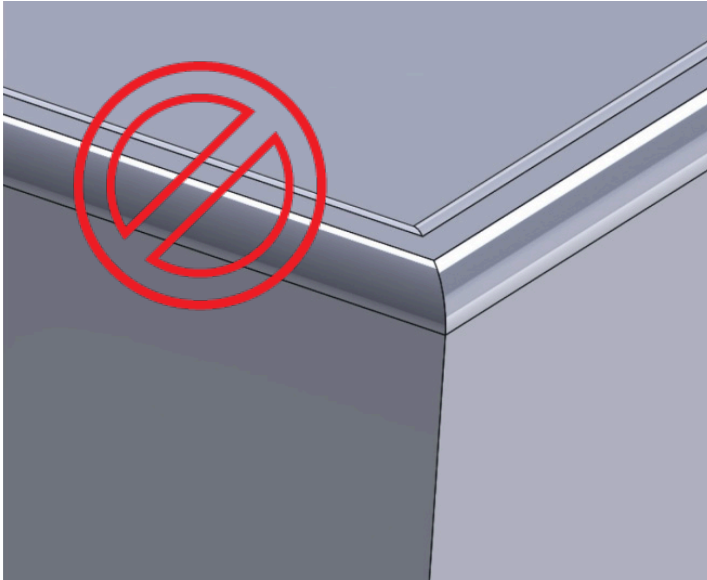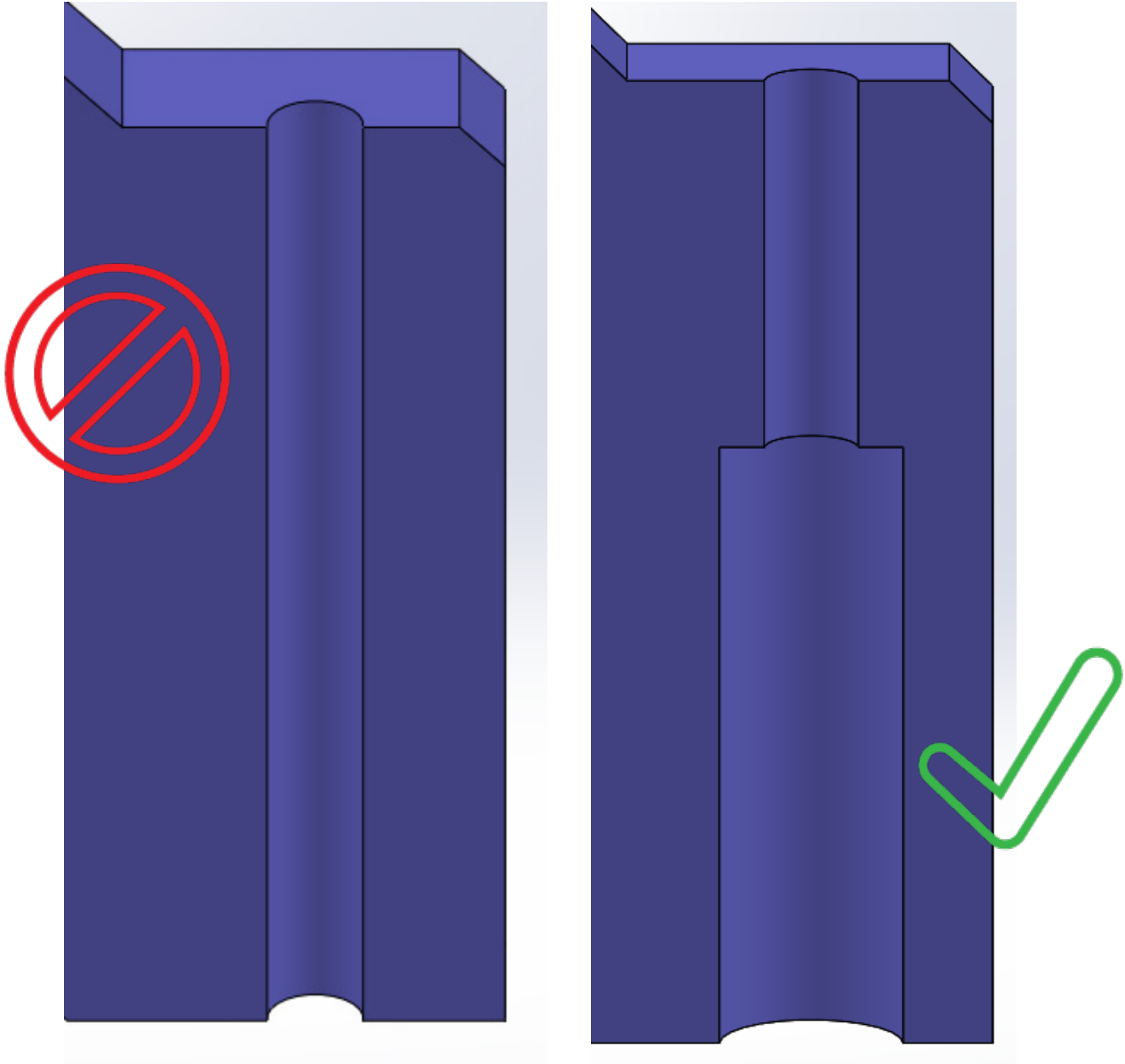
Holes deeper than 2.00" may require longer tooling which creates chatter (tool vibration) resulting in potential surface finish and tolerance issues. If deep holes are required and you have clearance, creating a step down will allow the manufacturer to use shorter tooling which will reduce cost.

## SURFACE FLATNESS

For machined surfaces with a high degree of flatness, bosses should be used. This clearly defines what areas need to be flatness controlled, and simplifies painting and other finishing operations.
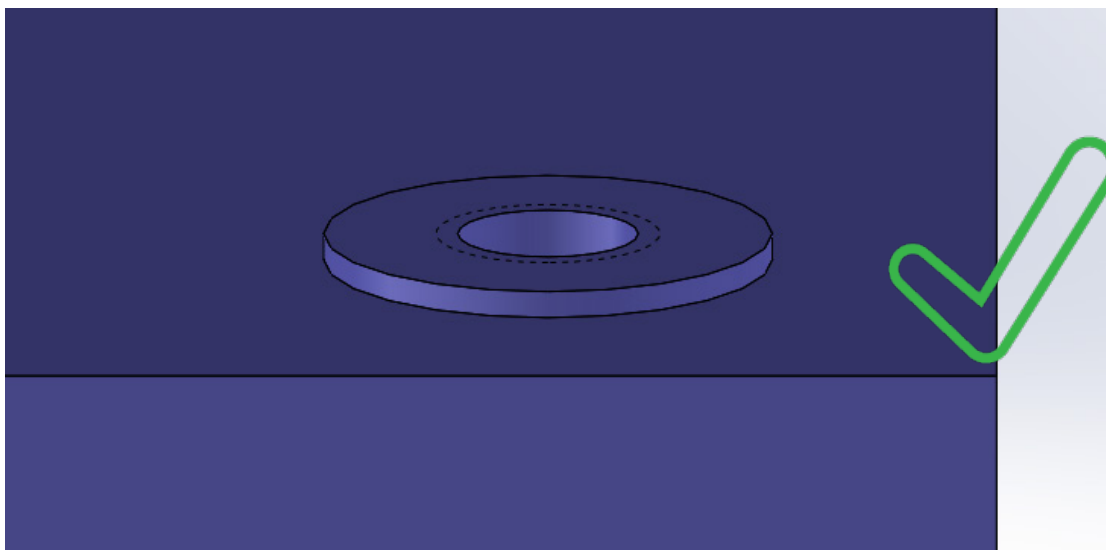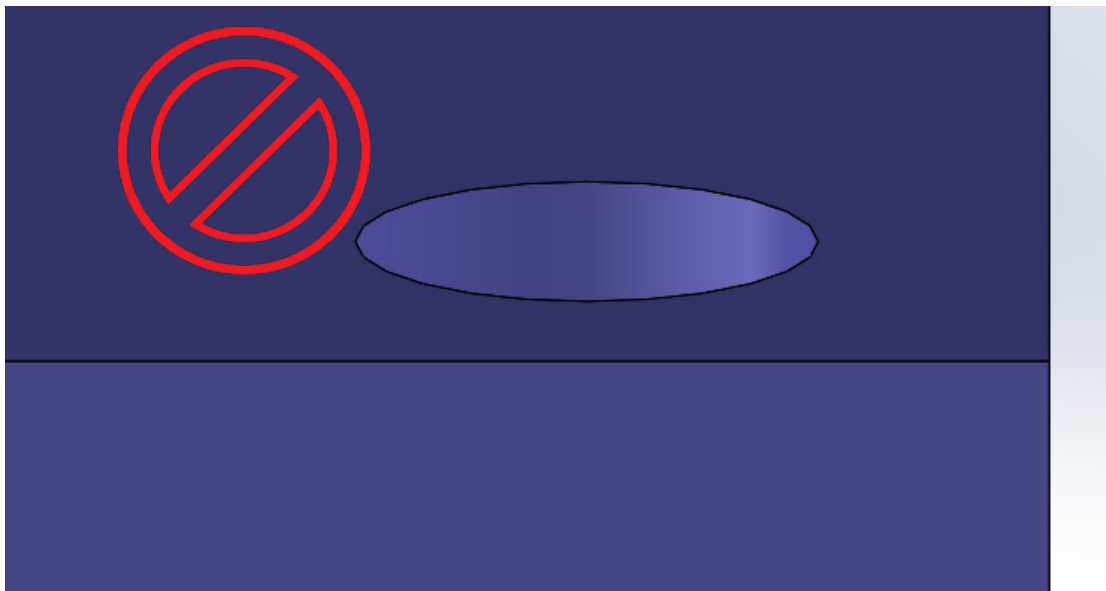
## MATING PARTS

When designing parts that fit into each other, one option is to use fractional diameter holes in the corners so the manufacturer can simply drill out then machine the profile. This isn't aesthetically pleasing, but will decrease time and cost to manufacture. Also note that tolerances stack and if you are using +/- .005" tolerances, at least .010" clearance between parts should be designed.
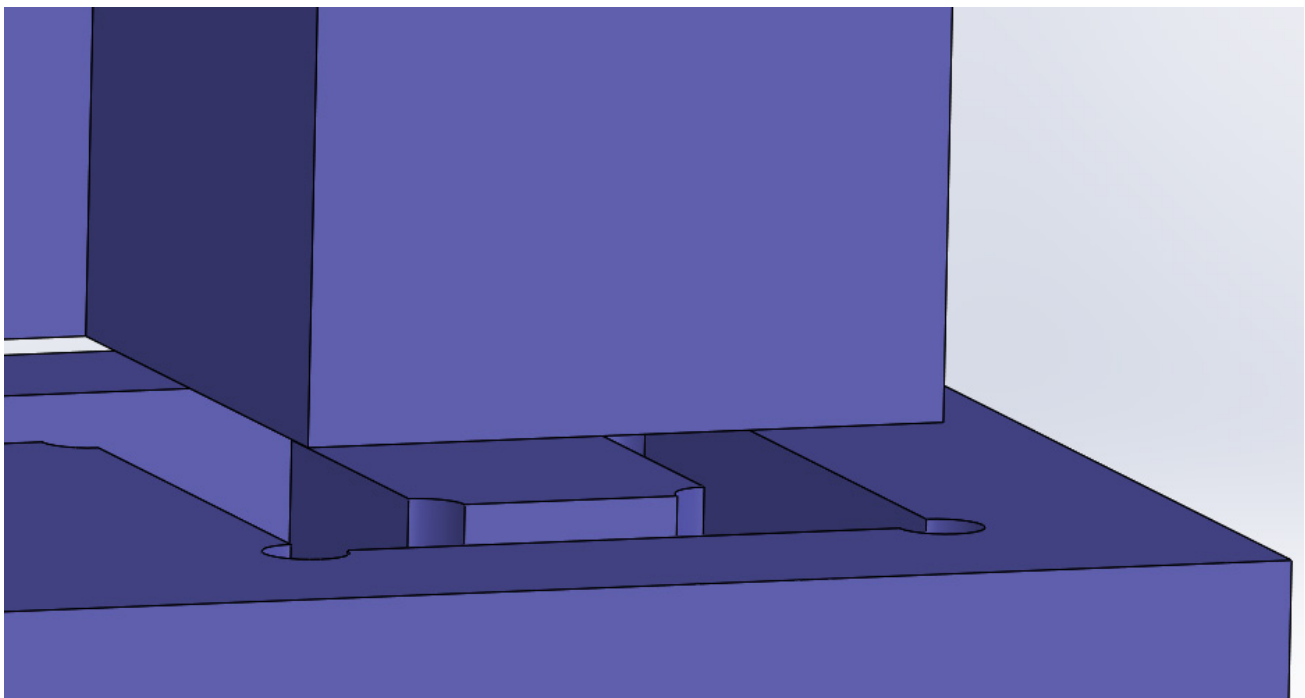
# WALL THICKNESS

Machined part wall thickness should be greater than .060". If walls are too thin the part may distort and warp, especially if using a plastic material.
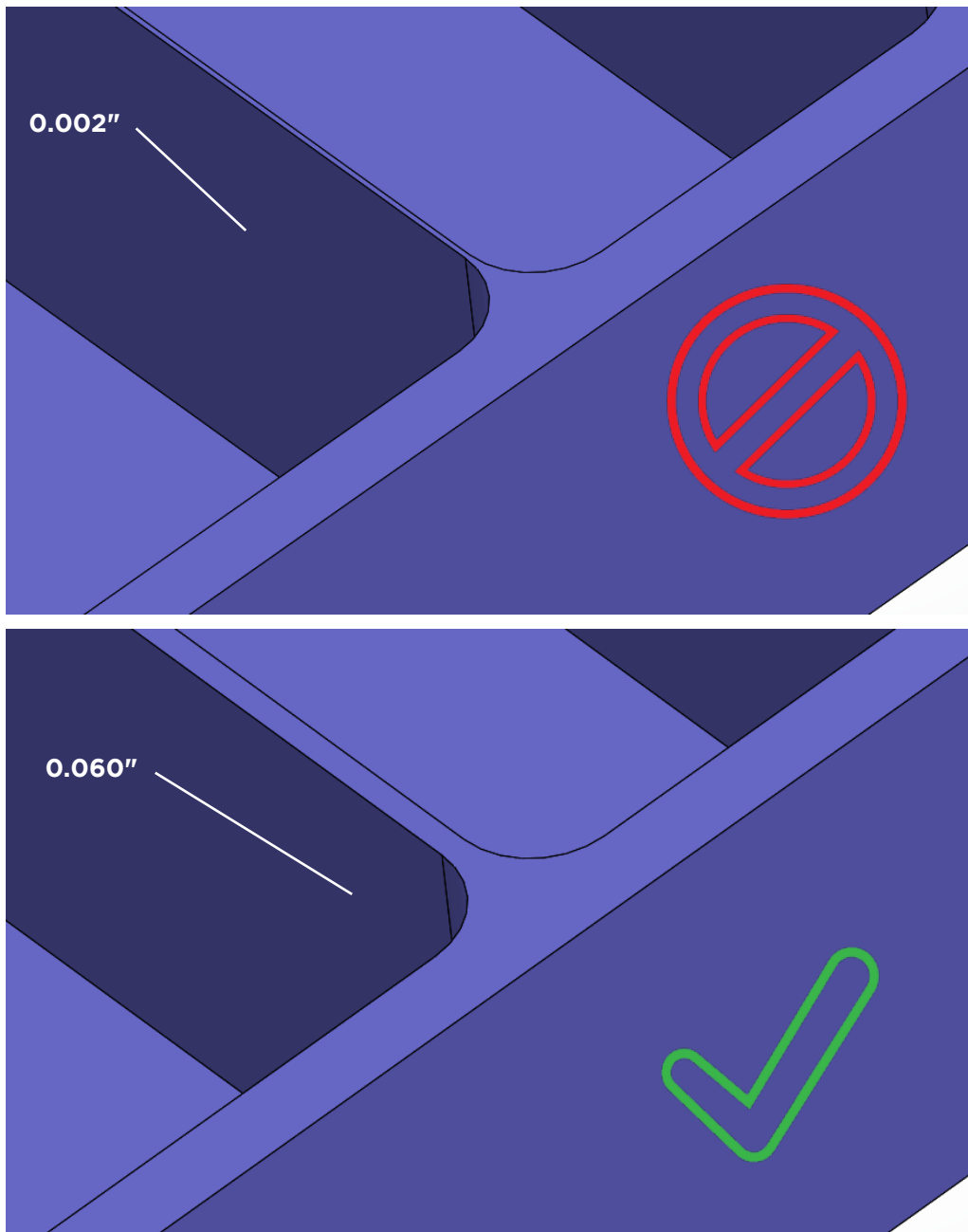
## UNDERCUTS

Undercut issues result when a machine cutting tool cannot reach a designed feature. Undercuts should be avoided as they add cost and possibly lead-time to the part. The reasons undercuts can be costly is the requirement of a special tool and special programming / slow cutting speeds for the undercut feature.
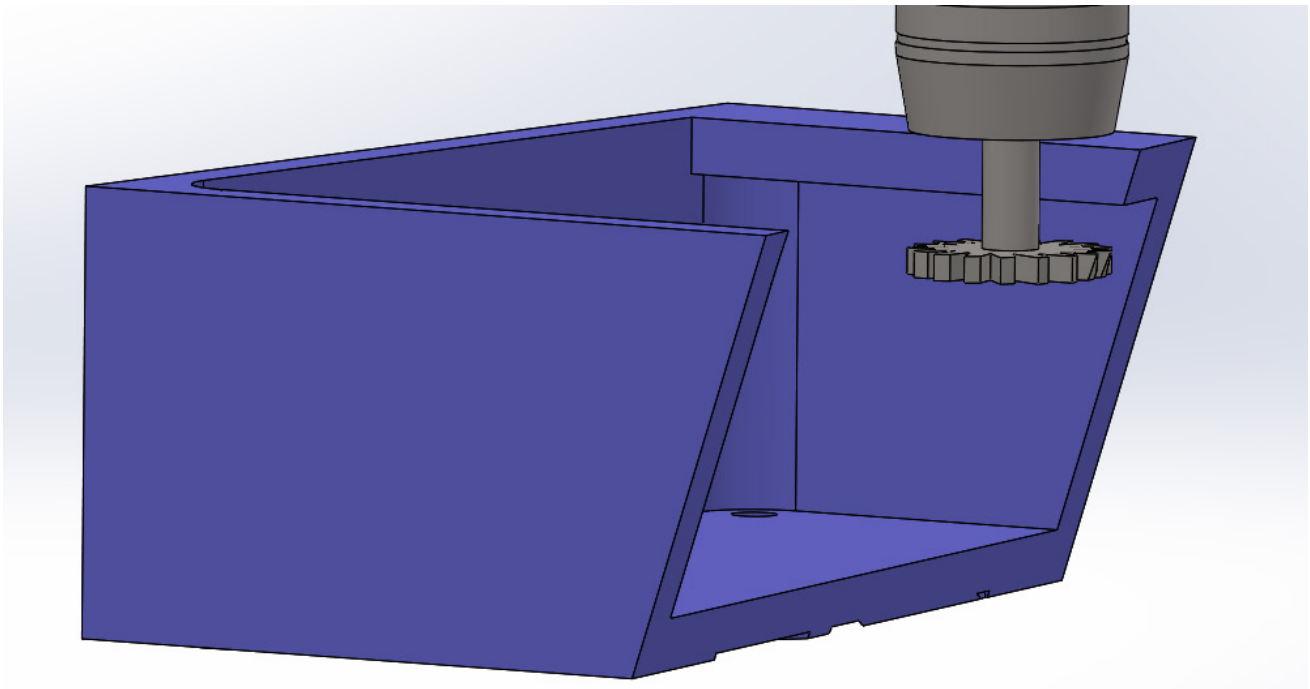
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## ABOUT S&S Machine

S&S Machine is a first-generation, family owned NH precision machine shop specializing in prototypes, short runs and quick turnaround projects. Services include cnc milling, cnc turning,  5-axis waterjet cutting, wire EDM, drilling, boring & welding. Our machine shop is the total package; when you send a job to us we will perform ALL work in order to complete your project. This may include engineering, welding, sheet metal, grinding, heat treat, coating, or other secondary work through our machine shop, or approved and trusted vendors

Request a quote today! We can't wait to meet you and exceed your expectations!

### Contact S&S Machine

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