

## Design and Spruing

Design and spruing are two of the most fundamental aspects of lost wax casting. They can be the source of a quality casting, or dreaded porosity. The challenge is that not all custom designs can be treated the same. Moreover, a good design or sprue placement for wax injection does not necessarily translate to a good casting. The general guideline is to allow the molten metal to flow from **thicker areas to thinner areas; the sprue should be placed at the thickest area to facilitate this flow** and metal freeze, as allowed by the detail of the piece. Otherwise, shrinkage occurs and porosity appears.









This principle holds true for design as well. For instance, a piece that holds several geometry variations (i.e., thick areas to thin and back to thick, etc.) will require more creative spruing in order to prevent porosity from forming. Occasionally, creative spruing is not enough, and a design must be reworked.

Other key design recommendations involve minimum thickness of 1mm throughout and metal flow pertaining to negative space and wax-engraving. If a piece has sections that are too thin, the molten metal may be unable to reach that area, causing a non-fill area. Smaller widths can sometimes cast successfully, but are dependent on how pervasive the small area is. The further the molten metal has to travel through these narrow gaps, the less likely it is to fill completely.

This same principle applies to metal flow and negative space in design (engravings, thin ridges, small settings, pinholes). We recommend a minimum draft angle of 7°, a maximum depth of 0.5mm, and a minimum width of 0.75mm for all CAD/wax engraving.

Hoover & Strong is happy to evaluate your design for spruing and castability. For new customer designs, or custom contract casting, some pieces will be evaluated at a higher success rate. This is not common, but may be due to design complexity, size, thickness (whether very thin or very thick), elaborate engravings, etc. Some examples would be large cuff bracelets, belt buckles, or highly custom rings.

### GENERAL SPRUING GUIDELINES

	Correct	Incorrect
1. Sprue to the thickest section of the model. The sprue should be 25% larger than the heaviest section.		
2. Arrange sprues to provide sufficient mesh to each heavy section.		
3. If casting high karats, color or rings with textures, sprue to edge or inside to ring		
4. Avoid spruing at right angles. Do not sprue at dead level.		
5. Molten metal flows down and out into the flask. Sprue to accommodate flow.	