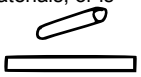
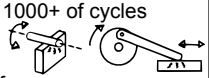
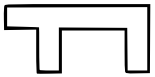
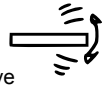
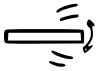
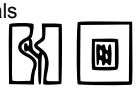
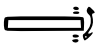
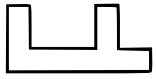
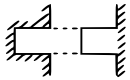
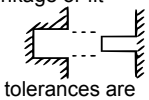
# Design for Additive Manufacturing

A quick method for reducing the number of printing and prototyping failures, by Joran Booth

**Instructions**: Mark one for each category for the part you plan to print. Check daggers and stars first, then scores

| Mark One | **Complexity** Simple parts are inefficient for AM | Mark One | **Functionality** AM parts are light and medium duty | Mark One | **Material Removal** Support structures ruin surface finish | Mark One | **Unsupported Features** Unsupported features will droop | Sum Across Rows | Totals |
|---|---|---|---|---|---|---|---|---|---|
| † ● | The part is the same shape as common stock materials, or is completely 2D  | *O | Mating surfaces are bearing surfaces, or are expected to endure for 1000+ of cycles  | O | The part is smaller than or the same size as the required support structure  | O | There are long, unsupported features  | x5 = | 5 |
| *O | The part is mostly 2D and can be made in a mill or lathe without repositioning it in the clamp  | *● | Mating surfaces move significantly, experience large forces, or must endure 100-1000 cycles.  | O | There are small gaps that will require support structures  | O | There are short, unsupported features  | x4 = | 4 |
| O | The part can be made in a mill or lathe, but only after repositioning it in the clamp at least once  | O | Mating surfaces move somewhat, experience moderate forces, or are expected to last 10-100 cycles  | O | Internal cavities, channels, or holes do not have openings for removing materials  | O | Overhang features have a slopped support  | x3 = | 0 |
| O | The part curvature is complex (splines or arcs) for a machining operation such as a mill or lathe  | O | Mating surfaces will move minimally, experience low forces, or are intended to endure 2-10 cycles  | O | Material can be easily removed from internal cavities, channels, or holes  | O | Overhanging features have a minimum of 45deg support  | x2 = | 0 |
| O | There are interior features or surface curvature is too complex to be machined  | O | Surfaces are purely non-functional or experience virtually no cycles  | ● | There are no internal cavities, channels, or holes  | ● | Part is oriented so there are no overhanging features  | x1 = | 2 |

| Mark One | **Thin Features** Thin features will almost always break | Mark One | **Stress Concentration** Interior corners must transition gradually | Mark One | **Tolerances** Mating parts should not be the same size | Mark One | **Geometric Exactness** Large, flat areas tend to warp | | + |
|---|---|---|---|---|---|---|---|---|---|
| O | Some walls are less than 1/16" (1.5mm) thick  | O | Interior corners have no chamfer, fillet, or rib  | O | Hole or length dimensions are nominal  | ● | The part has large, flat surfaces or has a form that is important to be exact  | x5 = | 5 |
| ● | Walls are between 1/16" (1.5mm) and 1/8" (3mm) thick  | O | Interior corners have chamfers, fillets, and/or ribs  | ● | Hole or length tolerances are adjusted for shrinkage or fit  | O | The part has medium-sized, flat surfaces, or forms that are should be close to exact  | x3 = | 6 |
| O | Walls are more than 1/8" (3mm) thick  | ● | Interior corners have generous chamfers, fillets, and/or ribs  | O | Hole and length tolerances are considered or are not important  | O | The part has small or no flat surfaces, or forms that need to be exact  | x1 = | 1 |
| | | | | | | | | | = |
| | | | | | | | | **Overall Total** | 23 |

**Starred Ratings**

| | |
|---|---|
| * | Consider a different manufacturing process |
| † | Strongly consider a different manufacturing process |

**Total Score**

| | |
|---|---|
| 33-40 | Needs redesign |
| 24-32 | Consider redesign |
| 16-23 | Moderate likelihood of success |
| 8-15 | Higher likelihood of success |

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