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	*○	Mating surfaces are bearing surfaces, or are expected to endure for 1000+ of cycles	○	The part is smaller than or the same size as the required support structure	○	There are long, unsupported features	x5 =	5
*○	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.	○	There are small gaps that will require support structures	○	There are short, unsupported features	x4 =	4
○	The part can be made in a mill or lathe, but only after repositioning it in the clamp at least once	○	Mating surfaces move somewhat, experience moderate forces, or are expected to last 10-100 cycles	○	Internal cavities, channels, or holes do not have openings for removing materials	○	Overhang features have a slopped support	x3 =	0
○	The part curvature is complex (splines or arcs) for a machining operation such as a mill or lathe	○	Mating surfaces will move minimally, experience low forces, or are intended to endure 2-10 cycles	○	Material can be easily removed from internal cavities, channels, or holes	○	Overhanging features have a minimum of 45deg support	x2 =	0
○	There are interior features or surface curvature is too complex to be machined	○	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		+
○	Some walls are less than 1/16" (1.5mm) thick	○	Interior corners have no chamfer, fillet, or rib	○	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	○	Interior corners have chamfers, fillets, and/or ribs	●	Hole or length tolerances are adjusted for shrinkage or fit	○	The part has medium-sized, flat surfaces, or forms that are should be close to exact	x3 =	6
○	Walls are more than 1/8" (3mm) thick	●	Interior corners have generous chamfers, fillets, and/or ribs	○	Hole and length tolerances are considered or are not important	○	The part has small or no flat surfaces, or forms that need to be exact	x1 =	1
									=

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

Overall Total 23

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