
Subject: Stainless Steel Print Strength

Posted by [mandolinwalt](#) on Mon, 17 Dec 2012 07:06:34 GMT

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With the stainless steel material, is the strength comparable to actual stainless steel? Would a printed design be as strong as a bronze casting?

Subject: Re: Stainless Steel Print Strength

Posted by [GlenG](#) on Sun, 06 Jan 2013 17:36:42 GMT

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In the order asked, the answers are: NO and YES. The overall design of the part will also a factor into the ultimate strength and functionality.

-G

Subject: Re: Stainless Steel Print Strength

Posted by [wiwa](#) on Mon, 14 Jan 2013 15:41:27 GMT

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The stainless is "stronger" than about 75% of other stainless steels; but it is much more brittle than any steel is generally (it is very stiff, but will break instead of springing back like steel would)

Subject: Re: Stainless Steel Print Strength

Posted by [GlenG](#) on Mon, 14 Jan 2013 16:28:01 GMT

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They key factor in determining overall strength of "stainless prints" has more to do with the process of manufacture rather than the alloy designation.

3d stainless prints are a true composite of ss and bronze (not an alloy) so you cannot simply compare or assume this material will have the same strength and characteristics of common sheet, plate, or bar stock, or even those of a solid casting.

In general what Wiwa says is true. Yes, the 3d ss prints are somewhat brittle and will not yield to applied stress as well as a pure stainless alloys. So good design is imperative. Frilly bits attached to massive elements are subject to failure. Fillets and smooth transitions improve strength in all materials and especially with brittle materials like cast iron or glass or 3d stainless prints. All that said, with proper attention to detail this composite material is more than serviceable in a broad range of applications. Like so many things the , "the Devil is in the details" and that's what being a designer needs to be about.

Subject: Re: Stainless Steel Print Strength
Posted by [CactusBones](#) on Thu, 17 Jan 2013 19:15:14 GMT
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I am just adding my experience here. I do not think that the composite print material stainless is as strong as real stainless. I have broken and cracked pieces before with relative ease on accident. When I broke something in half it was pale on the inside, the break was jagged and rather particularized much like breaking a pot metal tool made in china in half. I can use a hobby dremel to easily sand right through the material and I can easily drill holes(with a metal lathe). I hope that sheds some insight. Perhaps there are different batches that are coming out, but so far my experience is that the "stainless" material here has a different tensile strength than real steel> seems to be more brittle. I still think the material is excellent, but for certain applications like parts in machinery that applies pressure or has a high potential for wear, I would say that this is not a good idea.

Subject: Re: Stainless Steel Print Strength
Posted by [GlenG](#) on Fri, 18 Jan 2013 04:19:42 GMT
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CB,

The stainless print media is definitely not as strong as pure wrought alloy materials. And when it breaks, the fracture more resembles a cast material. This is all due to how these 3d prints are made. The process begins with spherical stainless powders, built up in layers, temporarily held together by polymer binders. A green print is very much like a stack of micro sized marbles (30-60microns in size). After printing these green parts are loaded into a controlled atmosphere furnace. Small sprues (stilts) are added to each part and a measured amount of bronze powder is piled on the open end of the stilt. As the temp of the furnace rises several things occur. First the binders burn off, then at somewhere around 1100Â°c each microsphere of stainless joins (welds) to it's neighbor, but only at the points of contact. Concurrently, the bronze powder, which is now fully molten, wicks through the stilt and infiltrates all the voids between the stainless micro spheres until the entire 3d print is saturated with bronze. Think of the final result as a stainless sponge full of bronze. Because 3d stainless prints have a sintered composite structure they won't be as strong as a part cast or machined from similar pure metal. Even so, when properly designed and engineered amazing things are possible. Critical, moderately stressed industrial parts are definitely possible. Designers just need to avoid scenarios that invite structural failure. If tiny jump ring elements snap off then make them fatter or more integral to the design. Avoid stress risers like sharp unions. If a .5 or 1mm wall element

continually fails, then it's time to redesign the part. You can't fight the nature of this beast but you can learn to work with it.

One thing you said surprises me though; "I can easily drill holes" ? My experience is that only carbide bits work for drilling and machining operations and even then it can be a real booger of a job. I grind, machine and otherwise finish this material on a daily basis and its generally a bear to work with. Tensile strength is only fair but wear resistance and compressive strength is actually very good.

Oh, I really like your little houses.

-G

Subject: Re: Stainless Steel Print Strength
Posted by [stannum](#) on Fri, 18 Jan 2013 05:08:25 GMT
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It always sounded like a bronze open cell foam, with the cells filled with steel instead of air, even if the "assembly" process is the other way around, steel then bronze. And the behaviour always sounded like that of concrete (good at compression).

Subject: Re: Stainless Steel Print Strength
Posted by [GlenG](#) on Fri, 18 Jan 2013 15:59:48 GMT
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Prints are roughly 60% stainless & 40% bronze. Bronze melts at much lower heat than steel and is happy to occupy the vacant real estate between the stainless bits.

"Concrete" is another composite material, one of the first discovered and used by humans! Pretty good analogy to SS print media.

-G

Subject: Re: Stainless Steel Print Strength
Posted by [njculpin](#) on Wed, 15 May 2013 22:37:20 GMT
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i apologize for bringing this back but had been having issues with the gold plating. Is the "bronze" plating more durable than the gold? I made a ring for my girlfriend recently and it seems that the gold comes off in soap and water over the course of a month. She works in bar so this is frequent. Note that I am having no issues with the ring itself just the plating.