
Subject: Weather proof metal
Posted by [joie](#) on Fri, 27 Jan 2012 17:07:07 GMT
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Hi there;

I have a really important (for me) question for all of you.

I want to 3d print something in antique bronze finish and leave it outside, that means bad weather, rain, sun, wind and that sort of things.

Are shapeways metals "weather-proof"?, Can I 3d print a metal statue (for example) and leave it in my garden forever?, if not, What kind of post-process should I apply to it to be safe?.

What do you think?.

Thank you.

Subject: Re: Weather proof metal
Posted by [GlenG](#) on Fri, 27 Jan 2012 17:28:56 GMT
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The SS print media will definitely corrode (red rust) if left out in the weather for extended periods of time. The only way to preserve the finish will be a post production coating with an industrial grade exterior clear coat designed for metals. Even this treatment will not last "forever".

-G

Subject: Re: Weather proof metal
Posted by [hagman](#) on Fri, 27 Jan 2012 18:49:27 GMT
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Really? I mean it's called stainless steel after all - and tagged as dishwasher-proof = yes. Just wondering ...

Subject: Re: Weather proof metal
Posted by [Youknowwho4eva](#) on Fri, 27 Jan 2012 19:01:41 GMT
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Yes but it bronze infused

Subject: Re: Weather proof metal
Posted by [stop4stuff](#) on Fri, 27 Jan 2012 19:20:01 GMT
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There are different grades of 'stainless steel', all with different degrees of corrosion resistance. Shapeways 'stainless steel' is bronze infused 420 stainless and as you might guess from 420 the stainless is a bit of a hippie and doesn't stand up to much abuse from the elements.

Subject: Re: Weather proof metal
Posted by [GlenG](#) on Fri, 27 Jan 2012 20:07:14 GMT
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Yes these comments explain the issues of corrosion resistance. Even if a highly resistant stainless alloy was used in the print medium there would still be problems on account of the bronze content. In effect, the matrix of printed/infused parts acts sort of like a battery and is subject to galvanic corrosion when wet. However, I have had large test parts out in the weather for several years now and I will say that the rust patina that has developed is actually quite aesthetically pleasing. It is also quite stable and adherent (does not easily flake off).

-G

Subject: Re: Weather proof metal
Posted by [hagman](#) on Sun, 29 Jan 2012 18:29:18 GMT
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Great to hear - experiment always beats theory

Subject: Re: Weather proof metal
Posted by [joie](#) on Mon, 30 Jan 2012 15:44:53 GMT
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Hi there GlenG;

Do you think my object can be then destroyed by weather and eventually collapse without being properly coated?, do you have a photo of your objects left outside for years?.

Thank you.

Subject: Re: Weather proof metal
Posted by [GlenG](#) on Mon, 30 Jan 2012 18:09:54 GMT
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Hi Joie,

How long a particular object will survive before it deteriorates beyond recognition is very hard to predict. Environmental factors like air pollution or proximity to ocean salt spray and hi humidity will generally accelerate rusting. The overall design of the piece will also factor into how well it withstands the elements. Areas or details that trap standing water should be avoided. If the design is hollow then allowances for drainage (weep holes) should be made. If a piece has lots of frilly skinny bits projecting from the surface expect these features to fail before solid surface details.

My test parts are in the form of a lifelike crab, about 6cm across, with a heavy solid body and thin legs of about 3mm dia. After 3 years outdoors the crab has an even, chocolate brown coloring. No heavy scaling and no indication of structural failure. At this rate I would expect it to be at least 25 years (probably a LOT longer) before any significant deterioration occurs. I will try to send a picture soon.

In my opinion, if you find this natural patina acceptable, I'd say go for it. Unattended the sculpture will likely outlast youand your kids!

-G

Subject: Re: Weather proof metal
Posted by [joie](#) on Mon, 30 Jan 2012 18:29:18 GMT
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Well, I guess a little cleaning once per year may help a little...

Subject: Re: Weather proof metal
Posted by [erckgillis](#) on Mon, 30 Jan 2012 18:56:03 GMT
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I can also recommend a cheap SS Black Oxide finishing kit and sealer that works well...

<http://www.caswellplating.com/kits/black.htm>

ERCK

Subject: Re: Weather proof metal
Posted by [GlenG](#) on Mon, 30 Jan 2012 22:23:35 GMT
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Public sculpture is frequently maintained with a product known as "Renaissance Wax". This is a synthetic microcrystalline paste wax of archival grade. GREAT STUFF! The finish on metal objects will definitely be extended by semi annual use of this stuff.

I have never tried the "black oxide kit" that ERCK mentioned but even that finish would likely require some form of barrier coat to prevent corrosion. Marine grade finishes designed for metal and some types of epoxy based powder coatings do retard corrosion but when it comes to this SS print medium: RUST NEVER SLEEPS! Without periodic maintainice almost any treatment will eventually fail.

-G

Subject: Re: Weather proof metal
Posted by [stannum](#) on Mon, 30 Jan 2012 23:57:03 GMT
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What was the bronze content? Being a mix, both parts should be addressed, and maybe they interact with each, making it a real special case. Wood and lead don't play nice, for example.

Subject: Re: Weather proof metal
Posted by [Bathsheba](#) on Tue, 31 Jan 2012 06:51:39 GMT
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Another vote for rust: it's 316 stainless as it goes into the RP process, but after it's been sintered with the bronze it's definitely lost some corrosion resistance. Ferrous material on on an oxygen-water planet, what can you expect.

If you live near the shore and there's salt in the air, that will accelerate it; I've had customers mention this.

Subject: Re: Weather proof metal
Posted by [erckgillis](#) on Tue, 31 Jan 2012 21:52:55 GMT
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Sound like we need some product testing!

True the Brass will patina well and it's qualities are well known, Stainless for all it benefits will rust some and also on it's own is a known factor.

The two together and any galvanic response will further effect both materials and any additional corrosives like Salt, Acid rain or other environmental factors will just also hasten the process.

So the best bet depends on the function and esoterics of the design, a clear sealer would preserve the color but would have to be re-applied as would any wax or baked on powder coatings. Other materials would effect the color and if a natural patina is desired then more long term testing would tell us if any defects or small details would be effected by such exposures.

YMMV

Subject: Re: Weather proof metal
Posted by [7777773](#) on Wed, 01 Feb 2012 01:05:23 GMT
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@ GlenG - I'd love to see photos of how your SS prints have held up after 3 years outdoors!

Subject: Re: Weather proof metal
Posted by [GlenG](#) on Wed, 01 Feb 2012 01:12:33 GMT
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The current stainless bronze (matrix) used for SW prints is composed of approximately 60% alloy 420 stainless steel the remaining 40% is a tin bronze alloy. This is a composite of the two metals. If you look at prepared specimen under a microscope you can see the matrix like configuration of the material. In many ways this is a unique material. It has it's.....

peculiarities! What is true about the individual components is not always true of the composite. The fact is, not every aspect of its nature is known or understood as yet. Not even close to the amount of data available for commonly used metals. But the fact is, the print process works, it meets the needs for many applications and is available at reasonable cost. I would encourage any and all adventurous souls to keep experimenting and testing and then to provide feedback to these forums.

-G

Subject: Re: Weather proof metal
Posted by [GlenG](#) on Wed, 01 Feb 2012 01:19:48 GMT
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I'll send some pics and a tutorial on how to produce a controlled rust patina. The process is similar to techniques used for creating rust patinas on firearms or other decorative items. It is not difficult it just takes a bit of time (days of waiting) so it is not practical for SW to offer as an available finish.

It might take me a week or so to get the info out to the forum.

-G

Subject: Re: Weather proof metal
Posted by [GlenG](#) on Mon, 06 Feb 2012 15:43:15 GMT
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Here is a picture of a test piece left outdoors for 3 years. After this natural weathering process, no other surface treatment has been applied to this piece. The "crab" is 2.5" across the top of the shell.

Initially this part was lightly polished, leaving heavy print lines intact. Part was de-greased with detergent, washed in dilute acid (vinegar) and then rinsed with clean water and placed outdoors with full exposure to the elements.

A brown/orange patina developed after about 6 months. After 1 year the coating darkened to mostly chocolate brown color and became even across the surfaces. After 3 years there is no flaking rust on the surface of this part and no indication of any structural compromise of the fine details of the legs.

File Attachments

1) [Crab 33.jpg](#), downloaded 296 times

Subject: Re: Weather proof metal
Posted by [GlenG](#) on Mon, 06 Feb 2012 15:54:19 GMT
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Here is another view of the same "crab" test part. The mottled coloration, varying from brown to orange is typical of natural weathering effects.

If this part were treated to a rub down with a fine stainless steel wire brush the color would even out. A coating of oil, wax, or clear lacquer would result in an even deep brown color. I will process this part further and post the results shortly.

-G

File Attachments

1) [crab2 33.jpg](#), downloaded 286 times

Subject: Re: Weather proof metal
Posted by [ana](#) on Mon, 06 Feb 2012 16:43:27 GMT
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Hey, really cool Glenn!

Thanks for taking the time to do this.

Subject: Re: Weather proof metal
Posted by [GlenG](#) on Mon, 06 Feb 2012 17:35:29 GMT
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I'm working on some simple DIY formulas for accelerating the rust patina process and will post results soon. The finish really can look lovely.

-G

Subject: Patina's!
Posted by [erckgillis](#) on Tue, 07 Oct 2014 20:24:56 GMT
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Patina's and "distressing" metal is well documented and most processes can be well controlled. ACID etching is a Whole 'nother FAQ. As is the Chromate finishing solutions and plating or electro/chemical coatings etc...fyi

First Know your alloys and base metals! ASTM - <http://www.astm.org/Standards/nonferrous-metal-standards-and-nonferrous-alloy-standards.html>

Clean, rinse and then clean again... oils, oxides and fingerprints will alter results and consistency. Temp is best warm or room temp for most alloys.

Use de-ionized water only for ALL rinses!

I prefer the following- YMMV!

Steel or Stainless - NaOH (Lye) or "Drain-O" Sodium Hydroxide is widely available but always in different strengths and additives. Try for pure or concentrated 'professional' strength or Chemical Suppliers. Commercial grades will vary.

A few seconds it will blacken Stainless, Base steel will rust in minutes.... go slow!

Same with most base metals. Brass, Bronze etc. Do not use on SW Coating like Nickel, Black or Bronze Steel etc. it will "eat" those.

Brass/Bronze- LOS "Liver of Sulfur" or LOS is a poorly defined mixture of potassium sulfide, potassium polysulfide, potassium thiosulfate, and probably potassium bisulfide. Synonyms include hepar sulfuris, sulfur, sulfurated potash and sulfurated potassa.

GREAT on most Copper Alloys and used warm, in water it will produce rainbow effects and over time green, brown & black results. New Gel formulas are more stable and easier to handle/apply.

Silver/Silver Plate- LOS works also, but it must be fairly strong and the surface must be prepped clean and oil free. Rinse, repeat.

See me for Q&A or these sources - <https://steelfxpatinas.com/product-category/steel-patinas/>
http://www.caswellplating.com/metal_finishing_solutions.html

Some other solutions or OTS fixes can be used YMMV!

Ed