

The Bellows Bottom Line

Practical advice on expansion joints

by Greg Perkins

This month - **Getting Useful Answers From Your Metallurgist**

by any means possible

What would Jack Bauer do?

Need a recommendation from your metallurgist on a bellows alloy and can't seem to pin him down on an answer? We water-board our metallurgist. I'm not kidding - and when I say 'water-board' I mean the good-old fashioned Salem-witch-water-dunking until they rat out their own mothers water boarding. Excessive? I think not. Ever try and get a succinct answer from a metallurgist?! They think that if they ever gave anything short of an encyclopedic recommendation in Latin, they would be hauled before a tribunal in Nuremberg and hanged.

Before judging our tactics, consider the useful information we obtained.

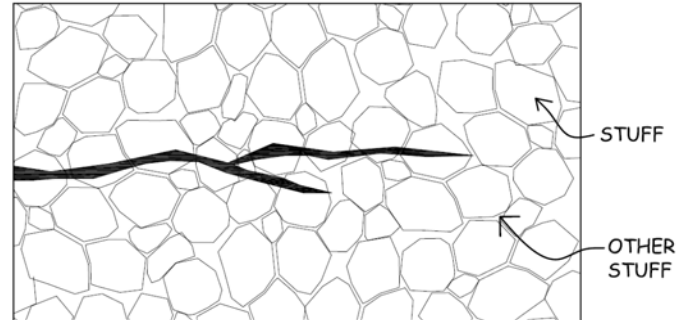
Metal ice

A metal, such as stainless steel, starts off as a molten liquid mixture of elements: iron, carbon, nickel, chromium and some other stuff. When it cools down it 'freezes' and forms crystals, or 'grains' much in the same way water solidifies and becomes ice.

These crystal grains grow until they bump into each other. The grains are made up of a better mix of elements than that of the stuff that hardens around them. The material between the grains is called the grain boundary which is less corrosion resistant than the grains.



Intergranular crack - 'the crack goes around the grains'



Transgranular crack - 'the crack goes through the grains'

The bottom Line - useful information

The two common types of cracks that can occur in a metal bellows are intergranular and transgranular; between the grains and through the grains. Without a microscope the cracks can look the same.

If you have a stainless steel bellows sample in which the crack has gone through the grains, then the failure is mechanical; most likely fatigue. It could be piping thermal cyclical fatigue but I would put my money on equipment vibration or flow induced vibration fatigue - check those out first.

If the stainless steel sample shows the crack going around the grain, then it is likely a corrosion attack and you would then need a chemical analysis of the media... and then another alloy recommendation... from, sigh... a metallurgist.

For that information I recommend using the rack.



*Legal disclaimer - Oakridge Bellows, LLC does not expressly condone the use of torture in obtaining information from a metallurgist... nor do we condemn it.

No metallurgists were actually harmed in the writing of this article.