

Information sheet: cadmium corrosion on the springs of ICA spring stretchers

Introduction:

Cadmium corrosion, a metal degradation product harmful to human health that often appears as a white or yellow powder, has been found on the springs of paintings on ICA spring stretchers. If you have paintings on these stretchers, this fact sheet will help you determine whether the springs are exhibiting cadmium corrosion. It will also outline steps to take to mitigate health risks.



Fig. 1. Corner of an ICA spring stretcher with metal hardware.
Image courtesy of Heidi Sobol and Aaron Shugar, October 2021

History:

In the 1950s Richard Buck, director of the Intermuseum Conservation Association (ICA) in Oberlin, Ohio, designed a new type of constant tensioning stretcher. The stretcher was manufactured first by a craftsman based in Oberlin and then from the mid-1990s until 2002 in Chicago under the name Superior Spring-Stretcher. It was used at the ICA in conservation treatments and was also independently available for sale to collectors and institutions until 2002. For this reason, it has been found on paintings that were never treated at the ICA. The dates of greatest use for the spring stretchers were likely between 1953-1980, a time when paintings conservators were undertaking linings and replacing stretchers on a regular basis.

To achieve the constant tension, the stretcher design used steel springs. The springs were coated with a protective, sacrificial coating. No coating appears to have been specified in the stretcher design for the springs. Rather, the springs appear to have been off-the-shelf products made for another industry like car manufacturing. Both cadmium and zinc coatings have been confirmed by XRD analysis on the springs on ICA stretchers and both can break down to produce white corrosion products. For that reason, some ICA stretcher springs may have zinc coatings with much less toxic zinc corrosion.

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This issue was first researched by paintings conservator Heidi Sobol at the Royal Ontario Museum in Toronto and conservation scientist Aaron Shugar of the graduate conservation training program at SUNY, Buffalo. They presented a paper on the phenomenon in 2019 at the American Institute for Conservation (AIC) annual meeting. A version of their paper with more detailed information and excellent images is online on the AIC Wiki website:

http://www.conservation-wiki.com/wiki/Stretchers_and_Strainers:_Addendum

Health and Safety:

According to the Occupational Safety and Health Administration (OSHA) cadmium is a known carcinogen, and long-term exposure can cause kidney, respiratory, and reproductive system damage. Its primary path into the human body is via ingestion, absorption through the skin, and inhalation. Occupational studies of the effects of cadmium on humans involve high levels of exposure, and the exposure risk for handling corroding cadmium coated stretcher springs is not known.

For this reason, if you are checking your paintings for cadmium corrosion on the stretcher springs, you must wear proper personal protective equipment (PPE) including disposable nitrile gloves and either a fit-tested respirator with P-100 filters or a disposable, fit-tested N-95 respirator. Always wash your hands after handling stretchers with potential corrosion.

How to determine if you have cadmium corrosion:

You can do a quick check with an ultraviolet light (UV) examination in a dark space since cadmium corrosion will often fluoresce a bright orange yellow. Zinc corrosion will not fluoresce in this manner.

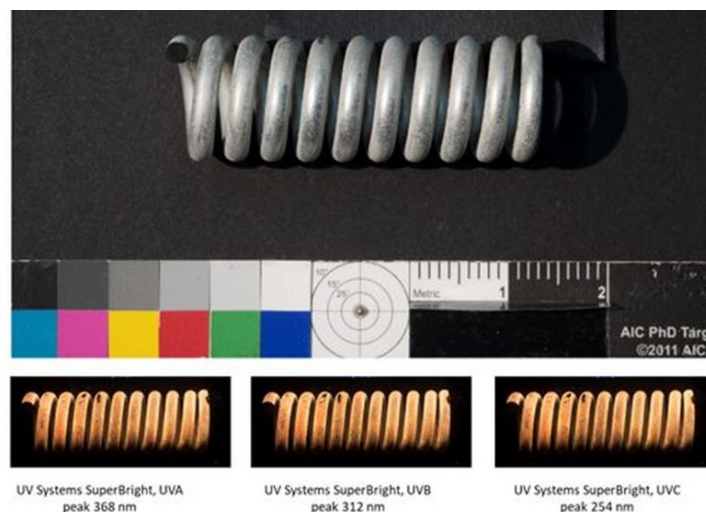


Fig. 2. Cadmium coating on a steel spring fluorescing bright orange under different UV light sources. Zinc coatings will not exhibit this fluorescence. Image courtesy of Heidi Sobol and Aaron Shugar, October 2021

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If after the UV exam there are questions about the presence of cadmium corrosion, x-ray fluorescence (XRF) analysis will allow a definitive identification.

If you have cadmium corrosion, what should you do?

- 1) The best option in terms of health and safety is to replace the stretchers. This is what Heidi Sobol did for 18 paintings at the Royal Ontario Museum. This is a time-consuming process that has to be done with appropriate PPE, in a properly set up “dirty” space. The work would likely need to be done by or in consultation with an art conservator. In many cases stretcher replacement might not be practical or affordable.
- 2) Removing the metal hardware from the stretcher is possible, but presents several challenges including sawing through metal stretcher components while the artwork remains on the stretcher. This work should definitely be done by an art conservator wearing appropriate PPE in a properly set up “dirty” space.

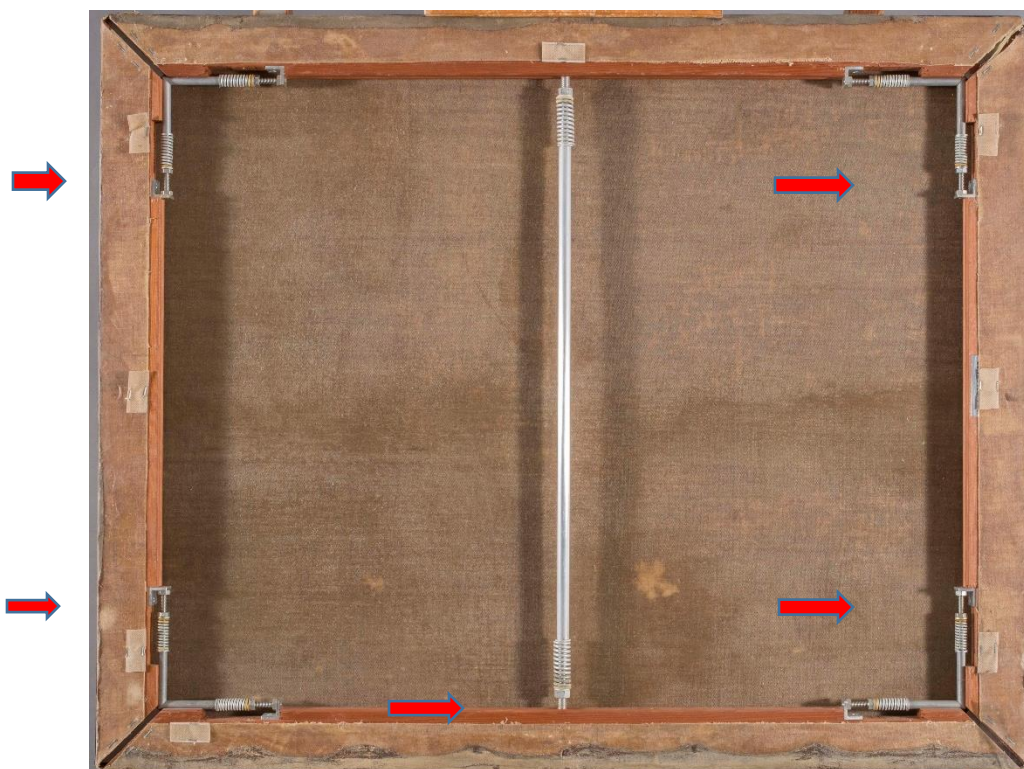


Fig. 3. Areas to be sawed labelled in red

- 3) The hardware can be cleaned to remove the corrosion. It can be vacuumed with a HEPA filter vacuum and then wiped down with damp rags and a detergent designed to pick up heavy metals. This should be done while wearing appropriate PPE.

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- 4) The fourth option is to put a backing board on the piece, tape the edges of the board to the back of the stretcher, and put a warning label on the backing board. This is the quickest, but also least effective option for the long term. The problem here, as Sobol and Shugar note, is that this creates a sealed microclimate with the wood stretcher, possibly increasing the rate of corrosion.

If you undertake options 1 or 2, the metal hardware must be disposed of properly by a licensed HAZMAT service.

If you have questions or need additional information, please contact ICA paintings conservators Wendy Partridge, wpartridge@ica-artconservation.org Andrea Chevalier, achevalier@ica-artconservation.org

Additional information on addressing cadmium corrosion on historic artifacts can be found in a poster produced by conservators at the Smithsonian National Air and Space Museum: <https://airandspace.si.edu/multimedia-gallery/conservation-poster-cadmium-plating-scientific-and-technological-collections>