

Title: Stress Corrosion Cracking in "Lead Free" Brass - Technical or Political Root Cause?

Abstract: "The effort to reduce lead in the water supply by the Federal Safe Drinking Water Act of 1974 resulted in a search for brasses without lead for use in plumbing components. California Law AB1953 eliminated the use of leaded brasses in California in 2010. Many states followed California's law. C360 is a leaded brass that had been the standard for plumbing components for many decades. "Lead free" C693 silicon brass is an alternative. Failure analysis of a plumbing component fabricated from C693 "lead-free" silicon brass revealed the failure mechanism to be stress corrosion cracking (SCC). The root cause was a high level of residual stresses from the fabrication of the raw material hex bar. Contributing causes included microstructural variation and banding throughout the thickness of the plumbing component. This presentation will also discuss the latent root cause of the political environment to remove C360 brass without proper technical justification and its effects on the brass industry.

Biography: Dr. Dennies is a licensed metallurgical professional engineer in the state of California. He has 48 years of experience working in various raw material, forging, aerospace, and aircraft-related industries with the last 16 years as a consultant. His industry roles have included working as a technical specialist supporting design, manufacturing and research, technical manager, and program manager. His academic credentials include B.S. and M.S. degrees in metallurgical engineering, an MBA, and a Ph.D. in materials science. Dr. Dennies' passion is for failure analysis, and he is an internationally recognized expert in the field. He finished a long career with Boeing as a Technical Fellow in failure analysis and metallurgy supporting programs across nearly every Boeing facility in the U.S. As an active member of ASM for 50 years, Dr. Dennies served on the ASM Board trustee in 2006 to 2009 and was an ASM Education Foundation trustee in 2004 to 2006 where he championed the Materials Camp program. He participated in over 50 Materials Camps over 20 years including the first Materials Camp. He has been an instructor and developer of ASM courses for 24 years. He was recently the President of the International Metallographic and the Failure Analysis Society affiliate societies. Dr. Dennies was a handbook editor/contributor to the ASM Handbooks on Failure Analysis Volume 11 and 11A published in 2021. He has served on 13 different ASM national journals, committees, and councils. Dr. Dennies has been on the LA Chapter's executive committee for over 30 years and he was a leader in commemorating his chapter's 100-year anniversary. Dr. Dennies has earned numerous ASM technical and volunteer awards over the years including the William Hunt Eisenman award in 2024, Journal of Failure Analysis and Prevention Editor's Choice Article award in 2021, George Roberts award in 2011, Journal of Failure Analysis and Prevention Best Paper Award in 2010, Prestigious Engineering Achievement Award by

Orange County Engineering Council in 2005, Allan Ray Putnam award in 2004, ASM Fellow in 2002, and the ASM Instructor of Merit award in 2002.