

# Study shows brass devices in plumbing systems can create serious lead-in-water problems

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A new research study co-spearheaded by Virginia Tech researchers highlights problems with some brass products in plumbing systems that can leach high levels of lead into drinking water, even in brand new buildings – and suggests that such problems may often go undetected.

Lead is heavy metal that can harm the nervous system and brain development, and is especially dangerous for pregnant women, infants and children.

The study, published in the November 2010 issue of the *Journal of the American [Water Works Association](#)*, is the result of collaborative research between the University of North Carolina at Chapel Hill and Virginia Tech.

The research was conducted by Carolyn Elfland, associate vice chancellor for campus services at Chapel Hill, along with Marc Edwards, the Charles Lunsford Professor of Civil Engineering, and Paolo Scardina, assistant professor of practice, both at the Virginia Tech Charles E. Via Department of Civil and Environmental Engineering.

The collaboration started in early 2007, when Chapel Hill discovered high lead in water in new buildings and asked Virginia Tech to assist in diagnosing and remedying the problem. The team developed a flushing protocol, which aims to ensure that before buildings are occupied, new

faucets and water fountains met the Environmental Protection Agency's Lead and Copper Rule of less than 15 micrograms of lead per liter of water, or 15 parts per billion.

The researchers also determined that switching to plumbing devices that meet specifications required under California law, which is stricter than federal regulations, would not solve the problem.

In mid-2008, an unusually severe problem arose with two drinking fountains in a large new laboratory building, one of which had lead levels exceeding 300 parts per billion. Repeated attempts to flush the lead over several months and to use conventional remedial measures were unsuccessful.

The problem eventually was traced to a source in the building's piping system upstream of the water fountains. The cause was a particular type of ball valve and the problem disappeared when the valves were removed. The valves were later found to have as much as 18 percent lead by weight on the inner surfaces contacting the [drinking water](#). Later testing proved the valves would leach lead at levels high above the EPA standard for months.

The valves were considered legal, because their average overall lead content was just under the 8 percent limit allowed by law, and were listed as having passed the lead leaching standards of National Sanitation Foundation International, the plumbing device industry's national standard-setting body. While there have been other verified cases of brass devices such as faucets and water fountains at the end of plumbing lines leaching high lead to water, this situation is the first time that a device upstream in a plumbing line has been proven to leach dangerous levels of lead to drinking water that reached the tap.

It verified earlier research by Edwards, which expressed concern about

relatively lax standards testing used to certify brass devices for use in plumbing systems as safe. In response to that work, the National Sanitation Foundation implemented more rigorous criteria, which will come into effect in 2012. However, these tougher standards reflect the California standards, and the Chapel Hill-Virginia Tech research team's experience indicates that they probably are still too lax, the authors said.

Edwards, named a MacArthur Fellow in 2007, said the case highlighted concerns about high lead content in certain brass plumbing devices, and the need for a method of preventing the installation of defective products in new construction.

"The levels of lead detected at UNC exceeded those known to cause elevated blood lead in children, as established by the Centers for Disease Control, and even levels causing acute lead toxicity established by the Consumer Product Safety Commission," he said. "Thankfully, UNC's procedures caught the problem before anyone could be exposed to the high lead in water, but in most other cases the issue would go undetected. The fact that some defective products, listed as safe, could be installed in schools and day care centers and harm children is very troubling"

Chapel Hill's Elfland noted that high lead in water was first identified as a problem during the days of the Roman Empire, and that lead solder and lead pipes have been outlawed for decades.

"People have a right to expect that drinking water in brand new buildings will not be contaminated by lead, and building owners should not have to go the effort and expense UNC does to ensure that expectation is met," she said "In my opinion, this is a major regulatory failure."

The Chapel Hill-Virginia Tech team's research demonstrated that the higher cost of devices that are truly "lead free" would end up saving money. Chapel Hill's standard pre-occupancy flushing protocol adds \$49

to \$91, or between 24 percent to 45 percent, to the cost of every fixture, Elfland said. The total cost of finding and replacing the problematic valves in the plumbing system was \$30,000, if the salaries of all the people who worked on the problem were included. The valves originally cost less than \$20 each.

Earlier this fall, a U.S. Senate bill to lower the allowable amount of lead in brass plumbing devices from 8 percent to a weighted average of 0.25 percent was introduced by Sen. Barbara Boxer (D-Calif.), chairwoman of the Senate Environment and Public Works Committee. "The bottom line is that there is no safe level of [lead](#) – a toxic heavy metal – in our drinking water," Boxer said in a news release at the bill's introduction.

**More information:** Journal website:

[www.awwa.org/publications/JournalCurrent.cfm](http://www.awwa.org/publications/JournalCurrent.cfm)

Provided by Virginia Tech

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