

# Pipe Lining

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Blown epoxy pipe lining is a technology which originated in Germany but gained popularity in North America in about 2000 as a less intrusive process to address pinhole leaks and extend the expected life expectancy of domestic water piping in residential high-rise buildings.

Epoxy was typically used to line domestic hot water (DHW) pipes that had reached the end of their service life and were experiencing pinhole leaks. The process was intended to line the interior surface of the piping system with a thin layer of epoxy, filling any pinholes and eroded areas and providing a microscopically smooth inner surface to promote a more laminar flow of water.

The use of epoxy lining was typically limited to the hot water piping. Hot water piping is subject to earlier deterioration than cold water because hot water systems recirculate (so the water is always flowing) and because corrosion rates are higher at higher temperatures.

While the specific materials and processes used to apply the lining vary, a typical lining process consisted of:

- Cleaning the interior of the pipe to remove mineral scale and expose the bare copper metal;
- Drying the interior surface of the prepared pipe;
- Introducing mixed liquid epoxy to the pipe; and
- Blowing air through the pipe to force the liquid epoxy against the walls of the pipe along its length.

Successful application of the lining required that the liquid epoxy adheres to the interior surface of the pipe. Any variation in the conditions within the pipe during application can interfere with the adhesion, notably any residue (wet or dry) from the cleaning process. Poor cleaning could also impact adhesion if the scale was not fully removed.

Companies who applied these epoxy lining products claimed that it would extend the life of the domestic water system by 50 or more years. Unfortunately, many buildings are starting to experience breakdown of the lining material around the 10-12 year mark.

While some sections of pipe appear to have good adhesion and a consistent layer of epoxy, others have loosely adhered areas of lining material which peel off. Smaller pieces and sediment travel through the system to individual fixtures, where they can clog faucet aerators and cartridges, shower heads, dishwashers, and laundry valves. Over time the deterioration continues and larger pieces of lining create blockages at

restrictions such as tee fittings, shut-off valves, and even the riser pipes themselves. This results in hot water flow and pressure problems which affect multiple suites.

In the early stages, clearing the epoxy debris from the DHW system can be handled via local repairs by the building's plumber. However, a water shutdown is usually needed to repair a blockage and this often creates a cascade of issues elsewhere in the system.

In our experience, the degradation of the epoxy lining will accelerate over time due to both continued exposure to DHW, as well as increasingly turbulent flow as pieces of epoxy detach, disrupting the relatively smooth inner surface of the lining. The frequency and severity of the DHW system blockages will continue to increase eventually requiring a complete domestic piping replacement.

While the lining materials would have needed to have been certified to NSF Standard 61 (for potable water), this certification would have been as a protective barrier material. The health effects of significant quantities of lining material suspended in potable water would not have been tested as part of this certification and are of concern to building residents.

The potential for lining deterioration resulting in lining particles in a building's potable water supply is considered to represent a significant risk to both domestic water system operation and water quality, which requires immediate action. Epoxy pipe lining is an irreversible process. In any case, even if it were possible to remove the lining, we know that the underlying pipes were approaching the end of their lifespan prior to the lining, so full pipe replacement is the appropriate remedy.

If you have epoxy lining in your domestic hot water piping, even if you are not yet experiencing any problems yet, we recommend monitoring closely for evidence of debris in tap aerators. We also recommend installing a strainer upstream of your recirculating pump to permit your plumber to monitor for accumulating debris. You should also contact a mechanical engineer to get expert advice on how best to proceed. Lastly, you should be sure to notify your reserve fund study provider so they can plan accordingly at your next update.