

GREEN SHEET

Some of Milwaukee's oldest buildings sit on wood pilings — which are at risk of rotting when water levels go down



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What's lurking beneath some of downtown Milwaukee's oldest buildings?

Some of the same stuff that used to be growing near where they stand.

A number of the buildings constructed downtown in the city's formative years and after — especially in East Town and the Third Ward — were built on top of wood pilings, many of which were sunk deep into marshy ground and surrounded by water.

The water part, it turns out, is key.

A reader asked What the Wisconsin? — the place at the Journal Sentinel where we take on questions large and small about our state, our communities and the people in them — about that: "Is it true that some buildings in downtown Milwaukee have wooden supports under them that have to be kept wet to avoid rotting?"

The answer is yes. But there's a little more to it than that.

The power of wood surrounded by water

Matt Jarosz, professor of architecture and the director of the Historic Preservation Institute at the University of Wisconsin-Milwaukee, explained that builders drive pilings deep into less-stable ground until they're unbudgeable (in engineering-speak, they're driven "to refusal"). A concrete pad, or pile cap, then rests on top of the pilings, forming a solid foundation.

It's a common building practice. And for years, those pilings were wood, because wood was cheap, plentiful — and, in the right conditions, sturdy.

Builders in Japan, for example, used wood pilings to make buildings' foundations less vulnerable to movement and collapse during an earthquake. (Today, Jarosz said, those wood pilings are being replaced with springs and rubber gaskets, "for more absorptive-type construction.")

In cities built on waterways like Milwaukee, wood pilings were driven deep into ground that formerly was swampland. The pilings can remain strong for a long time, Jarosz said — because of the water.

“As long as the water is consistent on those piers, wood can last. ... There are wood piles (lasting) 2,000 years,” he said. “They can last for a long, long time because of the consistency of that water being on the wood. As soon as that deviates, as soon as you start getting changes in the water levels, then you introduce oxygen — *then* you have deterioration problems.”

Lake levels drop, rotting begins

In downtown Milwaukee, much of the land south of Michigan Street, especially east of the Milwaukee River, was tamarack swamps that were filled in with dirt and gravel excavated for developments just to the north. So buildings constructed there required the support of those wood pilings.

And at the time, the wood for those pilings was in abundance, right nearby.

"In this area, back then, the 1850s, '60s, '70s, they had more old-growth timber than they knew what to do with ... ," Jarosz said. "They probably got some of this old-growth timber from Whitefish Bay."

And for decades that worked fine — so long as the water levels didn't drop.

Unfortunately, they have.

In 1923, A.C. Clas, of the Milwaukee architectural firm Clas, Shepherd & Clas, did a survey of pile foundations in downtown Milwaukee, and, according to Journal Sentinel archives, found several major buildings with rotting pilings, including Boston Store at what is now Phillips Avenue and Wisconsin Avenue, and the Bijou Theater on Second Street south of Wisconsin Avenue.

More than four years later, the Pabst Theater closed for several weeks for foundation repairs after a drop in the water level in Lake Michigan helped expose wood pilings and contributed to dry rot underneath the ornate theater.

In 1988, a drop in lake levels resulting from the summer's drought sent the downtown water table lower again, exposing pilings under the Pabst and a slew of other buildings. Two historic buildings at 525 and 529 N. Broadway were torn down after their pilings, exposed by the lack of water, rotted and made the structures "twist and sink," an official in the city Department of Building Inspection told the Milwaukee Sentinel.

At that time, STS Consultants, the company working with the Milwaukee Metropolitan Sewerage District, said the MMSD's deep tunnel construction project — the \$1 billion-plus tunnel system dug 300 feet below the surface to help limit wastewater overflows — was not connected to the water table.

But by 1991, MMSD had spent nearly \$1 million to repair and prevent damage to buildings affected by the decline in the water table along the route of the deep-tunnel project.

The impact of rotting pilings beneath downtown buildings continued for years, even after MMSD started pumping water underground to bring levels back up.

In one of the more high-profile instances, the Milwaukee Repertory Theater's home, a former power plant on Wells Street at the Milwaukee River, faced nearly \$2 million in repairs in 2014 because it had to shore up its sinking foundation, including installing a water recharging system to keep the remaining wood pilings under water.

Solutions to rotting wood pilings

To prevent damage to the 146-year-old Mitchell Building, 207 E. Michigan St., the owners replaced some of the five-story office building's old wooden pilings with concrete ones. For the others, Jarosz said, they installed a watering system that ensures the wood stays wet and doesn't get exposed to oxygen.

"They collect 'brown' water — it's not potable water — on the top of the building, and they send it down so that some of the areas that still have the wood piles have constant watering," he said.

"They have monitors to make sure the water is at the right height. They ensure you're not exposing the remaining wood piles, and they're kind of an environmentally good thing, too. So instead of dumping that (water) into the deep tunnel or into the river, you're recycling brown water."

Developers don't use wood pilings anymore for environmental reasons, and because of the shortage of strong, old-growth trees that were plentiful more than a century ago.

It's not to say wood wouldn't do the job today. There are a number of smaller, older buildings in Milwaukee still being held firm by such pilings.

"The wood piles are fine," Jarosz said. "Just don't change the water level."

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