Age-old Industry

History of sheet piling traces industry's origins

By Heather Hudson

Historians tell us we can't know where we're going unless we know where we've come from. And if you're in the North American piling industry, your roots are in the sheet piling business.

According to Scott Whitaker, who built a 44-year career in sheet piling, understanding the past is not exactly necessary for operating in the here and now, but it certainly helps put the industry into context. And though it isn't a huge segment of piling, it has always had its share of usage.

"The domestic sheet piling market is not large – perhaps in the range of 250,000 to 350,000 tons a year. This compares to a structural shapes market of several million tons a year," says Whitaker.

"Two mini-mills are currently producing sheet piling in the U.S. – Gerdau and NucorYamato – yet there is an adequate supply of domestically produced sheet piling."

Steel titan Bethlehem Steel hired Whitaker in 1967 when he was teaching at Drexel Institute of Technology. He worked with the company as a piling product consultant until September 2001. Since February 2002, he has been a sheet piling consultant with Gerdau Ameristeel.

In the same way we tip our hats to the innovators that came before us, with the help of Whitaker, we're honoring what is a technical marvel in the world of engineering and construction.

What is sheet piling?

Sheet piling is a structural shape with interlocks on its flange tips. Individual sections can be joined together and driven to form a continuous wall, which is earth-tight and water resistant.

One of the earliest forms of piling, it was first recognized by engineers in the U.S. as a safe, efficient and reliable tool in subaqueous construction in the early 1900s. Originally invented to replace wooden sheeting, its use was quickly extended to many other building constructions.

Carnegie Steel Company was the first in North America to begin rolling sheet piling. Their section had a web with a large circular socket at one end and a "wedge" at the other end – considered quite a feat at the time. The sections interlocked and functioned as a continuous wall, but with little beam strength.

Every producer has its own line of sections, which differs from structural shapes where mills roll sections as listed by the American Institute of Steel Construction (AISC). Traditionally, America is a ball and socket and Z-Piling market while Europe (and the rest of the world) is a Larssen interlock and "U" piling market.

All the different profiles may be broken into two groups based on end use.

Type 1 – The first end use is comprised of the majority of sheet piling profiles; Whitaker estimates up to 90 per cent of the market. It is used for beam strength for straight walls, which would normally be braced or tied-back but could also be cantilevered.

Type 2 – Profiles used for interlock strength (tension) make up the second end use. In this application, the sheet piling is set and driven in circular cells, which are filled with granular material. The fill pushes out against the sheets and places them in tension. The soil's effort to separate the sheets is resisted by the interlocks going into tension. The cells could be individual structures, such as pier protection cells or a series of cells inter-connected with sheet piling arcs. The end use could be structures such as cellular bulkheads and cofferdams.

Steel sheet piling is available to ASTM Standards with yield points ranging from 39 ksi (39,000 psi) to 60 ksi (60,000 psi).

History of sheet piling in America

1904 – Carnegie Steel Company begins rolling sheet piling.
1906 – Lackawanna Steel Company begins sheet piling production in Lackawanna, NY. They invented the "Lackawanna Interlock" (thumb and finger), which remains the interlock of choice by all producers of flat-web sheet piling today.
1908 – Lackawanna supplies the piling to build the largest steel sheet piling project on record: a cofferdam (temporary structure) to construct the ship lock at Black Rock Harbor in Buffalo, NY.
1922 – Bethlehem Steel buys Lackawanna Steel Company.
1926 – Carnegie Steel introduces new sections, their first since 1904.
1927 – L.B. Foster Company, founded in 1902, expands its product line by becoming a sheet piling distributor.
1928 – Piene (Germany) introduces the Combination Wall, also referred to as a King Pile or HZ system. Interlocking structural shapes and sheet piling together results in walls with large beam strengths.
1932 – Domestic producers (Bethlehem, USS, Inland, J&L and Weirton) begin efforts to standardize sheet piling sections.
1969 – Bethlehem introduces high strength interlock (28 kips/in.) section SP7b (flat-web section) with a section width of 15¼ inches. This was the first "new" domestic section since 1950.
1970 – Inland Steel, J&L and Weirton depart the sheet piling market, leaving USS and Bethlehem as the remaining domestic producers of hot-rolled sheet piling.
1971 – USS introduces a 28 kip/in. section (MP103) with a 16½ in. width. The increased width, along with erratic interlock strengths, puts Bethlehem out of the high strength interlock market.
1977 – Bethlehem discontinues production of sheet piling in Lackawanna, NY.
1980 – Bethlehem resumes production of sheet piling in Bethlehem, PA.
1984 – USS discontinues the production of sheet piling.
1997 – Bethlehem Steel discontinues the production of sheet piling and structural shapes. There are now no domestic producers of hot-rolled sheet piling.
1998 – TXI Chaparral (now Gerdau) begins rolling flat web sections (PS27.5/31) in Midlothian, TX. They expand production to roll the Bethlehem Steel line-up of PZ sections and introduce new and more efficient Z-Piling sections to replace the Bethlehem series.

Whitaker says while the ball and socket interlock remains the same, sheet piling sections and pile driving equipment have evolved dramatically over the years.

"One of main problems in this country with sheet piling is it's looked upon as a temporary product used to construct something else rather than a permanent structure."

While that might be the case, with its reliable and innovative design, sheet piling certainly has a rightful place in American industrial history. ▽

Photo courtesy of Scott Whitaker