

Case History

Permanent Basement Walls with Pressed-in Sheet Piles in Portland, Oregon, U.S.A.

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Steel sheet piles are utilized as temporary as well as permanent earth retaining elements. As a matter of fact, a sheet pile wall can be designed and built to function in both ways to achieve faster construction with lower project cost. Some of the new multi-unit residential and office buildings in the U.S. are built with sheet pile basement walls instead of more-typical concrete-based walls, such as diaphragm and secant pile walls. Sheet pile basement walls come with the following advantages in many cases.

- Simpler design and construction with a choice of a cantilevered, braced, or anchored wall.
- More flexible choice for a basement construction sequence among top-down, bottom-up, or hybrid of both.
- Narrower wall footprint, i.e., larger inner space of a basement. See Fig. 1.
- Can be designed to bear vertical loads, which likely reduce the size or the number of vertical load-carrying columns.
- Can achieve watertightness with sealing or welding of interlocks.

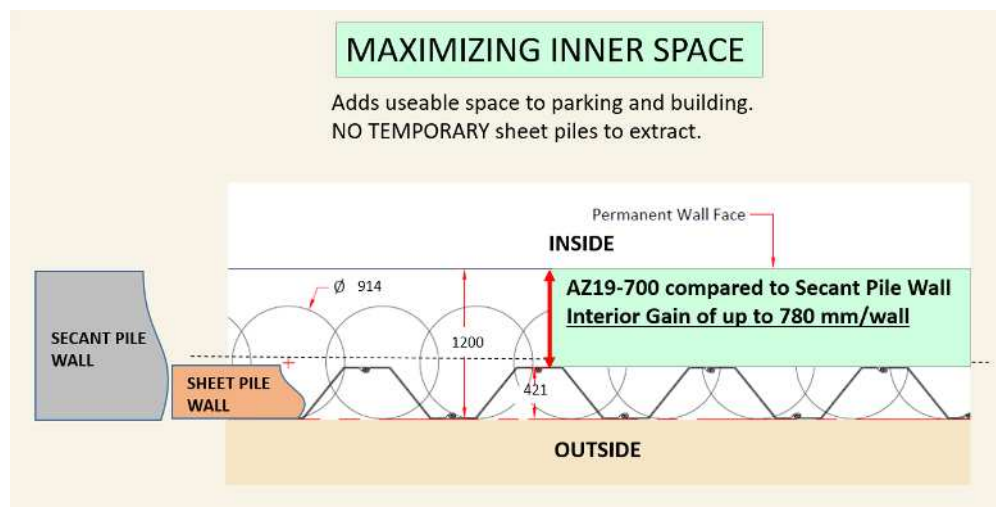


Fig. 1. Larger inner space with sheet pile wall than with secant pile wall
(Base drawing: Nucor Skyline)

Fire resistance should be attained with intumescent paint coating or placement of insulating panels, curtain walls, or concrete. Some sheet piles have been tested to meet applicable codes and standards.

A large-scale urban redevelopment project in Portland, Oregon in the U.S.A. took advantage of the sheet pile wall basement structure with the footprint of 140m x 61m. The 2018 project built 380 apartment units, 1,900m² of ground level retail space, and two levels of underground parking structures for 602 parking spaces on two city blocks. See Fig. 2 for an architect's rendering of one of the buildings. Due to its proximity to nearby buildings, a tight installation tolerance, and hard soil conditions with gravel and cobbles below a certain depth, press-in piling with an auger attachment was adopted as shown in Fig. 3. Excavation followed press-in piling as shown in Fig. 4 and tie-backs were installed for further excavation. Fig. 5 shows a basement garage with sheet pile walls of a different project as an example.

ArcelorMittal provides reference materials on this type of underground structure at the following link.
<https://sheetpiling.arcelormittal.com/applications/underground-car-parks/>

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Fig. 2. Architect's rendering of Conway Block 294E Building in Portland, Oregon
(<https://cairnpacific.com/block-2945-e>)



Fig. 3. Press-in piling with auger attachment
(Photo: Blue Iron Foundations and Shoring LLC)



Fig. 4. Press-in piling (far right) followed by excavation
(Photo: Blue Iron Foundations and Shoring LLC)



Fig. 5. Example of completed basement with sheet piles (different project)