

RECONSTRUCTION OF SEAWALL ABUTTING A HEAVILY TRAVELED COASTAL HIGHWAY WITHOUT SUSPENSION OF TRAFFIC WITH PRESSED-IN PIPE PILE WALLS

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BACKGROUND

National Route 134 of Japan is a scenic coastal highway about 30 miles southwest of downtown Tokyo. Its highly traveled two lane section in the ancient capital city of Kamakura (1.4 km, i.e., 0.85 miles long) is sandwiched by a sandy ocean beach on the south side and a narrow gauge railroad or rock outcrop on the north side. The 50-year old concrete seawall abutting the highway above suffered scour and settlement from a typhoon-caused storm surge in the past with the rest of the seawall also showing heavy deterioration.

PROJECT

The government's highway agency planned to add a turning lane at a couple of intersections to mitigate chronic traffic jams as well as to reconstruct the functionally obsolete earth retaining concrete seawall. The pipe piles were pressed into the existing concrete wall to create a new self-standing seawall prior to demolishing and removing the existing wall so it would not require lane closure or major detouring during construction. The roadway was widened towards the ocean to create room for the new turning lane at and near two intersections.

PRESS-IN PILING METHOD

The press-in piling is a method used to drive piles with hydraulic force by holding onto already driven piles. Due to the way it is designed, press-in piling equipment only emits low noise and practically no vibration. With this method pipe piles are normally rotated and simultaneously pressed into the ground with a cutting shoe welded at the toe of each pile, which can cut hard soil and existing concrete structures and install the piles in them. When the access to the piling location is limited, auxiliary equipment may be adopted to deliver, pitch and drive piles all from the top of already driven piles as exemplified on this project. See Figure 1 for the schematics of this systemized equipment group.

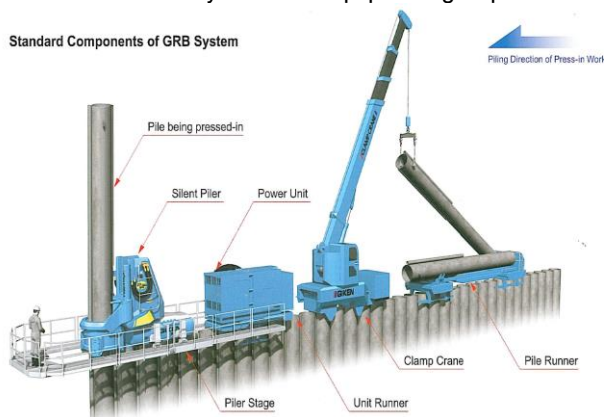


Figure 1 - Press-in Pile Driver, Clamp Crane and Pile Runner Operating on Already Driven Piles

BEACH RESTORATION

Although highway widening for the turning lane reduced

the beach area by 1,660 square meters (17,800 square feet), the new vertical pipe pile seawall allowed removal of the slope portion of the existing concrete seawall, increasing the beach area by 723 square meters (7,770 square feet). The native vegetation on the beach was carefully monitored and restored during and after the construction.



Figure 2 - Reconstructed Section of Seawall of Route 134 in Kamakura, Japan

CONCLUSION

Utilizing pressed-in pipe pile walls is a highly effective reconstruction and retrofitting method for a deteriorating concrete seawall especially with limited access as exemplified by the Route 134 Seawall Project. With the sea level rising, this construction method will benefit many more coastal seawall projects to come in the future.

REFERENCES

White, Finlay, Bolton, and Bearss (2002), "Press-in Piling: Ground Vibration and Noise During Piling Installation", ASCE Special Publication 116

Takuma, Nishimura, and Kambe (2016), "Aseismic and Anti-tsunami Seawalls and Port Structures", Proceedings of Ports 2016, the 14th Triennial International Conference, ASCE COPRI