NUCOR® SKYLINE

CASE STUDY

Dadeland

Miami, Florida

Dadeland is located in Miami, Florida, USA. The contract to build the $170 million "Downtown Dadeland" project, a mixed-use reurbanization development located on North Kendall Drive across from the upmarket Dadeland mall, was awarded to local general contractor Miller & Solomon. The 323,000 ft^2 landmark project in South Florida is a "village within a city" including 416 condominium residences, an 123,785 ft^2 retail area, and a large underground parking garage for 970 cars, all forming seven low-rise buildings. The project was completed in the spring of 2005.

The project got underway in early 2004 with local contractor Ebsary Foundation appointed as sub-contractor for the foundation work, including sheet pile installation. The contractor's extensive experience with foundation projects in the highly variable soil strata of South Florida proved invaluable.

Geological investigations of the downtown Dadeland site were carried out by Miami-based geotechnical consultant, Kaderabek Company. Water was encountered 9.8 feet below ground within the 13 ft. thick to layer of soil, a Miami limestone characterized by SPT values ranging from 30 to 50 blows per 30 cm penetration of the measuring tool. Beneath the Miami limestone, 9.8 ft of loose sand (SPT tests: 10-20 blows) overlie dense limestone and sandstone where the SPT tests reached 100 blows. South Florida's hard stone layers in conjunction with the high water table often rendered previous below-grade construction expensive and time-consuming.

A "bottom-up" sheet pile solution was chosen for the project in place of conventional temporary excavation support and an in-situ concrete wall because of the significant cost and schedule savings it induced. Sheet piles used as permanent retaining elements considerably simplified the construction process. The separate foundation system consisting of concrete bearing columns for the seven, seven-story buildings was built first. The sheet piles of the retaining wall for the 24.6-ft-deep excavation for the two-level underground parking garage had to be driven through the limestone to reach the design elevation.

Nucor Skyline provided a complete foundation package including design recommendations, specifications of sheet pile sections and on-site guidance for the construction team. The innovative solution involved using steel sheet piles as permanent retaining elements, once excavation was completed and as temporary separation walls, as the site was divided into a number of construction bays. Subdivision into

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PROJECT PARTNERS

Owner
Gulfside Development
Miami, FL

General Contractor
Miller & Solomon, Ebsary Foundation
Miami, FL

Designer
CEC Consultants
Naples, FL

PRODUCTS

Z-shaped Sheet Piles
A572 Grade 50
29.5 ft length

several sections reduced the concrete pour for the bottom slab into manageable sizes.

Some 3,307 tons of steel sheet piles were installed with a crane-mounted vibratory hammer, using a single-level template for guidance. About half the piles remained in the ground at the end of construction as the permanent outer wall of the basement structure.

29.5-ft-long Z-shaped sheet piles with a web/flange thickness of 0.48/.51 in. were chosen to ensure penetration through the hard soil layers to the depth required by the design. An H-pile fitted with a driving shoe was driven ahead of the line of sheet piles to fragment the limestone, enabling the sheet piles to be driven without damage.

Once pile driving was complete, formwork was placed at the heads of the sheet piles and a concrete cap poured. The capping beam incorporated temporary ground anchors that had been drilled through the sheet piles to provide temporary support until the floor slabs were cast. The interior of the first bay was then excavated to El. -24.6 ft. Divers inspected and, where required, cleaned the sheet piles at the bottom of the excavation to ensure proper connection with the bottom slab. Underwater concrete was tremied to create a 3.9-ft-thick slab that provided the seal needed for construction to begin with a dry excavation.

The sheet piles, which came under pressure as the water was drawn down, were pressed against the concrete, effectively sealing off water from below, trying to seep through the concrete-to-steel interface.

The middle interlocks of the Z-shaped double piles had been welded prior to installation. Once groundwater was pumped out, the remaining interlocks were seal-welded. When the sealing was completed, the piles serving as permanent walls were cleaned and an aesthetic coating was applied. The requirements for life expectancy and those resulting from fire analysis were easily met by the exposed sheet pile solution.