



The Willows Senior Apartments Lebanon, PA

UNITED STATES



Owner
Beneficial Communities

Engineer
Mactec Engineering and Consulting, Inc.

General contractor
Summit Contractors, Inc

Dates of work
2004/12 2005/01

Main figures

Controlled Modulus Columns (CMC)TM
515 EA.



Description

The Willows Senior Apartments is a three-story apartment building in Lebanon, Pennsylvania constructed on a site with very soft fill comprised of mine tailings and industrial sludge. The building was designed with no basement and uses a post-tensioned waffle slab-on-grade over a footprint area of 38,000 sq ft. The loads imposed from the structure would have created total and differential settlements detrimental to the service life of the building. Menard was hired to develop a ground improvement solution that would keep settlement to within project specifications and to ensure the soundness of the building subgrade.

A comprehensive geotechnical analysis was performed to better understand the engineering properties of the underlying soils. Upon review, Menard developed a design-build Controlled Modulus Column (CMC)TM rigid inclusion solution that met project requirements and saved the client time and money.

Ground conditions

Standard penetration values for the sludge layer ranged from 2 to 4 blows per foot. The 45-foot layer consisted of very soft to soft moist grey silt-like material. The sludge was underlain by stiff to very stiff inorganic clays of high plasticity and sandy clays with blow counts ranging from 12 to 15 blows per foot.

Solution

A comprehensive Finite Element Analysis was used to model the improved soils, load transfer platform (LTP), and to predict the long-term performance of the Menard design.

Plaxis models were developed to predict the settlement behavior of the CMC rigid inclusion system. The system was based on a uniform loading of 250 psf under the slab and keeping total and differential settlements within project requirements. Menard proposed a CMC rigid Inclusion system utilizing an LTP to distribute the structure load to each of the CMC rigid inclusion elements. An appropriate grid was used to adequately support the loads and distribute them to the ground improvement elements.

This solution saved the owner more than \$500,000 over other potential techniques that are used for these ground conditions. Construction was completed in less than three weeks saving the client significant time as well.

To prevent settlement and extend the service life of senior apartments built on soft ground, Menard developed a ground improvement solution using CMC rigid inclusions that met project requirements and saved the client time and money.

