



## Willows Senior Apartments

Lebanon, PA



*Menard installed Controlled Modulus Columns to improve the ground at a site with very soft fill.*

***To prevent settlement and extend the service life of senior apartments built on soft ground, Menard developed a ground improvement solution using Controlled Modulus Columns™ (CMCs) that met project requirements and saved the client time and money.***

### Project Summary

The Willows Senior Apartments is a 3-story apartment building 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 square feet. 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) 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. The 45 foot layer consisted of very soft to soft moist gray 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.

### Ground Improvement Solution

A comprehensive Finite Element Analysis was used to model the improved soils and transfer platform and to predict the long term performance of the Menard design. Plaxis models were developed to predict the settlement behavior of the CMC system. The CMC improvement design was based on a uniform loading of 250 psf under the slab and to keep total and differential settlements to within project requirements. Menard proposed a system utilizing a load transfer platform to distribute the structure load to each of the CMCs. An appropriate grid was used to adequately support the loads and distribute them to the CMC elements.

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

*Owner: Beneficial Communities  
General Contractor: Summit Contractors, Inc.  
Owner's Geotechnical Engineer: Mactec Engineering and Consulting, Inc.  
Ground Improvement Contractor: Menard*

### Menard

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