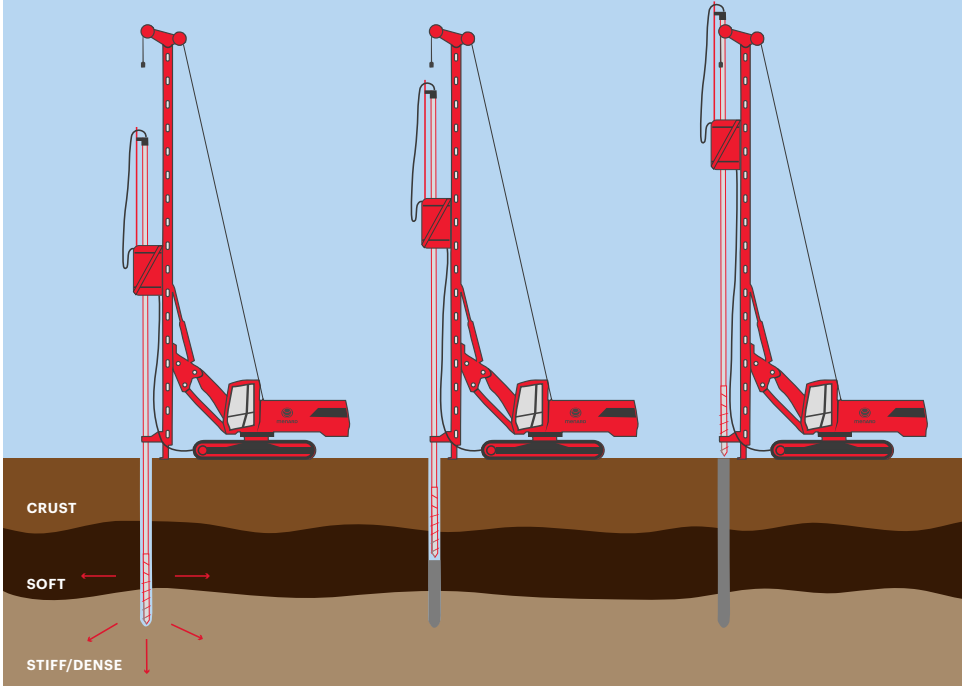


# Controlled Modulus Columns (CMCs)<sup>®</sup>



Controlled Modulus Columns (CMC)<sup>®</sup> are grouted columns formed using specially-designed tooling that displaces soil laterally, producing very little spoil. As the auger is extracted, a column of cement-based grout is formed.

## Advantages of CMCs include:

- Effective in very soft soils
- Can be installed to extremely deep depths
- High load carrying capability
- Only minimal spoils generated during installation
- Does not provide a pathway for groundwater contamination migration

Controlled Modulus Columns (CMCs)<sup>®</sup> are vertical, grouted elements that typically range in diameter from approximately 12 inches to 18 inches. CMCs were developed by Menard's French affiliate, Menard Soltraitement, in 1994. Since that time, with the industry-wide acceptance of CMCs, the technique is now commonly referred to as rigid inclusions.

## Installation

CMCs are usually installed with displacement-type drilling equipment but may sometimes be installed via a driven casing. With the displacement installation processes, the surrounding soils are displaced laterally, and only a minimal amount of spoil is generated.

The drilled-in elements are installed with virtually no vibration. CMCs may be installed in a grid pattern under uniformly loaded structures, but can also be installed in groupings to accommodate highly concentrated loads. CMCs are installed by advancing the tooling pipe to the target depth, retracting the tooling, and filling with cement-based grout as the tooling is retracted - grout is discharged at the base of the hollow tooling. CMCs have been installed to depths of over 150 feet.

## Applications

The combined effect of reinforcement and densification from the installation process improves the characteristics

of the ground resulting in a composite system. The load from the structure is distributed to the soil and CMCs, with the proportion of load carried by the soils depending on the stiffness of the soils - the stiffer the soil, the higher proportion of the stresses carried by the soil. Typically, a layer of compacted stone known as a Load Transfer Platform (LTP) is designed to span across the top of the CMCs to help distribute the load from the structure to the elements.

CMCs are well adapted to high surface loading conditions and strict settlement requirements and are used to support slabs-on-grade, foundations, embankments, and other structures on compressible clays, fills and organic soils.