Microplates

Earth Retention Systems And
Specialized Foundations

Schnabel
FOUNDATION COMPANY

New Construction, Seismic Retrofits, Structural Renovations

Micropiles

Clockwise from top: Drilling inside structures. Micropiles and underpinning support the Chicago Museum of Science and Industry. Drilling in difficult soils. Micropile transfer beams distribute the load in Woodstock, Connecticut.

Applications:

- *Seismic retrofit and settlement control*
- *Pile replacement and increased foundation capacity*
- *Low overhead conditions and congested sites*
- *Adding floors above or below grade*
- *Specialized retaining walls*
- *Underpinning and column pickup*

Advantages:

- *Applied where other piles would be costly or impossible*
- *Installed with small drills, with minimal noise and vibration*
- *Used in tension or compression to support loads or resist uplift and overturning*
- *Penetrates obstructions that other piles can not*
- *Installed inside existing structures*

Facility Expansion

During expansion of the baggage handling facility at Washington-Dulles International Airport in Virginia, micropiles were installed to transfer column loads to a deeper elevation and allow excavation below the terminal floor.

Definition

Micropiles are small diameter piles (12 inches or less) that are installed using specialized drilling methods. They carry very high loads despite their small size. Design loads up to 400 kips are routinely used, and ultimate capacities in excess of 1,000 kips have been obtained during load testing.

Micropiles are able to carry these high loads because they are heavily reinforced with steel casing and/or bars. They develop their capacity from drilling and grouting techniques that result in unusually high grout to ground bond values. Micropiles can be designed to function in compression or tension. They can be installed at almost any angle in lengths from 20 to 200 feet.

Application

Micropiles are often used in upgrades or renovations of hospitals, airports, factories, bridges, highways and historic buildings. They can be installed at a lower cost and with less disturbance, noise and vibration than driven piles or drilled shafts. They are installed using small drills, under low headroom conditions, inside structures, and on sites with limited access.

Micropiles are frequently used to increase the load carry capacity of existing structures, to control settlements, or during retrofitting to meet seismic standards. They are installed where other pile systems would be unable to penetrate obstructions cost effectively.

Limited Access and Difficult Drilling

Clockwise from top: Installing micropiles next to Children's Hospital in Philadelphia. Micropiles installed as soldier beams for excavation in difficult drilling conditions in Easley, South Carolina. Grouting micropiles. Micropiles used to support columns prior to excavation for a depressed railroad in Reno, Nevada.

Ground Conditions

Micropiles can be installed in any type of soil or rock. The type of ground will influence the load capacity, drilling method, grouting method, and settlement behavior of the micropile. Micropiles have been utilized in many challenging ground conditions including soft clays and silts, karst, bouldery ground, and open-jointed rock. They can be installed above or below the water table.

Design and Construction

Micropile design considers load capacity as well as settlement behavior under load. In other words, the micropile must be designed for both strength and stiffness. The objective is to carry the design load while ensuring that displacement is controlled to acceptable limits. This requires a detailed geotechnical analysis, consideration of the structure being supported, and careful selection and control of the installation and grouting process.

Construction begins with the drilling of a cased or uncased hole. The drilling method is determined by the ground conditions, capacity required, and site requirements. Once the hole is drilled, grout and reinforcing steel are placed. Finally, the micropile is connected to the structure. Each of the above tasks can be performed in many ways. Experience is critical in choosing the best method of installing a micropile for each project – expertise you'll find at Schnabel Foundation Company.

As a design-build contractor, Schnabel is uniquely qualified to provide engineering and construction services during every step in the process. Today's construction methods and testing

Renovation and Retrofitting

Micropiles were used to increase the capacity of existing timber pile foundations during the expansion of the historic Trinity Church in Boston, Massachusetts.

are extensions of technology developed by the tieback industry. Schnabel has been a leader and innovator in this industry since the 1960's.

Testing

Micropiles are often load tested to verify design assumptions and installation methods. The number of tests required for a given application will depend on the designer's level of experience with ground conditions and installation techniques. The load test may be either a compression or tension test.

Tension tests are the most economical. They are used to verify the bond stress used in design. Compression tests can be more difficult, since they require installation of reaction tiedowns. They also verify bond stress, as well as the structural capacity of the micropile cross-section in compression. The test load is a static axial load applied with a hydraulic jack. During the test, the micropile is incrementally loaded to the maximum test load, or until a predetermined displacement limit or creep threshold is reached.

Micropiles

Schnabel FOUNDATION COMPANY

www.schnabel.com

Schnabel Foundation Company is a nationwide contractor that designs and constructs earth retention systems and specialized foundations. Since 1959, Schnabel has constructed more than 4,000 projects in over 775 cities. Hundreds of these projects were repeat contracts with owners and general contractors.

Concentrating on earth retention systems, we have led the development of earth tiebacks and soil nails from their original application for temporary support to their routine use on permanent projects. Our engineering and craftsmanship has been recognized by numerous awards and citations for excellence.

Our unique blend of family pride, technological innovation, field experience, and engineering excellence consistently enables Schnabel Foundation Company to provide owners with economical solutions and quality work.

For more information contact one of our nationwide offices.

Schnabel
FOUNDATION COMPANY

45240 Business Court, Suite 250
Sterling, Virginia 20166

www.schnabel.com

Atlanta 770-971-6455 | *Boston* 508-303-3642 | *Chicago* 847-639-8900 | *Denver* 303-696-7268 | *Houston* 281-531-1103 | *Orlando* 407-566-0199 | *Philadelphia* 610-277-2950 | *San Francisco* 925-947-1881 | *Washington, D.C.* 301-657-3060