COST AND SAFETY FACTORS DRIVE,

ADVANCE BASIC CHANGES

IN

FOUNDATIONS

oundations—for buildings, bridges, highways, and other structures—seem so...well, fundamental that one might assume the techniques and materials for sound foundations are thoroughly settled and understood. In fact, though, in recent years a lot of changes have come over the systems that lie beneath construction. Though famously conservative, engineers are exploring and gradually accepting a wide variety of new approaches to the most basic of building tasks.

Industry observers say that two major trends drive the foundation market today. The first is the desire for quicker, easier, and cheaper foundation systems that nevertheless provide adequate support for the structures that depend on them. More designers and contractors are trying to avoid driving steel piles all the way down to bedrock, for example, but achiev-

ing the same results with less material and less labor heightens the need for engineers to be confident in the performance of the new systems. Hence the second market-shaping trend, the move to more testing, analysis, and verification of foundation technologies.

"The geotechnical community is increasingly interested in testing the capacity of both driven piles and drilled foundations," notes Gina Beim, P.E., senior consulting engineer for Pile Dynamics, Inc., in Cleveland, Ohio. As a result, the company's line of testing and measurement instruments is finding wide application. In particular, Beim notes the increasing use of drilled foundations and such relatively new foundation systems as micropiles. In general, drilled foundations are gaining market share, often in preference to driven piles, Beim says, but "since they have more

uncertainty about their integrity than driven piles, designers tend to specify them along with a quality assurance program."

The growing presence of new technologies in civil engineering environments, she adds, has led to such initiatives as load and resistance factor design (LRFD). The American Association of State Highway and Transportation Officials (AASHTO) has published a set of specifications for LRFD, and the Federal Highway Administration (FHWA) has joined AASHTO in seeking to have all new bridges after 2007 designed using LRFD. For Beim, LRFD reflects "a greater emphasis on testing" and a desire to design structures more efficiently based on an accurate appraisal of the performance of structural systems.

The FHWA reports that nearly all states are in the process of adopting the LRFD specification, working toward a deadline of October 1, 2007. Although LRFD specifically applies to bridges, its progress reflects a broader trend in the engineering community and among owners of major building projects. The goal of such initiatives as LRFD is to move away from a generations-old inclination to "overdesign" founda-

tion systems by specifying capacities and performance far in excess of what is really required. The potential savings in time and material are attractive, and moving toward such "leaner" design requires high confidence in the performance of the new systems being specified.

Often, Beim adds, clients want to test piles in a preconstruction program, then test multiple times as construction progresses. Recently developed testing instruments are compact and portable enough, she says, to be left on the job site and linked to the engineers' office by cell phone. "Whenever a pile test is scheduled the data [are] sent in real time to your office. You can 'see' everything that is going on during pile driving on your desktop computer. That really saves travel time and lowers the cost of pile testing."

This concern with frequent testing has grown hand in hand with the advent of micropiles and other new, lightweight foundation systems. (...)

Whether supporting expansions or shoring up structures in danger of failing, modern foundation tools and techniques are bringing greater efficiency, speed, and economy to a critical application area.