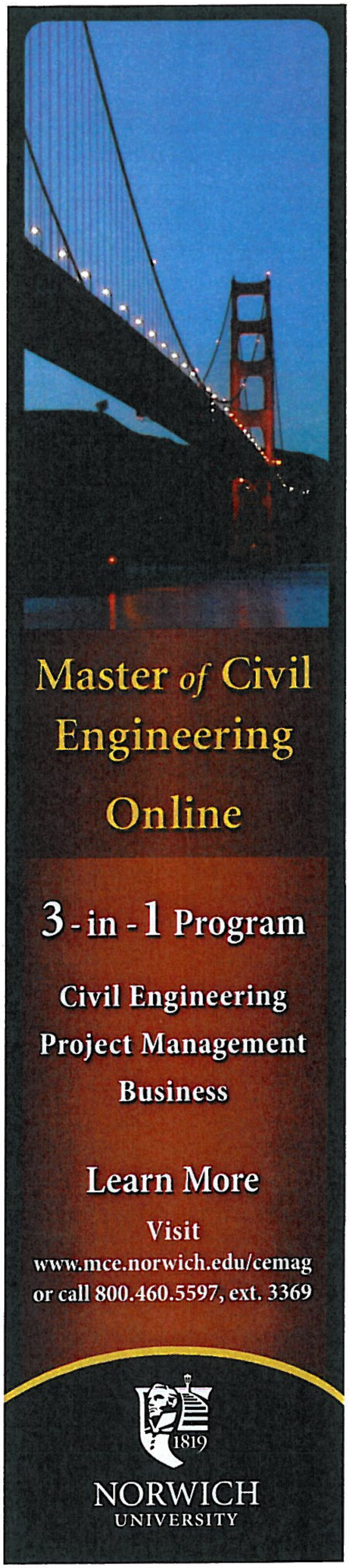

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and platinum (80 or more points). The rating systems for two other categories, namely, retail and health care, will be realigned at a later date, as will the rating system for homes.

Another key change for 2009 is the use of what are referred to as regional priority credits. These credits provide opportunities for a building or a project to earn additional points based on measures that are considered to be of particular importance to its region. "Project teams may select bonus points from a list of eligible credits driven by chapters, regional councils, and the LEED steering committee" within the U.S. Green Building Council, Katz says.

In addition to mastering the changes for 2009, design professionals will need to adjust to a new examination process. This process will now offer three levels, or tiers, of LEED accreditation, two more than the current single designation of LEED accredited professional (AP). The new tiers are green associate, AP+, and AP fellow, according to the Green Building Certification Institute, of Washington, D.C. The institute was established by the U.S. Green Building Council in 2008 to administer programs related to the accreditation of professionals in the building industry. (The institute also oversees the process by which buildings are certified under the LEED program.)

The first of the three tiers, that of green associate, "attests to demonstrated knowledge and skill in understanding and supporting green design, construction, and operations," according to a description provided by the Green Building Certification Institute. The AP+ designation "signifies an extraordinary depth of knowledge in green building practices and specialization" in one of five categories. Finally, the AP fellow designation is reserved for an "elite class of leading professionals who are distinguished by their years of experience and a peer review of their project portfolio," according to the institute's description.

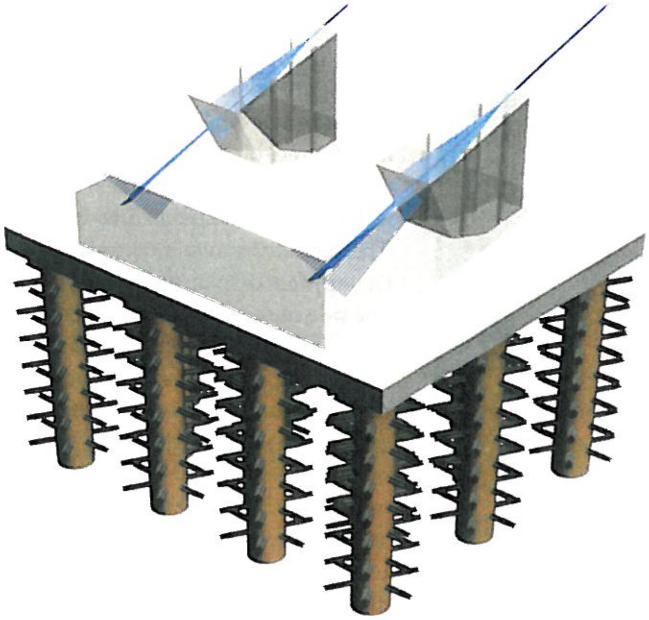
The new examination system is to be phased in during 2009. The first two exams—for green associate and for AP+ in the operations and maintenance category—are to be offered this spring after beta testing.

—JAY LANDERS

BRIDGES

'Rooted' Caissons Improve Vertical Bearing Capacity, Decrease Cost

ENGINEERS IN CHINA have developed a new type of caisson that is based, they say, on the "biological wisdom" embodied in trees. According to the designers, Y.G. Ying, a chief principal engineer, D.H. Sun, a deputy principal engineer, and F.C. Zhu, an engineer—all working in the bridge department of the Anhui Expressway Holding Corporation in Hefei, China—trees can grow taller than other plants because of their strong root systems. This knowledge suggested to the



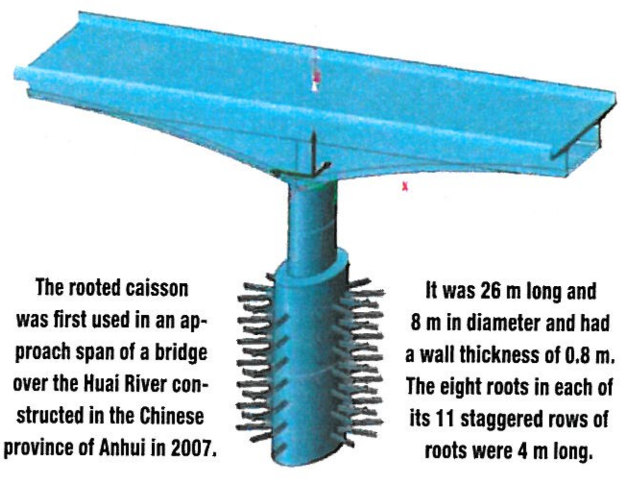
ANHUI EXPRESSWAY HOLDING CORPORATION, BOTH

The large anchor being considered for use in the bridge in Ma'anshan, China, includes 18 rooted caissons arranged in seven rows. A bearing platform measuring 71 by 59 m tops the caissons.

engineers that they could take advantage of the interaction between soil and structures by creating "roots" for caissons. Rows of these so-called roots, which extend outward from the caisson into the surrounding soil, are fitted to the caisson walls after the caisson has been sunk.

Because the roots used for the caissons are small in volume, they can be manufactured off-site and are relatively easy to install under a variety of conditions. Moreover, the quality of the finished product is reliable and the overall costs associated with caisson foundations can be lowered. Most important of all, the installation of the roots significantly increases the vertical bearing capacity of the caissons, the engineers say.

Six rooted caissons ranging in length from 38 to 50.5 m were recently constructed for the approach span of the bridge that crosses the Yangtze River in Ma'anshan, in



The rooted caisson was first used in an approach span of a bridge over the Huai River constructed in the Chinese province of Anhui in 2007. It was 26 m long and 8 m in diameter and had a wall thickness of 0.8 m. The eight roots in each of its 11 staggered rows of roots were 4 m long.

the province of Anhui. The two-span suspension bridge measures 1,080 m in length and includes three towers. The rooted caissons used to support the approach span were placed on one side of the river in an area where high underwater pressures and thick clay, loam, silt, and sand layers extending to a depth of more than 50 m complicated the bridge construction. An additional 18 rooted caissons are expected to be constructed to anchor the cables. These caissons will reach a depth of 54 m and will have an outer diameter of 6 m and an inner diameter of 4.4 m. A rectangular (71 by 59 m) bearing platform 8.5 m thick will be placed atop the caissons. The design concept is still being evaluated.

Each rooted caisson for the anchor cables will have 114 roots distributed in 19 rows, each root approximately 2.4 m long and 0.8 m in diameter. The roots are composed of a concrete and steel composite, and each is encased in a steel sleeve.

The engineers developed the rooted caisson system to avoid the time and costs that would have been incurred in constructing one of the approach span piers for a single-span bridge over the Huai River in Anhui that was built in 2007. In that project they established that, in comparison with the group pile foundation used elsewhere in the bridge, the rooted caisson foundation was 35 percent less expensive and took 25 percent less time to construct.

The rooted caisson in that case was 26 m deep and 8 m in diameter. With a wall thickness of 0.8 m and 11 staggered rows of roots, it was placed in the thick, soft alluvial lowland adjacent to the Huai. Each of the rows contained eight roots that were 4 m long.

To supplement the test version, a smaller rooted caisson was built for research purposes. The engineers established that the roots significantly increased the vertical bearing capacity

BUSINESS BRIEF

Freudenthal & Elkowitz Consulting Group, Inc., and Eschbacher VHB have merged, and the combined office has been named VHB Engineering, Surveying and Landscape Architecture, P.C. The office draws on the talents of more than 60 professionals and hopes to become the New York region's source for integrated transportation, land development, and environmental services. The office will operate as part of Vanasse Hangen Brustlin, Inc., a firm headquartered in Watertown, Massachusetts, that offers similar consulting services from 18 East Coast offices.

of the caisson, raising it by a factor of 2.24 compared with that of a rootless caisson. According to the engineers, with a vertical displacement at the top of the caisson of 8.22 mm, the rooted caisson offered a vertical bearing capacity of 34,676 kN, versus 15,481 kN offered by a rootless caisson. The horizontal bearing capacity of the rooted caisson also was greater than that of a traditional version.

Rooted caissons are constructed and sunk in sections. The sinking of the caissons is facilitated by the use of an air curtain, which is created by arrays of linked pipes precast into the concrete caisson walls. The pipes are filled with compressed air that is ejected around the caisson, producing an air curtain that by lessening the friction of the soil around the caisson wall enables the relatively light sections of caisson to sink easily under their own weight, Zhu explains. Water and flowable plastic silt also can be used to create negative pressure to sink the caissons.

The holes for the roots are predrilled into the caisson walls and covered with a six-layer waterproof seal, a feature that is particularly important in water-saturated soil. An internal permanent closure maintains the waterproof seal after the roots have been driven.

An adjustable 360 degree propelling platform was invented to drive the roots through the watertight seals in the sides of the caissons. According to the engineers, a symmetric liquid-propelled jack is used to push the roots through the waterproofing seals. Depending on the size of the roots, the soil overlay around the caisson, and the underwater pressure at the site, the procedure can take between 10 and 30 minutes for each root. Work starts with the bottom row and proceeds upward.

The foundation for the approach span of the bridge in Ma'anshan was completed in the autumn of 2008, and the detail design work for the bridge tower's foundation is currently in progress. Construction of the bridge is expected to be completed by 2013.

—CATHERINE A. CARDNO, PH.D.

BUSINESS BRIEF

Gannett Fleming, an international planning, design, and construction management firm headquartered in Camp Hill, Pennsylvania, has acquired Abrams-Cherwony & Associates, a public transportation consulting firm. The acquired firm will operate as the Abrams-Cherwony Business Unit in Gannett Fleming's Philadelphia office.