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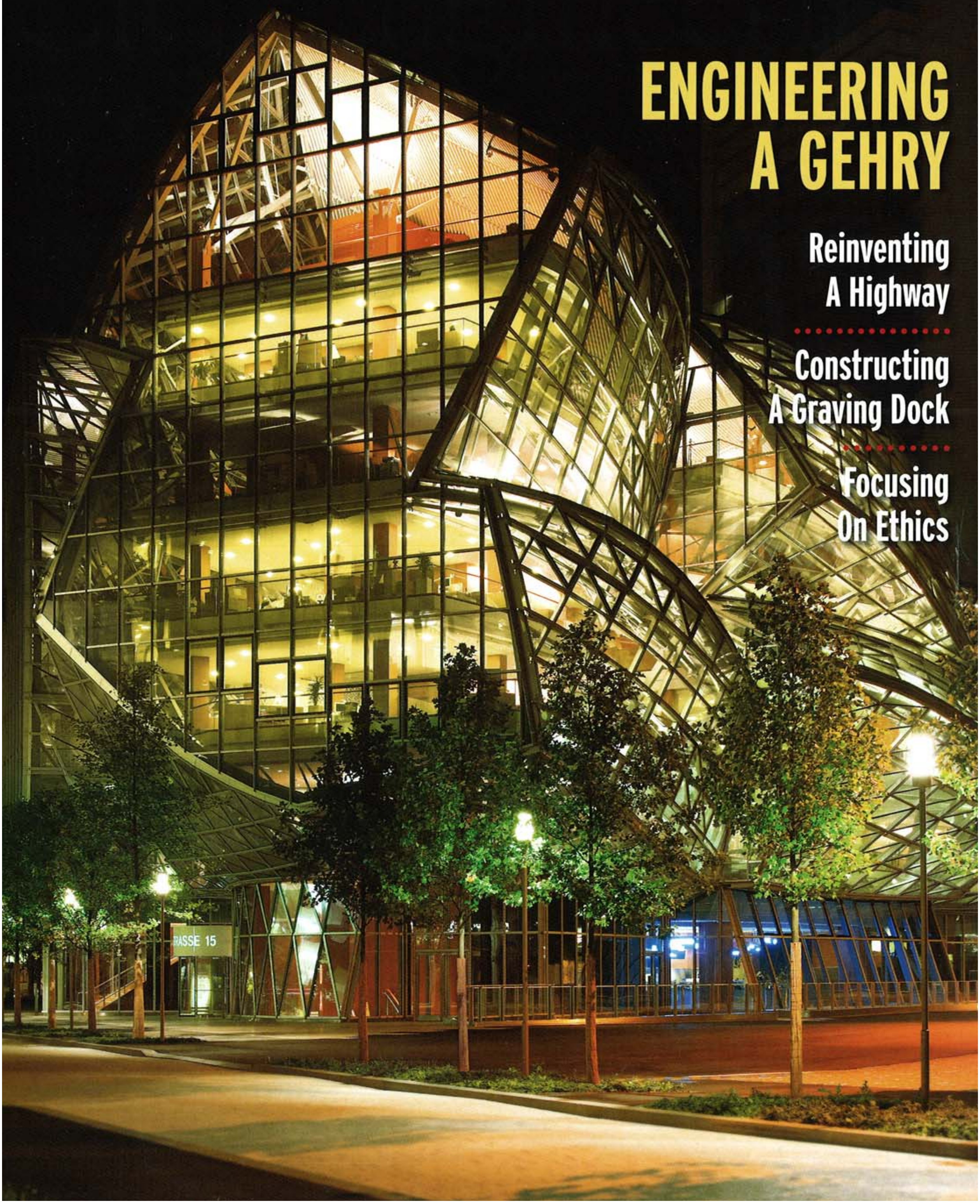
ENGINEERING A GEHRY

Reinventing A Highway

Constructing A Graving Dock

Focusing On Ethics



Rather than excavating a hole for a shaft and then casting concrete within it, the new method employs a system that uses both jetting—that is, air and water delivered under high pressure—and grouting to install and secure a pile of precast, reinforced concrete. In this way the noise and vibrations associated with pile driving are eliminated, as are the problems related to horizontal soil stress relief that are associated with drilled shafts. At the same time, the use of a precast pile eliminates the quality control questions associated with drilled shafts, and grouting the pile maximizes its skin and tip resistance.

In addition to the pile itself, the new approach requires the use of a lightweight crane from which to suspend the pile, a piping network and associated nozzles for jetting and grouting, a high-pressure water pump, an air compressor, a high-pressure grout pump, and grout. The jetting system is designed to allow grouting as well as jetting at the tip of the pile. The grout is delivered through orifices along the sides of the pile. The grouting system operates within upper and lower zones, delivering grout to the sides of the pile in two stages. A semirigid membrane surrounds the pile along its length and is attached to the pile near the top, center, and tip. The membrane ensures even distribution of the grout around the pile and prevents the surrounding soil from contaminating the grout.

Before the jetting is begun, a small hole is dug in the ground, and the precast pile is inserted into it. The jetting system located at the bottom of the pile uses pressurized water and compressed air to wash away soil around

A NEW FOOTBRIDGE for pedestrians and cyclists near the Margaretengürtel subway station in Vienna, Austria, will primarily be of locally derived timber, which designers say was chosen for its low processing cost and light environmental footprint. Knippers Helbig Advanced Engineering, of Stuttgart, Germany, designed the bridge in collaboration with Knight Architects, of High Wycombe, United Kingdom. The two firms won an international design competition organized by Vienna. By safely conveying pedestrians and cyclists over a busy street and tramway corridor, the 380 m long structure will link recreational parkland to the west with Bruno-Kreisky Park to the east. It will have a gradient of less than 4 percent and will be 4 m wide at its widest point. At its midpoint, where it traverses the highway and tramway, the path will trace a gentle S. Here the sides will rise into tall asymmetric wall-like structures on each side, and seating will be built into the rounded, banked forms. The body of the bridge will feature a core of spruce layers, or lamellae, bonded together with glue ("glulam"). The laminate will be designed to accommodate the stress levels at particular locations along the path. An outer layer of larch lamellae will provide durability and protection against moisture, according to a prepared statement from the design team. The bridge will be constructed using a semi-integral method and will have sliding bearings at both ends but not along the length of the structure. Thermal expansion and contraction will be minimal given the material properties of the timber and the curved geometry of the structure; changes in the radius of the curvature will limit elongation, said Thorsten Helbig, the managing partner of Knippers Helbig Advanced Engineering, in response to written questions from *Civil Engineering*. The vertical sides of the bridge will rest atop slender posts; the posts' inherent elasticity will allow some longitudinal movement of the deck, Helbig said. In areas of load transfer and peak stresses, the timber will be reinforced with threaded steel rods. The bridge will be assembled in segments at the factory and transported to the project site, where it will be positioned on concrete plinths designed to provide protection against vehicle impacts. Steps and an elevator in a new building beneath the bridge's western approach will provide access to the pathway above. The 960 m^3 of wood in the bridge's superstructure is expected to embody approximately 795 metric tons of stored carbon dioxide, and construction will require only a fraction of the energy that would be needed if concrete or steel were used. Construction of the bridge is slated to begin at the end of the year, and completion is anticipated in 2012.

KNIGHT ARCHITECTS