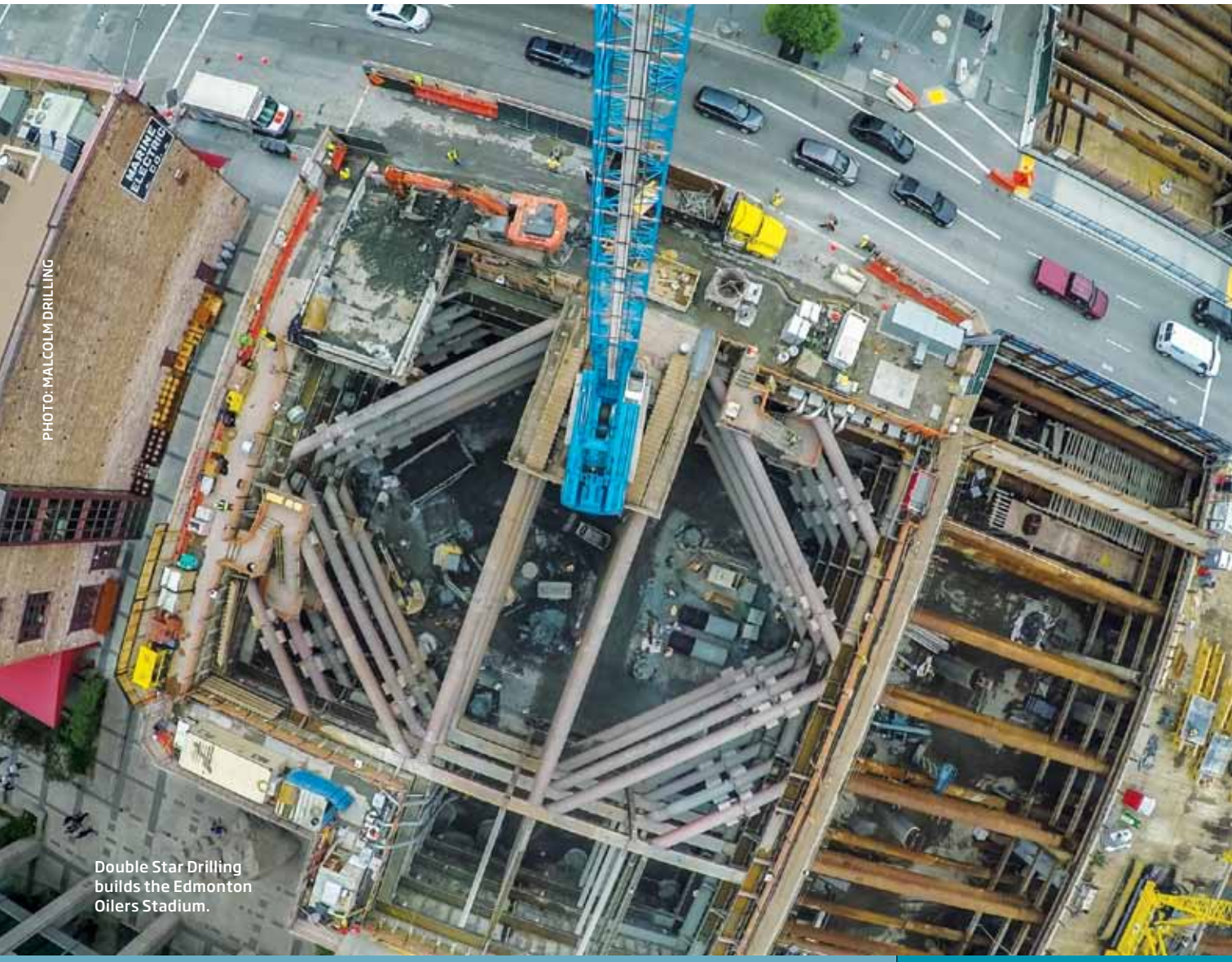

PHOTO: MALCOLM DRILLING

Double Star Drilling builds the Edmonton Oilers Stadium.

Underground I

Relieving the Pressure

Anticipated spike in infrastructure investments builds demand for fast, cost-effective underground solutions

By Vicki Speed

What's Inside


Robert Lauson


Jerrod Henschel


Steve Wilson


Sanja Zlatanic


Peter Faust


Eric Drooff

Voices of the Industry

Industry leaders and experts speak out about trends, challenges and advancements in underground tools, techniques and technologies.

Q: *Where is the greatest demand for underground work in 2015?*

Sanja Zlatanic, *P.E., Secretary General, Associated research Centers for the Urban Underground Space (ACUUS) VP, Chief Tunneling Engineer, HNTB*: A large part of ASCE's projected need for $3.6-trillion investment by 2020 in infrastructure will take part in tunnels and complex underground urban systems. The proposed Rebuild America Act of 2015 recommends a $1-trillion investment over five years. Out of the projected $200-billion annual spending, a good proportion could be expected to take part in the underground works. Public underground transportation options become the matter of choice when coupled with the general tendency of large cities in the U.S. and the world to improve transportation and "go underground" in order to free the surface for other uses, reduce the air pollution levels and move people faster.

Q: *What are the top challenges in today's environment?*

Dr. Mohammad Najafi, *P.E., Chief Editor, ASCE Journal of Pipeline Systems – Engineering and Practice; Director, UT Arlington Construction Engineering & Management; Director, Center for Underground Infrastructure Research and Education (CUIRE)*: There's a tremendous gap between technology advancement and application. Many municipalities and public agencies are not taking advantage of today's solutions, which are more accurate and cost effective over the life cycle of a project and can be more productive, while minimizing social and environmental challenges. There's a perception that new technology won't work, costs more or is too risky. We need to raise awareness within public agencies and the community about tunneling, trenchless and hybrid technologies, innovative inspection methodologies, asset management software and new databases.

Eric Drooff, *President, Hayward Baker Inc.*: Owners have not yet learned to properly develop performance specifications. Specialist and tunnel constructors get caught between combined prescriptive and performance specifications which don't recognize the capabilities and limitations of specialized technologies. The lack of specifications creates confusion in the assessment of price and risk and leads to widely divergent pricing and an increased potential for claims.

Steve Wilson, *General Manager, Champion Equipment Sales:* Current markets are demanding bigger, more powerful equipment in order to drill deeper and larger foundations. Contractors are under a lot of pressure to complete their projects quickly to ensure that they don't hold up the schedule.

Q: *What's next for underground tools, technology and equipment in 2015?*

Bob Lauson, *President, Terra Sonic Intl.:* There's an increased focus on reducing the waste generation and the repair/replacement of the crumbling infrastructure in populated areas. The evolution of sonic drilling over the past decades has enabled increased downhole power while keeping the rig footprint minimized; it can be done without necessarily using drilling fluids or mud and therefore only generates the core sample of interest and almost always results in drilling without the formation refusal encountered frequently with other technologies.

Ron Chilton, *CEO/President, National Trench Safety:* We continue to see a trend of increasing excavation depth and project complexity. Contractors today are routinely digging to depths of 20 ft and 30 ft, which presents unique considerations for protective systems. With those increased depths, we're also seeing an increase in the need for equipment to accommodate open span excavations.

Peter Faust, *VP, Business Development, Malcolm Drilling*: One of the biggest advancements in the foundation sector is in the field of soil mixing techniques. Large diameter single point or deep multiple auger mixing techniques have been applied to unheard of depth or diameters. These techniques are not new, but the use of larger and more powerful equipment has pushed the limit of what was constructible further and further.

Jerrod Henschel, *Vice President, Michels Communications, a division of Michels Corp.*: Continuing advancements in the capabilities of directional drilling locating equipment show promise for improving bore path planning and developing better as-built documentation for our customers. We're also seeing much better on-board equipment diagnostics information from most equipment manufacturers, which can help to identify maintenance issues before an equipment failure occurs and send an alert to our equipment maintenance team from virtually any remote site we operate in nationwide. ■

San Francisco's New 181 Fremont Foundation Bottoms Out

Crews completed the first major milestone of 181 Fremont, the new 70-story, 802-ft-tall luxury residential and office tower in San Francisco, with the installation of the 60-ft-deep base slab.

The design and construction methods of the deep excavation, shoring and foundation elements have been carefully engineered to navigate a variety of site constraints such as the subsoil conditions, proximity of adjacent buildings and, most importantly, the on-going construction of the new Transbay Transit Center (TTC) train box.

The constraints influenced the choice of foundation. Placing the tower on deep drilled shafts will reduce the effects of the tower's presence on the TTC structure. The drilled shafts are some of the deepest foundations constructed in San Francisco and were embedded as deep as 25 ft into the Franciscan Complex bedrock for total depth of approximately 260 ft.

Additionally, the tower has a five-story basement and the design and construction of the excavation was exceptionally challenging because of the adjacent ongoing construction for the TTC train box. In fact, the excavation for the tower shared a shoring wall with the TTC excavation. To allow for flexibility during construction, hydraulic rams were placed in a transfer waler along the shared TTC shoring wall that could adjust the forces transferred through to the TTC excavation if required. Furthermore, much of the design of the temporary works was coordinated with the permanent structural design of the tower's basement.

Lastly, the success of this project benefitted from an open and steady communication and collaboration between the various engineers and contractors working on the project. This project was unique in having the shoring designer a separate entity than the shoring contractor.

During the conceptual and detailed design, the shoring engineer (Brierley Associates), the geotechnical engineer (Arup North America) and the shoring contractor (Malcolm Drilling) coordinated efforts to deliver an excavation which would satisfy the complex constraints presented for this site. ■

181 Fremont luxury residential and office tower, San Francisco, Calif.