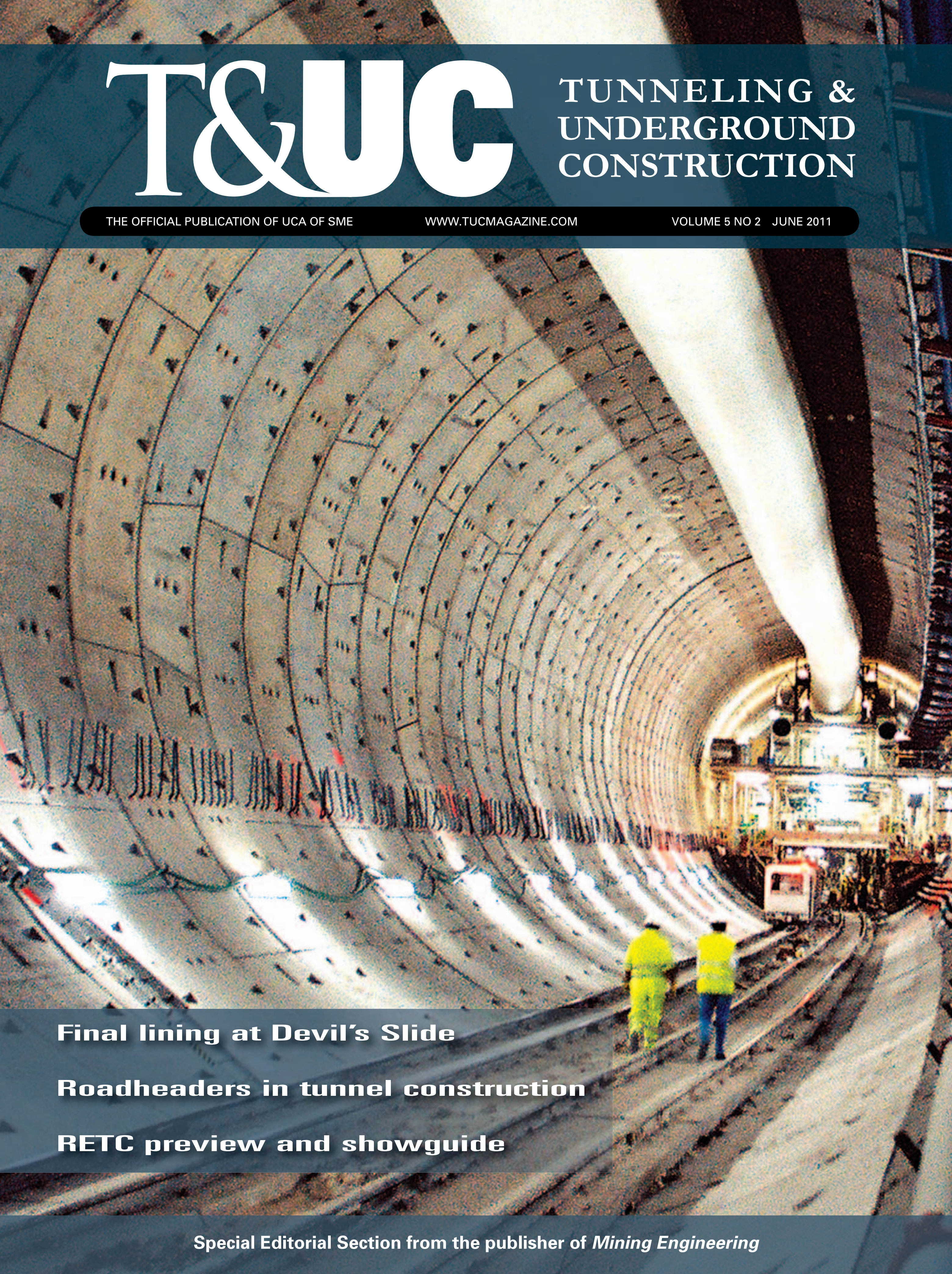


T&UC

TUNNELING & UNDERGROUND CONSTRUCTION

THE OFFICIAL PUBLICATION OF UCA OF SME   WWW.TUCMAGAZINE.COM   VOLUME 5 NO 2 JUNE 2011

Final lining at Devil's Slide

Roadheaders in tunnel construction

RETC preview and showguide

Special Editorial Section from the publisher of *Mining Engineering*

T&UC

TUNNELING & UNDERGROUND CONSTRUCTION

AN OFFICIAL PUBLICATION OF UCA OF SME | WWW.UCA.SMENET.ORG | VOLUME 5 NO 2 JUNE 2011

COVER STORY

COVER — The 2011 Rapid Excavation and Tunneling Conference is set for June 19-22 in San Francisco, CA. About 1,500 attendees are expected, along with 127 exhibitors, page 23. Stephen Liu discusses the challenges and successes in the final tunnel lining phase at the Devil's Slide Tunnel project, near San Francisco, page 12. Cover photo courtesy of Brian Fulcher.

 TUNNELING & UNDERGROUND CONSTRUCTION (ISSN 0026–5187) is published quarterly by the Society for Mining, Metallurgy, and Exploration, Inc., at 12999 E. Adam Aircraft Circle, Englewood, CO 80112-4167. Phone 1–800–763–3132 or 303–973–9550. Fax: 303–973 –3845 or e-mail: sme @smenet.org. Website: www.smenet.org. **POSTMASTER:** Send changes of address to TUNNELING & UNDERGROUND CONSTRUCTION, 12999 E. Adam Aircraft Circle, Englewood, CO 80112-4167. Article copies and back issues available on microfilm or microfiche from Linda Hall Library in Kansas City, Mo. Printed by Cummings Printing Co.

CONTENTS

FEATURE ARTICLES

DEPARTMENTS

EDITORIAL STAFF

Editor
Steve Kral
kral@smenet.org

Senior Editor
William M. Gleason
gleason@smenet.org

Senior Editor
Georgene Renner
renner@smenet.org

Production Designer
Nate Hurianek
hurianek@smenet.org

BUSINESS STAFF

Media Manager Advertising
Johanna McGinnis
mcginnis@smenet.org

Phone 1–800–763–3132 or 303–973–4200
Fax 303–973–3845
E-mail publications@smenet.org
Internet www.smenet.org

CHAIRMAN'S COLUMN

Leadership changes take place on UCA of SME executive committee

At the January 2011 Executive Committee meeting in New York City, the UCA of SME held its annual election for new executive committee members and for a new chairman and vice-chairman. Effective June 23, 2011 Jeff Petersen will be the new chairman and Bill Edgerton will be the new vice-chairman of the UCA of SME. This will be my last quarterly Chairman's Column as I will become the past chairman with a more limited role. This is good because an association such as the UCA of SME needs change in the make-up of the executive committee to remain vibrant and responsive to the tunnel industry.

I would like to welcome Nasri Munfah, Len Worden, Judy Cochran, Michael Roach and Heather Ivory to the executive committee. On behalf of the executive committee, I would also like to express our appreciation to departing members Brenda Bohlke, Tom Clemens, Gregory Raines and Mark Kritzer who have served with distinction and have contributed to the continuing success of the association. Their contributions will be recognized at the June 22, 2011 executive committee meeting in San Francisco, CA.

Each June, SME holds its annual tunnel conference. This year it is the RETC and it will be held in San Francisco, CA from June 18 to 22, 2011. The RETC Committee has put together a very informative and interesting program plus the various exhibitors will highlight the latest technology that is available to the industry. I would encourage all companies involved in this industry to attend the RETC. I would also encourage companies to send young people if possible because I think they receive more from these conferences than us "gray hairs." The RETC and the NAT are good venues for mentoring purposes to educate our next generation.

The UCA of SME is the formal representative to the International Tunnel Association (ITA). The ITA is an internationally recognized organization of member nations that promotes the tunnel industry on a worldwide basis. The organization has working groups that generate technical reports that are available to the international tunneling community. As a sponsoring association, the UCA of SME contributes to the ITA through the dues paid by our members. Thus, members need to be aware of the activities of the ITA and how this can benefit them.

To improve communications between the UCA and ITA, the UCA executive committee solicited nominations from the industry and Randall Essex, director of tunneling, Hatch Mott MacDonald Consulting Engineers, was elected to be the new UCA/ITA representative. To assist the ITA representative in his duties, David Kanagy was named assistant ITA representative and Mary O'Shea was named UCA/ITA communications liaison. Essex, Kanagy and O'Shea attended the ITA World Tunnel Congress meeting in Helsinki, Finland in May.

The UCA Scholarship Committee has awarded its first scholarship in the amount of $10,000 that will be for the 2011/2012 school year. I want to thank Brenda Bohlke, chair, and the other members of the scholarship committee for developing the structure of committee and starting this important process. Contributions to the scholarship fund can be made directly to the UCA or when you pay your annual dues by indicating the additional

(Continued on page 6)

David R. Klug, UCA of SME Chairman

Indianapolis to seek bids for Deep Rock Tunnel Connector

Indianapolis city officials are seeking bidders for the first phase of the largest-ever public works project in the city, an underground tunnel system equipped to store millions of gallons of raw sewage and prevent the excrement from flowing into local waterways.

The project is part of a 2010 settlement with the U.S. Environmental Protection Agency (EPA). It calls for a system of five wastewater storage tunnels to be built by 2025 at a total cost of more than $1 billion, the *Indianapolis Business Journal* reported.

The first phase, the Deep Rock Tunnel Connector, would be built 76 m (250 ft) below ground and stretch 11 km (7 miles) north from the Southport Advanced Wastewater Treatment Plant on the southwest side. It would hold up to 204 million L (54 million gal) of raw sewage, and cost up to $300 million to build.

The Department of Public Works announced plans to begin seeking bids for the work on May 16, and is set to open bids July 19. Construction is scheduled to begin in late 2011 or early 2012.

The other four storage tunnels will run along White River, Fall Creek, Pleasant Run and Pogues Run. The city's agreement with the EPA requires the system be operational by 2025.

City and federal officials reached a deal in 2010 that paved the way for the tunnel system. The agreement includes an accelerated construction schedule for the city's efforts to reduce sewage overflows from systems that carry both storm runoff and sanitary waste.

The new plan is expected to reduce overflows from about 29 billion L (7.8 billion gal) to about 1.5 billion L (414 million gpy). ■

New York projects are advancing well

New York's Metropolitan Transportation Authority (MTA) announced that boring for two parallel subway tunnels of the No. 7 Subway Extension, which will provide new subway service to 34th Street and 11th Avenue is complete. The contract, which also includes excavation of a three-block long cavern for the subway station, a station platform and mezzanine level, is 85 percent complete. It has a contractual completion date of September 2012.

The concrete pours that create the main cavern arches for the station have been completed.

A systems contract, which will include rail track, all mechanical, electrical and related systems throughout the tunnels, station, ventilation buildings and the main subway entrance at 34th Street is currently in procurement, with a forecasted award date of July 2011. This is the last contract needed to initiate service on the No. 7 Line Extension in December 2013. An additional contract for a secondary entrance to the subway station will be awarded in the future, but its completion is not necessary for service to begin on the new subway extension.

A new terminal station will be located at 34th Street and 11th Avenue, allowing convenient access to the adjacent development and the Jacob Javits Convention Center.

The 7 line extension will introduce subway service to an emerging mixed-use community in Midtown West, fostering transit oriented development in one of Manhattan's most underserved and underdeveloped areas. The city created two local development corporations, the Hudson Yards Infrastructure Corp. (HYIC), which is contributing $2.1 billion to the project, and the Hudson Yards Development Corp. (HYDC), which oversees planning and development in the Hudson Yards on behalf of the city.

Two key new water tunnels completed

New York City's Department of Environmental Protection has announced the completion of two 2.74-m- (9-ft-) diameter tunnel boring machine- (TBM) bored tunnels that will convey water to and from the $3 billion Croton Water Filtration Plant currently under construction. The announcement was made on Feb. 28 by Environmental Protection Commissioner Cas Holloway.

Begun in August 2006, the two tunnels have a combined length of 2.4 km (1.5 miles) and will connect the plant with the Croton reservoir system in Westchester County. Around 1 billion l/day (264 million gpd) of treated water will eventually flow through the tunnels to supply nine million people in New York City and the neighboring counties of Ulster, Orange, Putnam and Westchester.

In addition to the two main tunnels, the project also includes the construction of a 3.65-m- (12-ft-) diameter untreated water tunnel that was drill-and-blasted through 268 m (880 ft) of solid rock; three newly excavated shafts as well as the lining of five shafts with depths ranging between 27-35 m (88-115 ft). Completion of the tunnels is seen as a key part of the plant's construction

(Continued on page 10)

Final breakthrough at Gotthard tunnel leads to next stage of work on world's longest tunnel

Five months after the holing through in the east tube of the Gotthard Tunnel in Switzerland, AlpTransit has announced that final breakthrough was achieved in the west tube.

The last few meters were excavated on March 23 between Faido and Sedrun. Both single-track tunnels have been excavated along their entire 57-km- (35-mile-) length. Work will now begin on installing the tunnel lining, infrastructure systems and railway installations.

The breakthrough concludes the tunnel excavation that began in 2001 in the southern section at Bodio, although in 1996, logistical access tunnels had been constructed at Amsteg, Sedrun, Faido and Bodio, in addition to two 800-m- (2,600-ft-) deep shafts at Sedrun.

"With the end of excavation under the Gotthard, a further important milestone has been reached in the construction of the world's longest railway tunnel," said Renzo Simoni, cheif executive officer of AlpTransit Gotthard.

Of the Gotthard's 152-km (94-mile) tunnel system, including all passages and shafts, around 56 percent has been excavated by tunnel boring machine and around 44 percent by drilling and blasting.

During the excavations, around 28 Mt (30 million st) of rock were transported out from the mountains.

As the excavation of the tunnels concludes, the finishing work will begin. ABB has won an order worth about $21 million from AlpTransit Gotthard AG (ATG) to provide a ventilation system for the Gotthard Base Tunnel. In total, the project's network of tunnels, shafts and passages equals 152 km (94 miles). The order was booked in the first quarter of 2011.

Technical rail systems are scheduled to be installed and operational by 2017. Once completed, an estimated 200 to 250 trains per day will travel through the tunnel.

Together with TLT Turbo GmbH (Germany), ABB represents a consortium that was awarded the project, which is worth about $45 million. The consortium is responsible for developing, producing and installing what will be the largest tunnel ventilation system ever built, providing fresh air for the entire tunnel network. ABB technologies will ensure it operates at the highest levels of reliability and energy efficiency.

"System reliability, safety and quality are critical in this tunnel project. The ventilation system meets ATG's highest safety requirements, while ensuring energy efficient operation," said Veli-Matti Reinikkala, head of ABB's Process Automation division. "This project demonstrates how our comprehensive solutions and application know-how developed in process industries can help improve efficiency of other operations."

ABB's scope of supply includes medium- and low-voltage switch-

(Continued on page 9)

The New York Blower Company offers one source for four of the industry's top brands of fans and blowers: New York Blower, MAS Air Systems, Alphair, and TLT-Babcock. Providing the highest quality fans for the OEM, industrial, process, and power industries has always been our top priority. Our product range is unparalleled, and includes a comprehensive offering that covers the spectrum from pre-engineered OEM products and high-temperature, custom industrial fans, to highly engineered process fans for the mining, tunnel, and power markets.

With the unique specialties of each brand in the family, New York Blower has made specifying easier than ever before. Elevate your expectations when sourcing your next project. Visit us at **www.nyb.com** or email us at **sales@nyb.com**.

THE NEW YORK BLOWER FAMILY OF COMPANIES

nyb®

MAS Air Systems, Inc.
A New York Blower Company

ALPHAIR
A New York Blower Company

TLT-BABCOCK
A New York Blower Company

www.nyb.com

Chairman's column

(Continued from page 2)

contribution on the payment form. I would encourage all UCA of SME members who have family members or know of young people who have an interest in underground heavy construction to go to the UCA website: uca.smenet.org, and submit a scholarship application.

Since my last column, I have had the opportunity to visit some interesting tunnel projects that are reflecting the capabilities of our industry by overcoming design, managerial and technological challenges. In New York, I visited the East Side Access program — projects CM009 and 019. The running tunnels have been mined and the two stations and escalator construction is underway. The completed project will improve the quality of life for the commuters and the people of New York City.

In Switzerland, I had the opportunity to visit two interesting tunnels under construction. A tunnel is being built for a hydroelectric project where the contractor is driving an 8-m- (26-ft-) diameter hardrock TBM up a grade of 13.5° with belt haulage down slope. The other project was for the southern section of the AlpTransit Gotthard Rail Program. This project has four drill-and-shoot tunnel headings with conveyor haulage to the surface. Both project managers told me that they are having difficulty in attracting young people to their industry and they have an apprentice program.

The industry continues to be strong in the U.S. with major tunnel projects bidding in San Francisco, CA, Austin, TX and Indianapolis, IN. Major tunnel construction programs are continuing in Louisville, KY, Washington, D.C. and Columbus, OH. Please refer to the Tunnel Demand Forecast in this issue of the magazine (Page 28). You may want to monitor the funding of many of the projects listed and write your member of the House of Representatives or Senate as some projects may be impacted by the budget negotiations that are occurring in Congress.

We have made some changes in the UCA Education Committee and these were detailed in my last Chairman's Column. I have written an article detailing the new mission and organization (Page 33). For those interested in serving on the committee, please read the article and respond accordingly.

It has been a pleasure to serve as Chairman of the UCA of SME for the past two years. The organization continues to grow in membership and in industry importance. I feel that everyone should contribute to the industry in which one derives his livelihood. I would encourage everyone to contribute in some manner and it does not have to be through the UCA of SME. For those interested in being part of a UCA committee, please contact me or any UCA executive committee member. It has been a pleasure. ■

It has been a pleasure to serve as Chairman of the UCA of SME for the past two years. The organization continues to grow in membership and in industry importance.

Drilling work finished on Vancouver water tunnel project

The drilling work was completed on twin water tunnels that are part of Metro Vancouver's $800-million Seymour-Capilano Filtration Project. The tunnels, inside Grouse Mountain, are 4-m- (13-ft-) in diameter and about 7-km- (4.3-miles-) long. They are expected to be completed in 2013.

A tunnel boring machine (TBM) broke through to daylight on April 15.

The project halted in 2008 when the original contractor stopped because of ground issues. The job was retendered by Metro Vancouver.

The filtration plant itself started filtering water from the Seymour reservoir more than a year ago but additional work is being done to complete the tunnels and begin filtering water from the Capilano reservoir.

The cost of the tunnels went $170 million over the original budget, but Metro is suing Bilfinger Berger, the original contractor, over the contract termination and aims to recover some costs if it wins a trial slated for late 2012.

The system, which also disinfects using ultraviolet light and chlorine, should eliminate rare bouts of turbid, cloudy water that sometimes occur when storms or mudslides stir up silt in the North Shore reservoirs.

Once Capilano is on stream, the

Work begins this summer on a $110-million ultraviolet light disinfection plant for the Coquitlam Reservoir. That project is to be finished by late 2013.

plant will filter up to 1.8 billion L/day (of water a day, serving 70 percent of Metro Vancouver residents.

Work begins this summer on a $110-million ultraviolet light disinfection plant for the Coquitlam Reservoir. That project is to be finished by late 2013, when advanced treatment should be in place for all three Metro reservoirs. ■

Dulles Airport Station to be underground

On April 6, the Metropolitan Washington Airports Authority Board of Directors approved the underground location for the Metrorail station at Washington Dulles International Airport.

In reaching its decision, the board determined the location offers a more cost-effective version of the original station planned in 2005 while also retaining the features and underground location of the original station. This modified option will save up to $330 million from the original design estimate for the rail project Phase 2, the board said in a release.

Savings were obtained through engineering changes that include a revised tunnel and station design, reduced tunnel length and depth, the use of a different construction method for excavation, providing air conditioning from an existing airport facility and moving the required electrical substation above ground.

However, since the decision was made opponents to the plan, including Virginia Gov. Robert F. McDonnell, have spoken out with the hopes of getting the Metropolitan Washington Airports Authority board to reconsider its decision.

McDonnell sent a letter to authority board chairman Charles D. Snelling asking that the 13-member board of directors "promptly reconsider and change its vote" to build a $912 million underground rail station.

He said the station had "relatively minimal positive logistical or aesthetic benefit" and it would financially burden Northern Virginia taxpayers more than expected.

McDonnell's transportation secretary, Sean T. Connaughton, had already issued a letter opposing the project and they have been joined by other state officials, the *Washington Times* reported.

The station is part of the second half of the 17-km (23-mile) long Dulles Corridor Metrorail Project, which will extend Metro service to Dulles and eastern Loudoun County.

The Phase II project had an original price tag of $2.5 billion but has since increased to $3.5 billion. The above-ground station at the airport would cost about $612 million. ■

Gotthard: ABB and Balfour Beatty land large contracts

(Continued from page 4)

gear other electrical equipment, 800 x A control systems, sensors and other digital field devices to measure air flow and temperature, drive systems and other automation equipment. ABB is also responsible for cable design and delivery, as well the installation, assembly and commissioning of the other components.

Balfour Beatty Rail, as part of Transtec Gotthard joint venture, is providing total project management involving the design, installation and commissioning of rail infrastructure equipment for the tunnel as well as equipping the two 57-km (35-mile) single track tunnels and the adjoining, open north and south sections that connect to the existing rail network.

The work on the track, the overhead line system and elements of the supply system is being carried out in joint venture by Balfour Beatty Rail and various other partners (Alpiq InTec AG, Alcatel-Lucent Schweiz, Thales Rail Signalling Solutions and Alpine Bau GmbH).

The Transtec Gotthard Team work for Alp Transit Gotthard Ltd, the main constructor, who is responsible for the overall task of building the Gotthard Base Link between Zurich and Lugano.

The Transtec Gotthard team took two years at the design stage to plan its methodology and integration using a 250-m (820-ft) test track. Complete semi-permanent bases have been set up some 5 km (3.1 miles) outside the northern Erstfeld portal and in Biasca in the south, again about 5 km (3.1 miles) from the Bodio portal.

Computerized logistic controls are installed, workshops, aggregate and cement stores and loading bays.

The rail track work illustrates the detailed and disciplined logistical organization needed to do the work. Transtec Gotthard has invested in a carefully designed set of specialized plant and mobile machinery, some completely new, and on a large scale.

The machines are specially designed and developed for the construction of the slab track in the tunnel. ■

New York: TBM begins second run

(Continued from page 3)

and a milestone in the provision of clean water. The Croton plant is on track for completion in 2012.

Second Ave. Subway

Excavation work on the eastbound tunnel of the Second Avenue Subway project began earlier this year as the TBM used for the first tunnel was positioned for its second run.

Starting again from 92nd Street, this second tunnel will be 2,400 m (7,800 linear ft) long.

The second tunnel will include tight, westerly curve into the existing 63rd Street Station. Once completed, the tunnel will receive the concrete lining which provides the permanent tunnel structure.

During the first 61 m (200 ft), the TBM will be mining through ground which has been frozen.

The TBM previously mined 2,183 m (7,162 ft) for the first tunnel. The 44 t (485-st), 137-m- (450-ft-)-long machine began mining in June 2010 from 92nd Street to 65th Street and was then disassembled and pulled back to 92nd Street where it started its second run on the second tunnel. The subway line is on schedule to be completed by December 2016.

Phase I of the Second Avenue Subway will serve more than 200,000 people per day, reducing overcrowding on the Lexington Avenue Line and restoring a transit link to a neighborhood that lost the Second Avenue Elevated in 1940. When Phase I is complete, it will decrease crowding on the adjacent Lexington Avenue Line by as much as 13 percent, or 23,500 fewer riders on an average weekday. It will also reduce travel times by up to 10 minutes or more (up to 27 percent) for those on the far east side or those traveling from the east side to west midtown.

The line is being built in phases, with Phase I providing service from 96th Street to 63rd Street as an extension of the Q train, with three new ADA-accessible stations at 96th, 86th and 72nd Streets. New entrances to the existing Lexington Av/63rd Street Station will also be added at 63rd Street and Third Avenue. Further phases of the project will extend the line from 125th Street in Harlem to Hanover Square in the Financial District. The configuration of the tracks will allow for possible future extensions into Brooklyn, Queens, and the Bronx. ■

FEATURE ARTICLE

Final lining at Devil's Slide Tunnel

Tunnel excavation while mining is not often performed in North America primarily due to access constraints in both operations. Referencing European approaches for long distance tunneling, the Devil's Slide Tunnel project has applied innovation and technology to provide the ability to overcome this unique challenge. The Devil's Slide Tunnel requires the construction of twin bore tunnels excavated based on sequential excavation method (SEM) construction methods using New Austrian Tunneling Methods (NATM) principles. The twin tunnels are approximately 9 m (30 ft) in diameter and 1,250 m (4,100 linear ft) in length. The purpose of this project is to reroute Route 1 from around the Devil's Slide through the San Pedro Mountains crossing from Montara, CA along the south and into Pacifica, CA in the north.

Service gantry at the Devil's Slide Tunnel project.

The Caltrans project was awarded in December 2006 for a total of $272,366,000. The job is an A+B job, thus the estimate scheme of final lining while tunnel excavation is important to save time. A+B is a method of rewarding a contractor for completing a project as quickly as possible. By providing a cost each working day, the contract combines the cost to perform the work (A) with the cost of impact to the public (B) to provide the lowest cost to the public.

Concurrent mining while lining is achieved through a series of gantries and a set of tunnel forms allowing the pass-through of the excavation equipment. The tunnel lining operation passes through several phases of work that are dependent upon the progress of the tunnel excavation process. This involves unique milestones, such as the evolution of the ventilation system, development of an enlarged cross passage to allow equipment to access each tunnel from within the tunnel and, finally, the installation of an invert prior to arch lining that limits the continuity of the final lining operation.

Stephen Liu

Stephen Liu, UCA of SME member, is project engineer, Kiewit Infrastructure Group, Omaha, NE, e-mail stephen.liu@kiewit.com.

Tunnel final lining

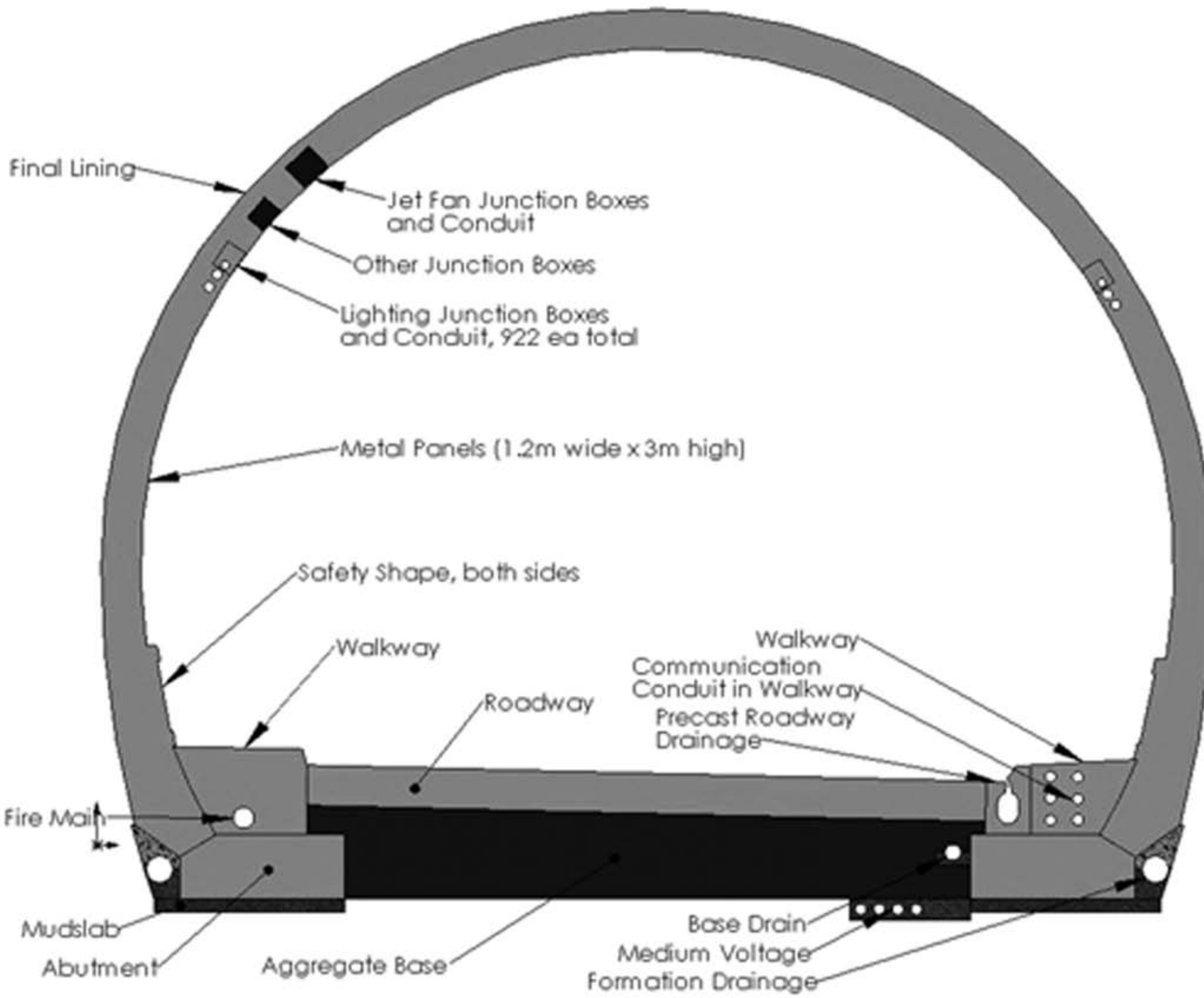
The tunnel liner is a 38-cm- (15-in.-) thick liner using a 4,000 psi concrete peastone mix. Rebar reinforcement calls for double matted rebar. Both inner and outer mat is detailed at # 4 rebar at 15-cm (6-in.) spacing. The electrical embed installation calls for an average of 145 m (475 linear ft) of conduit per 12 m (40 ft) pour along with an average of four junction boxes per block. Each concrete "block" pour is 12 m (40 ft) in length. These block lengths were chosen based on the location of a series of 42 repeating service niches, formation drain cleanout (FDC) niches as well as the 10 cross passages located throughout the alignment of the tunnel. With every block pour, all of the niches and cross passages are projected to fall within the limits of each of block pour. There are a total of 200 block pours, 99 on the southbound tunnel and 101 along the northbound tunnel.

Sequence of installation

The entire final liner goes through many installation steps before the final product is achieved. The following is a brief description of the construction sequence for an independent final lining, block pour:

- The shotcrete initial liner is prepared via smoothing shotcrete. This involves both the surface preparation and the application of smoothing shotcrete.
- This is followed by the installation of 61-cm (24-in.) abutments that span the length of the tunnels.
- A 25-cm (10-in.) continuous formation drain is cast outside the abutments, which ties in the PVC waterproofing membrane.
- Once the smoothing and surface preparation steps are completed, a PVC waterproofing membrane is

Devil's Slide tunnel liner schematic.



installed along the arc-length of the initial liner. This waterproofing membrane ties into the abutment and over the formation drain system to allow water seepage into the drain system.

- Once the waterproofing membrane is installed, a contact grout system is attached to the membrane along the arches.
- This is followed by the installation of a double mat of rebar over two distinct steps, once before the electrical sub installs the conduit and once after the conduit is installed.
- The concrete is then placed into the arch liner forms with the mechanical and electrical conduits, anchors and junction boxes embedded.
- Prior to the arch forms arriving, on every fifth pour, a set of FDC and service niche forms are erected using separate formwork.
- On every tenth arch pour, a cross passage adapter is mounted on the cross passag (CP) inverts in order to mate it with each passing arch pour.
- Stretched across various locations throughout each tunnel are areas where a full arched invert must be placed in order for the continuity of the arch concrete to pass through these areas. Thirty-five percent of the length of the tunnels are estimated to require a full arched invert.

Waterproofing the initial shotcrete liner involves a detailed process of both surface preparation and surface application of smoothing shotcrete.

The contract requires the application of a universal 2.5-cm (1-in.) layer of nonfiber-reinforced shotcrete (NFRS) the tunnel forms required many months of pre-engineering and pre-planning. Each gantry needs to be flexible enough to perform different tasks such as storage of rebar as well as the installation of it.

Meanwhile, the electrical and mechanical subs need the gantries to install embeds. Each gantry was analyzed and determined to have specific requirements that matched its intended operational goals based on the original estimate. Meanwhile, specific height and width clearances need to be addressed to not only allow traffic to pass underneath, but also be capable of sustained utility connections throughout the gantry operations.

The arch forms required even more engineering and attention to detail as each form is intended to perform 100 concrete placements. It also had to sustain a liquid head around the entire perimeter of the forms while providing for a bulkhead design that allows the rebar and the electrical/mechanical embeds to pass through. Along the lower quarter Arch, a textured elastomeric panel was mounted to the side elements to produce a textured look above the safety walkway. In addition to this requirement was the need to be able to remove these panels on a regular basis (every fifth pour) to allow for the installation and concrete placement of the niche formwork that repeated 42 times in the tunnel.

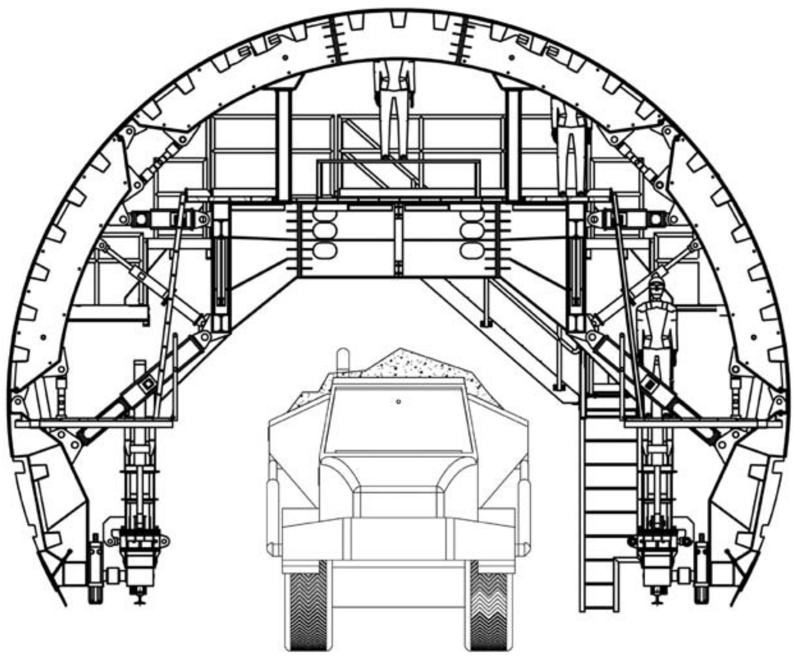
The forms were also designed to accommodate the differential settlement post the pour. Based on past experiences with this type of lining, the forms were oversized by 18 mm (0.7 in.) to allow for this settlement. Other unique features were the inclusion of a steel chamber system that produces clean defined construction joints (CJ) around the perimeter of each joint.

A key takeaway in the procurement stage is ensuring that all intended users of either the gantry system or in the formwork system have thoroughly scrubbed the original design for their scope of work or involvement in the system. This includes everything from the supplier of the elastomeric panels and the arch formwork designer to the rebar installer and the gantry capabilities. Specific conflicts like fit-up, access, code regulation or integration of the intended installation process versus physical obstacles become difficult to manage once the process has started.

Arch concrete placement

The final liner concrete is placed by concrete mixer trucks and pumped using an electric Schwing 750. The concrete pump is capable of pumping up through a 12.7-cm- (5-in.-) diameter concrete slickline. The concrete is distributed through the formwork using a unique concrete distribution unit by ACME. The concrete distributor has eight outlets that are fed by a main turret that can swivel around and be connected to a series of ports that are plumbed to different guillotines. Concrete is deposited in the formwork through a series of guillotine ports that allow differential settlement along each side of the form. The forms are designed to accommodate 1 m (3.3 ft) lifts loaded uniformly until the arch form is full. The leading end of each new block is contained using a 2 x 4 fantail bulkhead stacked radially along the arc-length of the tunnel form. These fantails are braced using C-channels and coil rod along its entire radius. The bulkhead must also allow for the double matted rebar to penetrate through along with all the conduit lines for the electrical and mechanical systems. Out of the entire erect and strip process, the majority of complexity and man-hours are directed to this specific piece of work.

Tunnel arch form with equipment driving through.

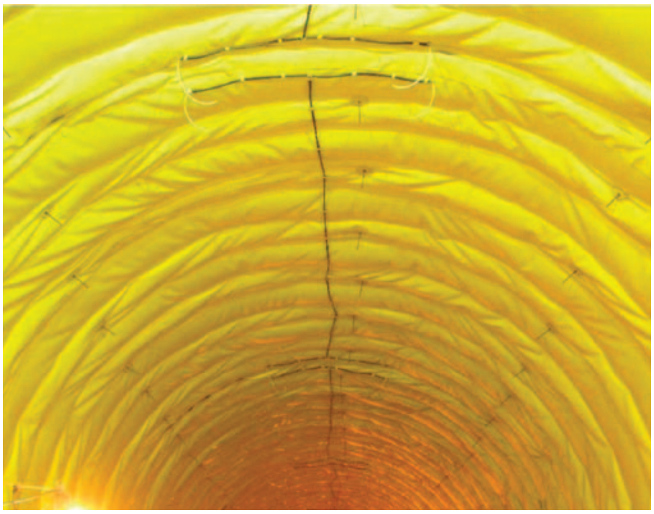


Key challenges

Access. One of the primary challenges for the final lining operation is access. Each tunnel drive contains a top heading excavation as well as a bench excavation spread. Each of these heading operations requires support equipment on a regular basis. The following are examples of challenges that were addressed daily:

- The construction of concrete abutments concurrent to the excavation process and the impacts to access during each respective cycle.
- A minimum of 152 m (500 ft) is required to adequately park and stage all excavation equipment in each tunnel drive.
- Haul truck traffic is impeded when placing arch concrete.

Waterproofing membrane installation.

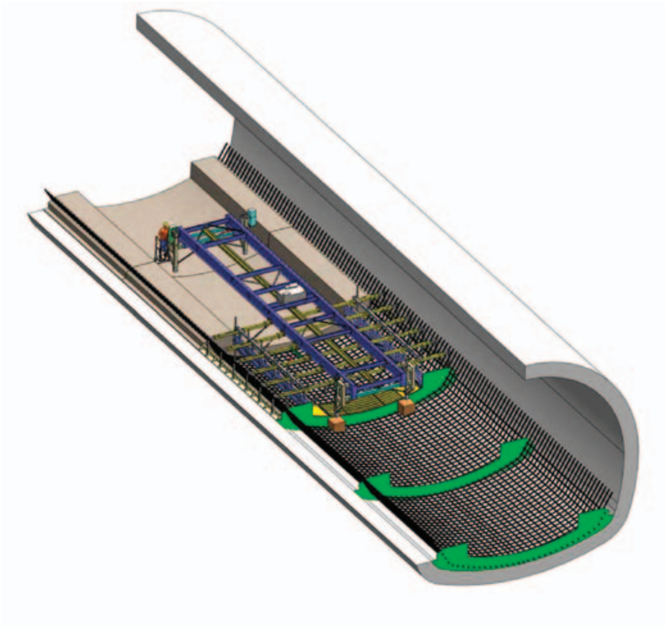


to cover any protrusions or sharp edges. Another criterion is the depth to wavelength ratio of the initial liner which helps ensures that pronounced dips and undulations are smoothed out, thus preventing the waterproofing from stretching too far. Upon final surface acceptance, a 2.5-cm- (1-in.-) thick PVC membrane is pinned to the initial liner in a series of 2- x 23-m (2-x 75-ft) transverse strips.

These strips are then heat welded together. Upon its completion, a series of template anchors are installed through the PVC membrane to serve as the template bar for the rebar mats that are installed immediately after this.

Following the lining placement, the mechanical and electrical packages represent a large portion of work post tunnel concrete. The mechanical package requires the installation of a 30-cm- (12-in.-) diameter water main and a 25-cm (10-in.) fire main down the length of each tunnel. The electrical package consists of six sets of electrical plans (utility and grounding plan; lighting plan; power plan; traffic system plan; fire life safety plan and instrumentation plan). These six systems consist of approximately 40,000 m (130,000 ft) of conduit and approximately 800 junction boxes of various sizes.

Customized invert arch liner form shows the need to install the invert concrete prior to the arch form tunnel liner.



A thorough QC program for verifying embed location, quantity and its secure placement is critical to the success of the factory testing and commissioning stage of this project.

Gantries and tunnel forms

The Devil's Slide Tunnel purchased a series of six identical working gantries and two tunnel forms from Ceresola tls. All of the respective gantries and forms are fabricated out of steel.

Each working gantry is 15 m (50 ft) in length, 8 m (26 ft) wide and 27 t (30 st) in weight. The advantage to having large gantries of this size allows for increased material stocking of up to 9,100 kg (20,000 lbs) and the ability to have up to 10 people working simultaneously. Up to six working gantries are planned to be in use in both tunnels.

This allows for concurrent work to occur for waterproofing installation, rebar installation (inner vs. outer mat); mechanical and electrical embeds. The four post gantries are run hydraulic over electric using a 25-kW diesel generator that is incorporated in the body of each gantry. They are designed to travel up the 2 percent slope of the tunnel at a maximum speed of 6 m/min (20 ft/min). There are several unique features to the gantries. Access can be made to several different levels along the arch working at different levels concurrently. Second, a 7.3-m- (24-ft-) long trolley is mounted to an I-beam that can stock both the rebar bundles as well as electrical conduits for a capacity of 9,100 kg (20,000 lbs).

The tunnel arch forms are 118 t (130 st) in weight and 12 m (40-ft) long. The forms also are mounted on a four-post carrier frame that rides on 38 kg (85 lbs) rail that is gauged at 6 m (20 ft). The tunnel form operates hydraulic over electric and is capable of 11/7 MPa (1,700 lb/sq ft) of concrete loading.

The steel form is hinged at two locations that allow for stripping of the tunnel forms. The forms are secured during a concrete pour using eight jacked legs and two sets of float pins, four on each end of the form.

The unique aspect of these float pins are that they are placed entirely outside each pour. One set is on the trailing end on pre-existing concrete. The other set is on the initial liner. Once the arch concrete is placed, the forms are stripped and moved forward in its entirety with all of the form accessories and bulkheads and reestablished in the next pour.

The procurement process for both the gantries and

FIG. 10

Fantail bulkhead braced by C-channel and coil rod.

- Ventilation system orientation does not allow lining operations to proceed past 1.3 way through the tunnel (Cross Passage 3).

General facts

- 23,670 m³ (835,893 cu ft) of final lining concrete ; 2,200 m³ (77,690 cu ft)of portal concrete
  - 135 NCY per 12 m (35 ft) placement (8.6 m³ or 304 cu ft TM)
- Concrete mix design
  - 7 sack mix 39.4 MPa (4,000 psi)
  - 12.7 mm and 9.5 mm (0.5 in. and 0.375 in.) aggregate
  - Chemical admixtures (VMA and Glenium) for dealing with high slump
  - High early strength testing and monitoring (strip at 8 MPa)
- Placement rate 0.8 m³ (30 CY per lift) at 1 m (3.3 ft) displacement per side
- 2,331,000 kg of rebar (1,604 st) OR 400 #/LF
  - Outer mat is #19 at 325 mm (13 in.) spacing (variance from specification)
  - Inner mat is #13 at 150 mm (6 in.) spacing
- 65,900 m² (709,000 cu ft) of waterproofing
  - Cross passage concrete (10 each at 17-m- (55-ft-) long
- 3 chambers (SEC, CEC, NEC)
- Curing requirements
  - Seven-day form in place method
  - Curing compound

- The installation of a noncontinuous final arch invert in each of the tunnels.

Material handling

The quantity of material to be installed and coordinated concurrently within each tunnel varies between subcontractor and between different operations.

In order to balance the production advancement between subcontractors, each day is carefully coordinated between operations.

- Tunnel waterproofing requires the daily handling of either fleece or waterproofing membrane. These deliveries consist of stocking 2- x 23-m (2- x 75-ft) rolls of waterproofing membrane and 10 to 12 rolls of fleece onto a tube scaffold.
- The stocking of #4 rebar x 9 -m- (30 ft-) long directly from the delivery truck onto the steel 15-m- (45-ft-) long gantries.
- Requires the use of a intermodal trailer towing a flatbed of 13,600 kg (30,000 lbs) twice-weekly during the day shift.
- Rebar is bundled into 907 kg (2,000 lbs) loads 9-m- (30-ft-) long. Ten bundles are hoisted onto the gantries by a trolley hoist that lifts the bundles up onto the top deck of the gantries.
- Electrical conduit, junction boxes and other electrical embedded items are also required to be stocked weekly for the electrical subcontractor.
- The unique aspect of coordination between electrical and rebar subcontractors is keeping them well paced apart so that they do not run into each other.

Conclusion

The complexity of final lining reflects the many challenges for building a final product “right the first time.” The key lesson has been to plan the final lining operations with accurate detail to reflect the complexity of the work. This requires the need for detailed brainstorm sessions early in the pre-engineering phase.

The number of concurrent operations between different subcontractors and Kiewit operations all sharing the same space but working at different paces require constant surveillance and adaptation.

Success involves early coordinated planning with the subcontractors and getting their buy-in on the proposed means and methods for access and material handling.

When choosing the right form design and engineering issues, it is important to ensure that the completed engineering design performs as intended. Taking advantage of key opportunities such as a preliminary mockup and having key operations personnel stay with both the design and the fabrication phase ensures any fit-up conflicts are minimized before it departs the supplier.

Finally, the benefits to concurrent mining while lining provide a key advantage to future tunnel projects. Understanding the sequence and flow of work on what is achievable versus what is impractical will be a valuable lesson. ■

FEATURE ARTICLE

Versatility of roadheaders in tunnel construction

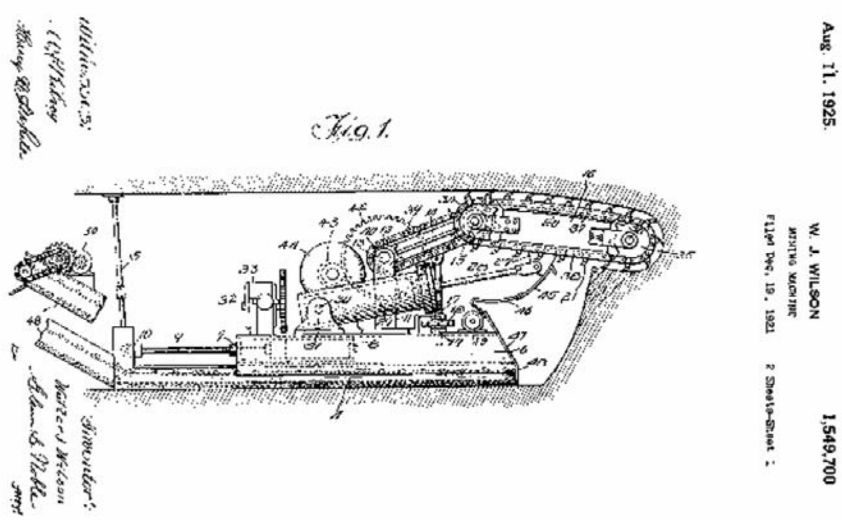
David Kwietnewski, Ray Henn and Gary Brierley

David Kwietnewski, is project engineer Brierley Assoc., LLC, **Gary Brierley**, member UCA of SME is president Brierley Assoc., LLC, Littleton, CO, and **Ray Henn**, member UCA of SME is senior consultant, Denver, CO e-mail rhenn@lymanhenn.com or dkwietnewski@brierleyassociates.com

Roadheaders are gaining widespread acceptance in North America as a means for mechanical tunnel excavation. Until recently, almost all of the large-scale North American tunnel projects were excavated one of two ways — the tried and true drill-and-blast method or with the use of tunnel boring machines (TBM), the hi-tech super-excavators. TBMs enjoyed fast-growing popularity worldwide as TBM manufacturers offered greater technology to meet the demand of the civil tunnel industry in the late 20th century. Recently, though, more tunnel projects, large and small, can thank the brute force of a roadheader for getting the job done.

FIG. 1

From the 1925 U.S. patent for the mining machine.



Brief history

Similar to the TBM, it is not very far back in history that the origin of the roadheader can be found. In 1949, Dr. Z. Ajtay applied for a patent for the first roadheader machine in Hungary. However, there are patents for equipment that looks similar to roadheaders dating back as far as the 1920s. The U.S. patent for the patent for the "Mining Machine" by W.J. Wilson (Fig. 1) is one such example.

The illustration in Fig. 1 looks similar to a current roadheader machine. The roadheader was probably not born a civil tunnel excavator but, instead, as a mining machine. The evolution of the roadheader can almost be seen in Fig.s 2-4 from later U.S. patents (spanning from 1973 to 1978).

The earlier cousin to the roadheader is called the continuous miner. The continuous miner became popular in Europe around 1950 and was probably first introduced in North American coal mines in the mid to late 1950s. Soon, the continuous miner was adapted for civil construction, creating the modern day roadheader. At first, roadheaders were slow to gain popularity among the civil contractors because the early machines were unreliable, often broke down and were difficult to maintain.

Today's roadheaders

Throughout the recent years, roadheader manufactures have come and gone and some have merged as well. Following is a list of some of the most common names seen on roadheaders:

- Paurat – German manufacturer of heavy duty roadheaders (acquired by Wirth in 1999).
- Dosco – manufactured in the U.K. (affiliated with Meco-Moore), www.dosco.co.uk.
- EBZ – manufactured in China.
- Mitsui Miike – manufactured in Japan since 1968 (affiliated with SLB roadheaders, www.mitsui-miike.co.jp).
- Sandvik – German manufacturer (acquired Tamrock, Voest Alpine and KR roadheaders www.miningandconstruction.sandvik.com/us).
- Alpine – early North American distributer and manufacturer of excavator attachments, www.alpinecutter.com.
- Wirth (now a division of Aker Solutions), www.wirth-erkelenz.de/.

FIG. 2

From the 1973 U.S. patent for the tunneling machine.

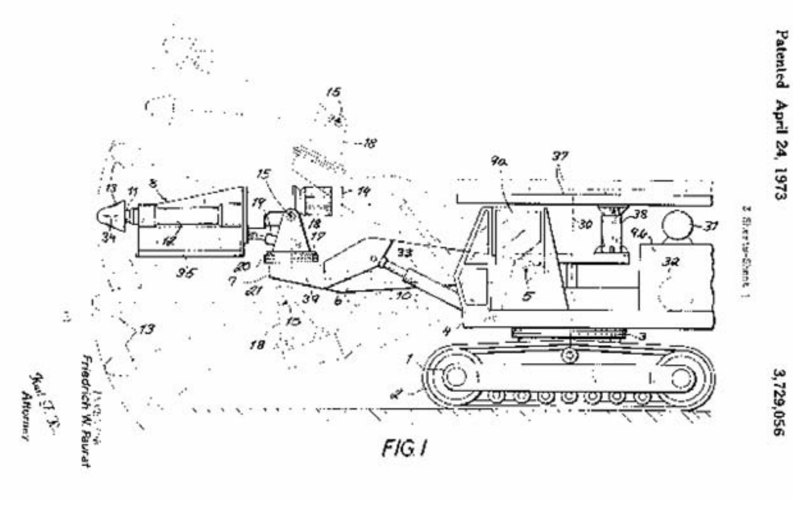


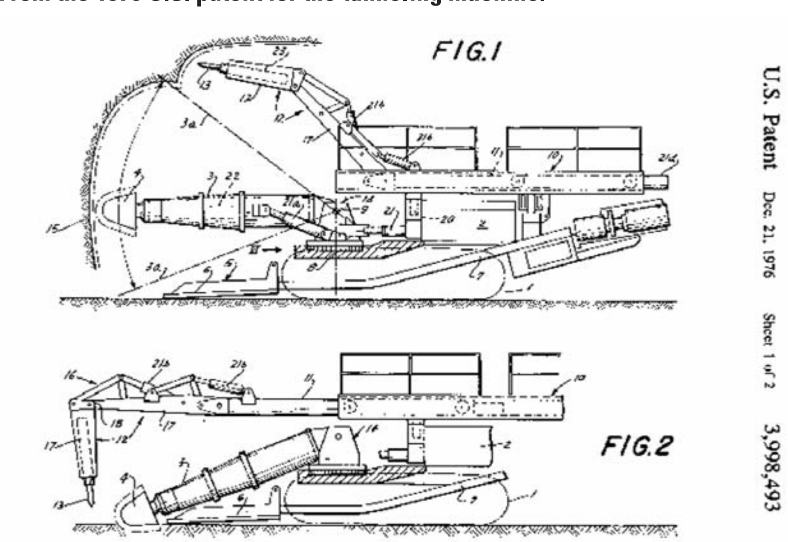
Table 1

Antraquip roadheaders.

Model	Weight (tons)	Total power (kW)	Cutter power (kW)
AQM 200	55	350	200
AQM 150	35	239/264	150/175
AQM 100	25	198/200	110/132
AQM 50	13	60/132	30/60

FIG. 3

From the 1976 U.S. patent for the tunneling machine.



- Eickhoff – German roadheaders, www.eickhoff-bochum.de/en/.
- KSP Roadheaders – manufactured by the Yasinovatsky Machine Building Plant(Ukraine), www.jscymz.com.
- Antraquip – U.S. roadheader manufacture since 1984, www.antraquip.net.

Each manufacturer offers several different machine sizes and will likely customize an existing roadheader model to contractor's specifications. Table 1 is a comparison of four Antraquip models and offers a brief example of typical roadheader options.

The Model AQM 200 is Antraquip's heavy duty model for civil or mine work in hard to medium hard rock. A heavyduty roadheader is usually chosen for it brute strength and large size and fits the requirement for most large cross-section tunnel openings. The Model AQM 150 is the medium class model and the AQM 100 and AQM 50 are the light duty models. The AQM 50 claims to be the narrowest roadheader in the world. This is actually a virtue for jobs that require small tunnel openings and have tight underground spots.

There is an abundance of roadheader specifications for each model provided on each of the manufacturers' websites. This vital machine information is required when choosing the right machine for the job at hand. This information includes machine descriptions, parameters, capacities, reach profiles, roadway profiles and often videos describing the mechanics. It is most important to get the roadheader manufacturers involved with the details of the tunnel project to be sure that the machine is sized and fitted for the project.

Why a roadheader?

There are good reasons for contractors to choose a roadheader for their tunneling jobs. Here are some of the main reasons (in no particular order):

- Cost: A roadheader is a fraction of the cost of a TBM. Having to choose between a TBM and a roadheader on a particular tunnel project, some experts would say the price tag associated with a roadheader generally becomes more attractive when the tunnel length is less than 1.6-km- (1-mile-) long.
- Mobilization: A brand new roadheader is often procured much faster than a TBM. Generally, they can be mobilized

like any other piece of heavy construction equipment.

- Project specifications: When working in an urban area or when vibration is a concern, a roadheader can often take the place of conventional drill-and-blast excavation.
- Geology: Roadheaders are well suited for most ground conditions.
- Tunnel shape: A TBM will always create a circle for a tunnel cross section. Roadheaders offer flexibility with tunnel excavation profiles.
- Versatility: Roadheaders can be modified to fit almost any project. They work perfectly inside open shields for circular tunnel bores. Roadheaders can be fitted with special booms for drilling, bolting or a man-basket.

There are also potential drawbacks to roadheader excavation, including:

- Tunnel length: A roadheader will probably drive tunnel just as fast as conventional drill-and-blast excavation (maybe even faster) but usually will not excavate as fast as a TBM. Generally, the benefits of a roadheader start to go away when the tunnel length is measured in miles instead of thousands of feet.
- Bad ground: Roadheaders do not work well when there is high ground water inflow. Similar to conventional drill-and-blast excavation, roadheader excavation requires adequate stand-up time. For this reason, the roadheader will never be able to do the job of a slurry TBM or earth pressure balance machine.

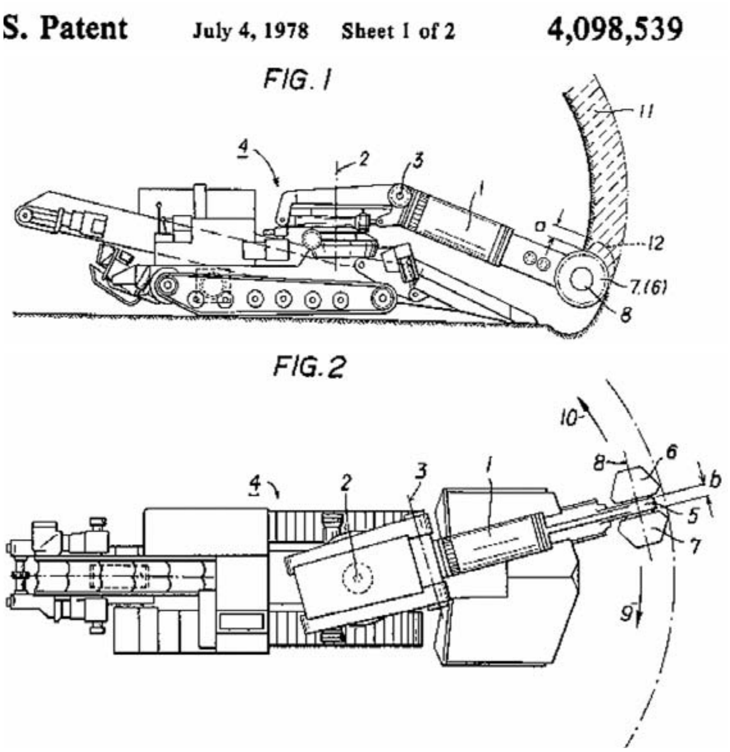
Roadheaders at work

Here are a few examples of recent projects that have been completed with a roadheader or are currently being built with a roadheader:

- The Big Dig in Boston, MA. A massive concrete box tunnel was jacked beneath the railroad tracks in frozen ground. The tunnel was excavated with a roadheader from inside the box.
- Devil's Slide Tunnel, Highway 1, CA. A roadheader was used to perform sequential excavation on this tunnel in difficult ground requiring constant monitoring and complicated combinations of ground support.
- Caldecott Tunnel, 4th Bore, CA. The fourth tunnel is currently under construction using one the of the world's largest roadheaders, a Wirth T.3.20 (Fig. 5).

FIG. 4

From the 1978 U.S. patent for the tunneling machine.



- New Irvington Tunnel, San Francisco, CA: About 5.8 km (3.6 miles) of tunnel are under construction near Fremont California for new water tunnels. TBM excavation was prohibited by the owner because of the risk of getting it stuck squeezing ground conditions. As a result, the tunnel will be excavated

FIG. 5

A Wirth T.3.20 heavy duty roadheader.

FIG. 6

Backed up from the face, a Voest-Alpine AM 50 (Alpine Miner) roadheader.

FIG. 7

A Wirth T.3.20 heavy duty roadheader cutting rock with ease.

by conventional drill-and-blast and roadheader excavation.

- Lake Pleasant Water Tunnel, Phoenix, AZ: This tunnel represents many smaller tunnel jobs around the country. This tunnel was 3 m x 3 m (10 ft x 10 ft), horseshoe shaped and approximately 550-m- (1,800-ft-) long. The ground conditions consisted of crushed to blocky and seamy granite and was perfect for the Voest-Alpine AM 50 roadheader shown in Fig. 6.

Choosing a roadheader

Most often, a roadheader will be selected based on the size of the tunnel. A small roadheader will often be adequate for small tunnel openings; 3-m- to 4.5-m- (10-ft- to 15-ft-) high and wide. When the tunnel cross section is larger, 6 m (20 ft) and more, heavy duty roadheaders are generally required. Size is usually the first thing considered when selecting a roadheader, although it is very important to understand that there is a lot more to roadheader selection than just the size of the machine.

The single most important condition for choosing the right roadheader is the type of ground that will be excavated. A wise contractor will always consult an engineer who has experience interpreting tunnel contract documents as well as the type of ground that will be encountered during construction. How the ground will behave has everything to do with how the roadheader will perform. Notice in Fig. 7 how the rock is ground up by the roadheader. This roadheader is well suited for these ground conditions.

Besides ground type and roadheader size, there are some additional things to consider when selecting a roadheader.

- Tunnel grade: Most roadheaders can effectively operate on a 12° grade. Some models can even go up to 18°. Any steeper and the weight of the machine will work against it.
- Rock strength: Even though rock strength is included with ground type, it is noteworthy that most roadheaders can excavate rock that is up to ~70 MPa (10,000 psi) and some of the newer heavy duty roadheaders can excavate rock up to ~150 MPa (22,000 psi). Some manufactures may give even higher numbers, but

machine performance is seriously reduced as rock strength goes up.

- Machine reach: Every roadheader has a different reach. Some machines can provide extra reach with a telescopic boom.
- Permissibility: Most of today's newer roadheader models will meet the explosion proof requirements of gassy or potential gassy environments.
- Automation: Some of the newer roadheaders can operate automatically. The tunnel shape is preprogrammed and the machine excavates based on input survey data. Some machines can also be controlled remotely so the operator can stay farther away from unsupported ground.
- Longitudinal vs. transverse cutter head: The contractor can often choose between the two types of cutterheads. The longitudinal cutterhead is the cone shaped spiral head with cutter picks as shown in Fig 7. The transverse cutterhead looks like a rolling barrel with cutter picks. The transverse cutter head is shown on Fig. 8. ■

FIG. 8

Continuous miner, Sandvik MH 620 (formerly the AHM 105).

NEW TECHNOLOGY

Onsite first time assembly used to build hybrid earth pressure balance machine

Onsite first time assembly (OFTA) of a 10 m (32.8 ft) Robbins Hybrid earth pressure balance machine was completed in Madhya Pradesh, India on March 14, 2011. A commissioning ceremony celebrated the launch of the tunnel boring machine (TBM) at the 12-km- (7.5-mile-) long Sleemanabad Carrier Canal, a water transfer project being built by contractors M/s Patel Engineering, SEW and Coastal Projects Ltd (CPL).

The launch ceremony also marked the first time OFTA has been used on a hybrid EPB. The Robbins-developed method allowed the TBM to be initially assembled on location, rather than in a manufacturing facility. Critical subsystems, such as the electrical and hydraulic systems, were tested before being shipped to the jobsite.

The unique TBM is a fully functional hard rock single shield and soft ground EPB, built to bore in long sections of 180 MPa (26,000 psi) UCS jointed rock and marble, interspersed with clay and gravel. In sections of soft ground, the TBM runs as a standard, pressurized EPB with an abrasion-resistant, shaft-type screw conveyor. When short sections of rock or mixed ground are encountered, the machine can be run in non-pressurized open mode. In longer sections of rock, the machine can be converted to a hard rock single shield setup by switching out the screw conveyor with a TBM belt conveyor.

The crew began excavation on March 31 in full EPB mode, as the first 3 km (1.8 miles) is expected to consist of mainly soft ground. After the initial section, the machine will be operated as a non-pressurized EPB or as a hard rock single shield TBM depending on the ground conditions.

Ole Pederson, Robbins India jobsite manager, cited the remote project location and transport of parts as challenging aspects of the assembly and launch. Local support is easing these difficulties while providing an economic boost to the area. "The launch of this project has brought extra work to local farmers in the region, who supporting operations at the jobsite. Parts delivery and food at the jobsite are also being provided by local businesses," said Pederson.

The Sleemanabad Carrier Canal is part of the larger Bargi Diversion Project for the Narmada Valley Development Authority, a division of the Madhya Pradesh Government. The major trans-valley canal will stretch 194 km (120 mile) from the existing Bargi Dam on the Narmada River to arid areas. Once complete, the Bargi Diversion Project will transfer 152 m^3 (40,000 gallons) of water per second to Katni, Satna, Panna and Jabalpur districts, irrigating over 100,000 hm^2 (250,000 acres) of land. ■

FEATURE ARTICLE

San Francisco area projects will be highlighted at RETC

San Francisco, CA will host about 1,500 tunneling and underground construction professionals from around the world during the biannual Rapid Excavation and Tunneling Conference (RETC), June 19-22.

These professionals are gathering in a city that has seen much underground work throughout its history. And, today, the San Francisco region has more than $4.6-billion in tunneling projects under way.

The RETC will include three-and-a-half days of technical programming, complete with proceedings, two short courses, two field trips and a host of social activities. In addition, the accompanying exhibit has attracted 127 exhibitors in 152 booths, an RETC record.

The following is a brief list of activities that will take place during the conference. A more complete program is provided in the official showguide that is bound into this issue of *Tunneling & Underground Construction*.

The 2011 Rapid Excavation and Tunneling Conference, in San Francisco, CA, is expected to attract about 1,500 professionals.

Short courses

The 2011 RETC will include two one-day short courses, "Grouting in Underground Construction" and "Large Diameter Tunneling Technologies." Both will be held Sunday, June 19 at the Marriott Marquis Hotel.

"Grouting in Underground Construction" will present an overview of the materials, equipment and grouting methods that are used in underground construction in soils and rocks. Content includes an introduction and overview, cements and admixtures, equipment, jet grouting, compaction and permeation grouting, backfill and contact grouting, cellular grouts, chemical grouts, grouting to protect pre-existing structures, and probe hole drilling and pre-excavation grouting. Continuing education credits will be awarded to each attendee.

The course is being coordinated by Ray Henn. Instructors include Henn, Chris Gause, Joe Schatz, Tim Avery, Brad Crenshaw Rich Palladino, Brian Iske, Paul Schmall and Brian Fulcher.

"Large Diameter Tunneling Technology" will provide an overview of the technological developments involving large diameter tunneling, 14 m (45 ft) in diameter. Conventional and mechanical tunneling methods will be covered. The course is recommended for engineers, contractors, owners and consultants who are involved in the design and operation of large tunneling projects.

Course topics include site investigations for large tunnels, selection of excavation methods, tunnel boring machine (TBM) operation and design, tunneling under high water pressures, and machine advance rates and tool life estimations. Other topics include segmental concrete liner design and production, New Austrian Tunneling Method (NATM) design and operation, ground support and stabilization and pipe umbrella techniques. Reviews of several case studies will be part of the course.

Technical programming

The technical programming at the RETC will include 115 papers in 21 sessions. The 1,608-page proceedings volume of the 2011 conference is available from SME Customer Service, 12999 E. Adam Aircraft Circle, Englewood,

Steve Kral, Editor

CO 80112, USA, phone 800-763-3132, 303-948-4200, e-mail cs@smenet.org, www.smenet.org, member $139, student member $139, list $179.

The following is a list of the program topics and their chairs. A complete list of papers and their abstracts are in the official RETC Showguide, bound into this issue of *Tunneling & Underground Construction*.

The technical programming begins at 1 pm, Sunday, June 19 with two sessions. The Contracting Practices/Costs session will be chaired by L. Maday, King County DNRP, Bothell, WA; and J. McNally, McNally Construction, Toronto, ON, Canada. The Owner's Forum will begin at 2:30 pm. It will be chaired by Chris Dixon, Tutor Perini, Seattle, WA.

RETC's accompanying exhibit will feature 127 exhibitors in 152 booths, a conference record.

Monday, June 20. The Large Span Tunnels/Caverns session begins at 8:30 am on Monday. It will be chaired by M. Smithson, Kenny Construction, Northbrook, IL; and N. Sokol, Arup, New York, NY. Also on Monday morning is the Pressure Face TBM Technology session, chaired by M. Krulc, Traylor Brothers, Lakeside, CA; and E. Gemin, Frontier Kemper, North Vancouver, BC, Canada.

Another session on Monday morning is the San Francisco Bay Area Projects session. It will be chaired by C. Ferraz, Caltrans, Oakland, CA; and J. Funghi, SFMTA, San Francisco, CA. The SEM/NATM session rounds out Monday morning's session. It will be chaired by R. Shetty, Frontier Kemper Constructors, Seattle, WA; and A. Rule Aecon Constructors, Toronto, ON, Canada.

Monday afternoon's sessions begin at 1:30 pm. The Difficult Ground session will be chaired by R. Bennett, Frontier Kemper, North Vancouver, BC, Canada; and D. Metcalf, Kiewit Construction, Park Ridge, NJ. The New and Innovative Technologies, running concurrently, will be chaired by F. Ismail, Frontier Kemper, North Vancouver, BC, Canada; and A. Elioff, Parsons Brinckerhoff, Los Angeles, CA.

A session on Pressure Face TBM Case Histories will be chaired by S. Sullivan, Obayashi, Atlanta, GA; and M. Wong, SFPUC, San Francisco, CA. The Risk Management session ends the Monday program. It will be chaired by P. Cassouf, Triad Engineering & Contracting, Walton Hills, OH; and J. Rosteck, J.F. Shea Construction, New York, NY.

Tuesday, June 21. The Design and Planning session begins at 8:30 am. It will be chaired by J. Slavin, Sound Transit, Mississauga, ON, Canada; and B. Zelenko, Parsons Brinckerhoff, Boston, MA. The Geotechnical Considerations session will be chaired by D. Dobbels, Jacobs Associates, Burlington, MA; and V. Paternon, Skanska USA Civil, New York, NY.

Ground Support/Final Lining, also on Tuesday morning, will be chaired by I. Pawlik, Jacobs Associates, San Francisco, CA; and J. Kabat, Michels, Portland, OR. The final morning session will be Water and Gas Control, chaired by J. Johnson, Jacobs Associates, Seattle, WA; and P. Schmall, Moretrench, Rockaway, NJ.

The Drill-and-Blast session begins Tuesday afternoon at 1:30. It will be chaired by S. Lipofsky, J.F. Shea; and L. Jennemyr, Skanska USA, Whitestone, NY. The Future Projects session will be chaired by J. Kirk, CH2M Hill, Vasbon, WA; and T. Stirbys, Parsons, Woodinville, WA. A session on Hardrock TMB's will be chaired by A. Mekkaoui, Jay Dee Contractors, Livonia, MI; and D. Jezek, Hatch Mott MacDonald, Vancouver, BC, Canada. A third afternoon session, Tunnel Rehabilitation, will be chaired by G. Klein, URS, Oakland, CA; and K. Fleming, Michels, Menlo Park, CA.

Wednesday, June 22. The final day of the RETC will include four sessions, each beginning at 8:30 am. The Environment, Health and Safety session will lead off. It will be chaired by S. Tzobery, Parsons, Henderson, NV; and J. Hawley, Hatch Mott MacDonald, San Jose, CA. The Grouting and Ground Modification session will be chaired by C. Heinz, Kenny Construction, Chicago, IL; and R. Guardia, Shannon & Wilson, Seattle, WA.

The Microtunneling and Trenchless session will be chaired by R. Shoulders, Mole Constructors, Beachwood, OH; and T. Abkemeir, Shannon & Wilson, St. Louis, MO. Shafts and Mining will end the technical program of the 2011 RETC. That session will be chaired by B. Roberds, J.S. Redpath, Fernley, NV; and R. Hutton, McNally Construction, Hamilton, ON, Canada.

In addition to the 115 technical presentations, the exhibit will feature the latest in tunneling technology.

Field trips

In addition to the pair of technical sessions and short courses, two field trips to San Francisco area underground construction projects are planned.

The tour on Sunday, June 19 will be to the San Francisco Public Utilities Commission's New Irvington Tunnel project. This tunnel is being driven parallel to the existing Irvington Tunnel at a depth of 9 to 213 m (30 to 700 ft). The 5.6-km- (3.5-mile-) long tunnel will have an internal diameter of 2.6 m (102 in.).

Southland/Tutor Perini is the contractor. It is using conventional mining methods including several roadheaders and controlled detonations. The tour will focus on the Alameda West Portal, one of the project's three main tunneling locations.

The second tour, the Sunnydale Auxiliary Sewer Project, will be take place on Wednesday, June 22. The Sunnydale tunnel is designed to prevent flooding of residences near San Francisco Bay during storm events. The 2.4- to 3.7-m- (8- to 12-ft-) diameter tunnel is 1.2 km (4,000 ft) long. It will require a single-pass, segmentally lined earth-pressure-balance drive, a microtunneled drive, a jacked-shield and a short cut-and-cover section. The tunnel crosses through a variety of soft ground and highly variable Franciscan Formation bedrock.

Social events

The welcoming luncheon, scheduled for Monday, June 20, will feature James Stefanic as the speaker. Stefanic, with Geotec Boyles Bros., was one of the principals involved in the rescue of the 33 miners trapped in Chile's San Jose Mine last year. He will discuss the rescue and the technology involved.

The Underground Construction Association of SME's breakfast is set for Tuesday, June 21 at 7 am. UCA Chairman David Klug will discuss UCA activities this past year. He will also report on the division's activities with the International Tunnelling Association. And Klug will introduce incoming UCA of SME chair, Jeff Petersen.

The RETC dinner will begin with a reception at 6 pm in the Marriott Marquis Hotel. The dinner is sponsored by MWH Global and Herrenknecht Tunneling Systems USA.

RETC Executive Committee

The 2011 Rapid Excavation and Tunneling Conference is the result of a large amount of hard work by its executive committee. Members include Dave Rogstad, chair, of Frontier Kemper; Red Robinson, vice chair, of Shannon & Wilson; John Hutton, of S. McNally International; Gary Almeraris, of Skanska USA Civil Northwest; Bill Mariucci, of Kiewit Construction; Chris Dixon, of Tutor Perini; John Townsend, of Hatch Mott MacDonald; Michael Traylor, of Traylor Brothers; Victor Romero, of Jacobs Associates; Steve Redmond, of Frontier Kemper; and Michael A. DiPonio, of Jay Dee Contractors.

The RETC International Committee includes Ted Nye, Australia, Mott MacDonald; Christian Neumann, Austria, Beton-und Monierbau; Rick P. Lovat, Canada, Lovat Tunnel Equipment; Ross Dimmock, England, Mott MacDonald; Jean-Claude Amet, France, Vinci Construction Grands Project; Klaus Rieker, Germany, Wayss & Freytag; Remo Grandori, Italy, SELI Societa Esecuzione Lavori; Roberto Gonzalez Izquierdo, Mexico, Moldequipo International; Enrique Fernandez Gonzales, Spain, Dragados; Stig Eriksson, Sweden, Skanska Infrastructure Development; and Frederic Chavan, Switzerland, Marti Contractors.

Upcoming UCA of SME meetings

The UCA of SME's 2012 North American Tunneling Conference is scheduled for June 24-27 at the J.W. Marriott Indianapolis Hotel in Indianapolis, IN. The biannual meeting includes technical programming, a proceedings volume and an exhibit.

The annual George A. Fox Conference will once again be at the Graduate Center, City University of New York. This one-day technical paper conference is set for Jan. 24, 2012. For information on both conferences, contact SME Meetings Department, phone 800-763-3132, 303-948-4200, e-mail sme@smenet.org. ■

Robbins double shield breaks through on Sochi project

In early March 2011, a 6.2 m (20.3 ft) diameter Robbins Double Shield tunnel boring machine (TBM) crossed the finish line in Sochi, Russia. The machine completed a 4.5-km- (2.8-mile-) long section of tunnel that will ultimately become part of the transportation infrastructure for the 2014 Winter Olympic Games. The TBM advanced through difficult ground at average rates of 100 to 120 m/week (330 to 390 ftpw) for contractor OJSC Bamtonnelstroy, a division of the SK Most Company.

The section of tunnel will ultimately become a service tunnel for Complex #3 — a section of Sochi's transportation infrastructure under construction, which includes road and rail tunnels. A second, 10 m (32.8 ft) diameter Robbins Double Shield TBM is currently excavating the parallel 4.6-km- (2.9-mile-) long main railway tunnel using a continuous conveyor system for efficient muck removal. A 13.2 m (43.3 ft) diameter highway tunnel is also under construction.

A Robbins Shield is excavating the 4.6-km (2.9-mile) main railway tunnel at Sochi, Russia's Complex #3.

The 6.2 m (20.3 ft) Robbins TBM achieved high rates despite difficult conditions. The tunnels run through mixed ground including massive to completely fractured limestone with clay seams. Some sedimentary rock including sandstone and siltstone is present, along with fault zones consisting of breccias and conglomerates. In May 2010, the machine was stopped after encountering a significant fault zone consisting of broken rock and running soft ground. Field service personnel and crew successfully freed the machine by excavating a bypass tunnel around the TBM, freeing the cutterhead. Following the restart, a combination of continuous probe drilling and ground treatment with cement silicate and foam kept the machine moving forward.

While the service tunnel is now complete and lined, work still remains on the main rail tunnel. The 10 m (32.8 ft) diameter double shield was modified and repaired by Robbins site personnel prior to the start of excavation. The TBM is currently 726 m (2,382 ft) into its portion of tunnel, with an expected completion date of March 2012.

All together, more than 20 road and rail tunnels totaling 40 km (25 miles) are under construction from Adler to Alpika areas, in anticipation of the 2014 Winter Olympic Games in Sochi. Project owner DCRC-Sochi, a subsidiary of Russian Railways, hopes to complete all rail and road infrastructure by June 2013.

Robbins TBM sets record in China

One of two 6.3-m- (20.7-ft-) diameter Robbins earth pressure balance tunnel boring machines (EPB TBM) working at for Zhengzhou's Line 1 in Zhengzhou, China, achieved a project record of 720 m (2,362 ft) in one month. Daily rates have been as high as 22 rings (33 m/108 ft) in two 10-hour shifts. The rates are not only a project record amongst nine other machines on the project, but also rank as some of the highest rates ever recorded for Chinese EPB TBMs in the 6 to 7 m (20 to 23 ft) diameter range.

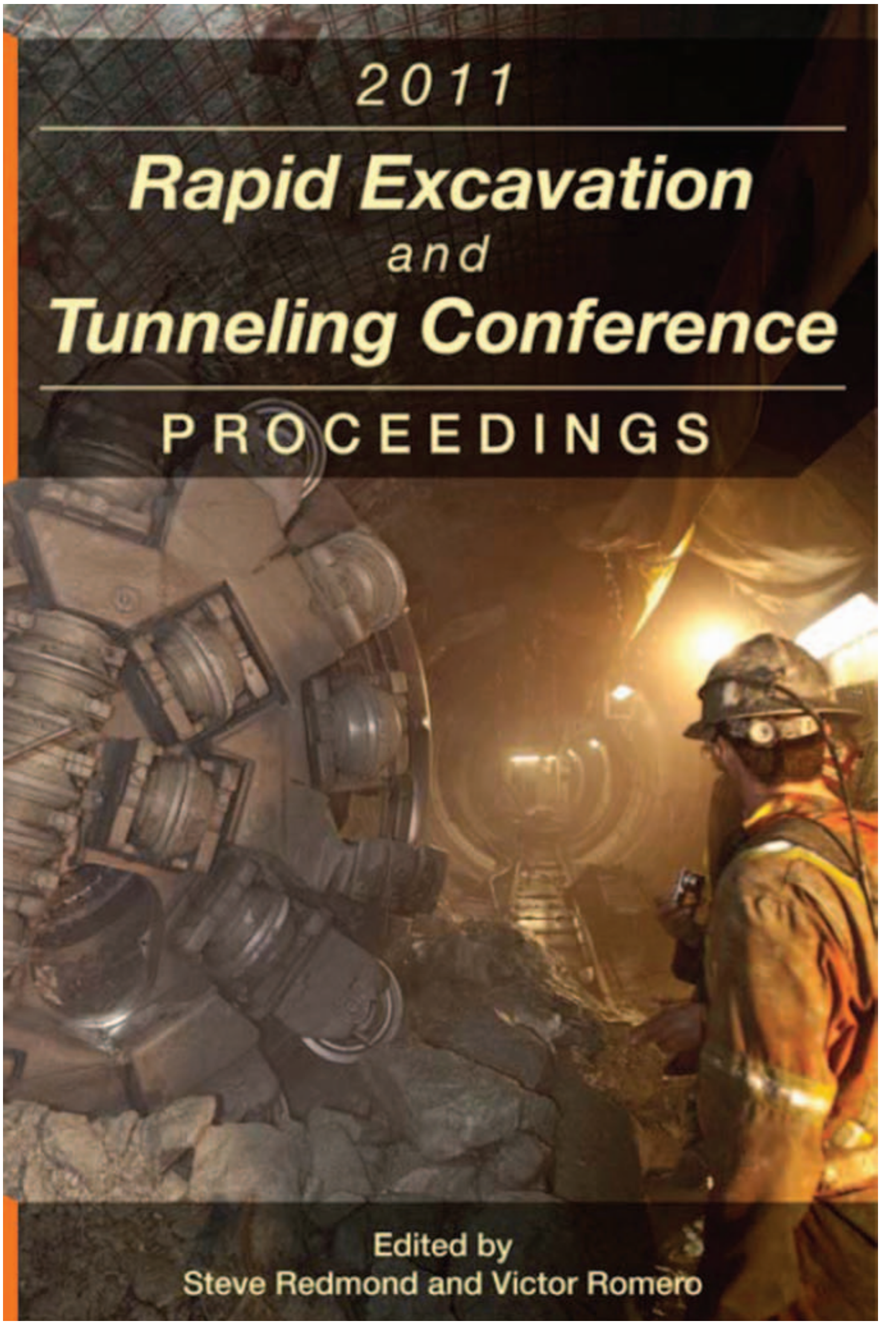
The Robbins machines were launched in November and December 2010, and have each achieved intermediate breakthroughs into a cut-and-cover station site, most recently on March 29, 2011. The TBMs emerged into the station at the 1,300 m (4,250 ft) mark after excavating in conditions including soft, powdery soils — a benefit for swift tunnel boring. "The breakthroughs went perfectly. Machine downtime during tunneling has been very minimal, and the organization of this project has been very good," said Zhou Shuqing, general mechanical and electrical engineer for contractor CRCC, 11th bureau. Ground in later sections of the tunnels is expected to consist of clay, fine sand, loess, and some pebbles, with little groundwater.

Both EPBs, for the 11th Bureau of the China Railway Construction Corp. (CRCC), are excavating under downtown areas with cover as low as 8 m (26 ft) for nearly half of the tunnel length. The parallel 3.6-km (2.2-mile) long tunnels are passing through four intermediate stations between Kaixuan and Tongbo areas of the city. All sections are expected to be complete by September 2011.

The high advance rates are being achieved despite challenges including a section of tunnel just 7 m (23 ft) below Xi Liu Lake, and nearby structures such as building foundations and a highway interchange bridge. In order to reduce settlement, foam and bentonite are being injected for soil conditioning. The advance rates and muck removal volume are being closely monitored to prevent subsidence. ■

NEW MEDIA

RETC 2011 Proceedings



2011, edited by Steve Redmond and Victor Romero, SME Customer Service, 12999 E. Adam Aircraft Cirle, Englewood, CO 80112, phone 1-800-763-3132, 303-973-9550, fax 303-933-6269, e-mail cs@smenet.org, Web site www.smenet.org. ISBN-13: 978-0-87335-343-4. Book order no. 343-4. 1,608 pages plus CD, 5 lbs. $139 Member, $139 Student Member, $179 Non-Member/List

Every two years, industry experts and practitioners from around the world gather at the prestigious Rapid Excavation and Tunneling Conference (RETC) to learn about the latest developments in tunneling technology, and the signature projects that help society meet its growing infrastructure needs.

Inside this authoritative 1,608-page book, readers will find the 115 influential papers that were presented providing valuable insights from projects worldwide. Readers will gain from the lessons learned — often the hard way — from large and demanding projects in difficult ground conditions.

This book will take the reader underground for a practical, up-close look into headline-making projects from around the globe. Virtually every aspect of tunneling is examined. It is an indispensable resource for design and construction engineers and contractors in the large-scale civil tunnel industry who want to stay on the leading edge of their profession.

- Contracting practices and costs
- Design and planning
- Difficult ground
- Drill and blast
- Environment, health and safety
- Future projects
- Geotechnical
- Considerations
- Ground support and final lining
- Grouting and ground modification
- Hard rock TBMs
- Large span tunnels and caverns
- Microtunneling and trenchless tunneling
- New and innovative technologies
- Pressure face TBM case histories
- Pressure face TBM technology
- Risk management
- San Francisco Bay area projects
- SEM/NATM
- Shaft and mining
- Tunnel rehabilitation
- Water and gas control ■

TUNNEL NAME	OWNER	LOCATION	STATE	TUNNEL USE	LENGTH (FEET)	WIDTH (FEET)	BID YEAR	STATUS
Gateway Tunnel project	Amtrak	Newark	NJ	Subway	8,000 x 2	24.5	2014	Under study
2nd Ave. Phase 2-4	NYC-MTA	New York	NY	Subway	105,600	20	2012-20	Under design
Water Tunnel #3 bypass tunnel	NYC-DEP	New York	NY	Water	20,000	15	2015	Under design
Water Tunnel #3 Stage 3 Kensico	NYC-DEP	New York	NY	Water	84,000	20	2017	Under design
Cross Harbor Freight Tunnel	NYC Reg. Develop. Authority	New York	NY	Highway	25,000	30	2013	Under design
Cross Sound Link Highway Tunnels	Sound Link	Long Island	NY	Highway	190,000	55	2014	Under design
Clinton CSO Tunnel	City of Syracuse	Syracuse	NY	CSO	2,000	17	2011	Advertising 05/12/2011
Silver Line Extension	Boston Transit Authority	Boston	MA	Subway	8,400	22	2013	Under design
Hartford CSO program	MDC	Hartford	CT	CSO	32,000	20	2013	Under design
East-West Subway Extension	Baltimore MTA	Baltimore	MD	Subway	32,000	18	2012	Under design
WASA CSO Program Blue Plains Tunnel Anacostia River Tunnel Northeast Branch Tunnel Northeast Boundry Tunnel	DC Water and Sewer Authority	Washington	DC	CSO CSO CSO CSO	23,400 12,500 11,300 17,500	23 23 15 23	2011 2013 2018 2021	T-S- JD JV Under design Under design Under design
North/South Tunnel	Georgia DOT	Atlanta	GA	Highway	77,000	41	2015	Under design
ISCS Dekalb Tunnel	Dekalb County	Decatur	GA	CSO	26,400	25	2013	Under design
Lockbourne Interceptor Sys. Tunnel	City of Columbus	Columbus	OH	Sewer	10,000	12	2012	Under design
Olentangy Relief Sewer Tunnel	City of Columbus	Columbus	OH	Sewer	58,000	14	2012	Under design
Alum Creek Relief Sewer Tunnel	City of Columbus	Columbus	OH	Sewer	74,000	10 - 18	2014	Under design
Black Lick Tunnel	City of Columbus	Columbus	OH	Sewer	32,000	8	2013	Under design
Euclid Creek Tunnel	NEORSD	Cleveland	OH	CSO	18,000	24	2010	McNally/ Kiewit JV
Dugway Storage Tunnel	NEORSD	Cleveland	OH	CSO	16,000	24	2014	Under design
Lower Mill Creek CSO Tunnel	M.S.D. of Greater Cincinnati	Cincinnati	OH	CSO	6,350	30	2015	Under design
Black River Storage Tunnel	City of Lorain	Lorain	OH	CSO	5,700	19	2011	Advertize July 2011
Water Treatment Plant #4	City of Austin	Austin	TX	Water intake	45,000	7 to 9	2010	Obayashi/ Manson

TUNNEL NAME	OWNER	LOCATION	STATE	TUNNEL USE	LENGTH (FEET)	WIDTH (FEET)	BID YEAR	STATUS
Jollyville Water Trans. Main	City of Austin	Austin	TX	Water intake	25,000	12	2011	Bid date 06/07/2011
Deep Rock Connector Tunnel	City of Indianapolis DPW	Indianapolis	IN	CSO	40,000	18	2011	Bid date 07/12/ 2011
Pogues Run Tunnel	City of Indianapolis DPW	Indianapolis	IN	CSO	11,000	18	2013	Under design
Drumanard Tunnel	Kentucky DOT	Louisville	KY	Highway	2,200 x 2	35	2012	Under design
North Link Light Rail Extension	Sound Transit	Seattle	WA	Transit	34,000	21	2013	Under design
Alaskan Way Highway Tunnel	Washington DOT	Seattle	WA	Highway	10,500	54	2011	Seattle Tunnel Partners
Central Subway Tunnel	S.F. Municipal Trans. Authority	San Francisco	CA	Subway	16,600	20	2011	Bid date 05/25/2011
San Francisco DTX	Transbay Joint Powers Authority	San Francisco	CA	Transit	6,000	35 to 50	2012	Under design
L.A. Metro Regional Connector	Los Angeles MTA	Los Angeles	CA	Subway	20,000	20	2012	Under design
LA Metro Wilshire Extension	Los Angeles MTA	Los Angeles	CA	Subway	24,000	20	2013	Under design
SVRT BART	Santa Clara Valley Trans. Authority	San Jose	CA	Subway	22,700	20	2011	Under design/ delayed
BDCP Tunnel #1	Bay Delta Conservation Plan	Sacramento	CA	Water	26,000	29	2014	Under design
BDCP Tunnel #2	Bay Delta Conservation Plan	Sacramento	CA	Water	369,600	35	2016	Under design
Kaneohe W.W. Tunnel	Honolulu Dept. of Env. Services	Honolulu	HI	Sewer	15,000	13	2012	Under design
Spadina Line Extension - South Tunnel	Toronto Transit Commission	Toronto	ON	Subway	11,000	18	2010	McNally/Kiewit/ AECON
Spadina Line Extension - North Tunnel	Toronto Transit Commission	Toronto	ON	Subway	11,000	18	2010	OHL/FCC JV
Eglinton West Tunnel	Toronto Transit Commission	Toronto	ON	Subway	10 km	6 m	2011	Under design
Yonge Street Extension	Toronto Transit Commission	Toronto	ON	Subway	15,000	18	2013	Under design
Downtown LRT Tunnel	City of Ottawa	Ottawa	ON	Transit	10,000	20	2013	Under design
Port Mann	Greater Vancouver Regional District	Vancouver	BC	Water	3,300	10.5	2010	McNally/AECON JV
Evergreen Line Project	Trans Link	Vancouver	BC	Subway	10,000	18	2012	Under design
UBC Line Project	Trans Link	Vancouver	BC	Subway	12,000	18	2014	Under design
Kicking Horse Canyon	BC Dept.of Trans.	Golden	BC	Highway	4,800 m x 2	45 x 32	2012	Under design
LRT Expansion North	City of Edmonton	Edmonton	BC	Subway	370 m x 2	6 m	2011	Bid date 2Q 2011

UCA Executive Committee announces new members

Five new members will join the Executive Commttee of the Underground Construction Association (UCA) Division of SME during the Rapid Excavation and Tunneling Conference this June. They will begin their terms on June 23, 2011.

The committee also welcomes Jeff P. Peterson as incoming committee chair and William W. Edgerton as incoming vice chair.

Jeff P. Petersen, Committee Chair

Petersen is vice president of Kiewit Construction Co., a subsidiary of Kiewit Corp. He also serves as district manager for Kiewit's nationwide underground contracting operations. He is responsible for the overall planning and direction of construction, engineering, estimating, bidding and administration of all work for the underground district. Petersen joined Kiewit in 1988 after receiving his construction engineering degree from Oregon State University. He began his career in Kiewit's operations in the Pacific Northwest, serving as project engineer, superintendent, project manager and sponsor on some of Kiewit's largest and most challenging projects. Petersen became a member of The Moles in 2006.

PETERSEN

William W. Edgerton, Committee Vice Chair

Edgerton is a principal with Jacobs Associates, headquartered in San Francisco, CA. For the past 10 years, he has served as the president, directing strategic planning, business development and administration. He also acted as the principal-in-charge and worked in a technical capacity on various underground projects. He served as chair of the UCA of SME Steering Committee, which recently completed "Recommended Contract Practices for Underground Construction," and currently serves on the UCA of SME Executive Committee. He also serves as an American Society of Civil Engineers program evaluator on behalf of ABET. He received his B.S. in civil engineering at Tufts University and his M.B.A. in procurement and contracting at George Washington University. He is licensed as a professional engineer in 10 states.

During the first 17 years of his career, he worked in project management, cost estimating and dispute resolution for construction contractors on projects throughout the eastern United States. In the more than 20 years he has worked for Jacobs Associates, he has represented owners and contractors as a dispute resolution consultant. He has worked on design-build and design-bid-build projects for contractors and for owners.

EDGERTON

Judy Cochran

Cochran manages the construction program for the Brightwater conveyance facilities for the King County, WA Wastewater Treatment Division. The conveyance program includes 20.8 km (13 miles) of tunnels and the influent pump station that will pump wastewater to the new Brightwater Treatment Plant, beginning in summer 2011. From 1996 to 2005, she was project manager (design through construction) of the Denny Way/Lake Union combined sewer overflow control project, which included the Mercer Street Tunnel and microtunnels in the south Lake Union area of Seattle, WA. Prior to that, she was program manager for the West Point Secondary Facilities Project.

Cochran holds a master's degree in urban studies from the University of Maryland and a bachelor's degree from Wellesley College.

COCHRAN

Heather Ivory

Ivory is a leader in the URS tunnel and underground structure practice, a registered member of SME and has authored or co-authored 14 technical papers. She has served the underground industry

UCA EXECUTIVE COMMITTEE

IVORY

through her involvement on the organizing committees for the North American Tunneling (NAT) conferences in 2008, 2010 and 2012 and as the NAT 2012 conference chair. She has an M.S. degree in engineering and a B.S. degree in geology with experience in all aspects of underground management, planning, risk analysis, design and construction.

Ivory has acted as the design manager on more than $8 billion in tunnel projects, and she has held a significant role in another $4 billion worth of projects. She has developed and managed tunnel design field services. She is experienced in construction engineering, management and the design of cut-and-cover, TBM, EPBM, NATM/SEM, microtunnel, drill-and-blast, hand mining, HDD and pipe-jacking tunnels. Her rehabilitation experience includes more than 304,800 m (1 million ft) of pipe assessment and rehabilitation work and cured-in-place relining, slip lining, pipe bursting, pipe reaming and structural grouting and patching projects. She has held a significant role in more than 354 km (220 miles) of tunnel projects with total estimated construction cost of more than $12 billion.

Nasri Munfah

MUNFAH

Munfah is a senior vice president and the national tunneling practice leader for Parsons Brinckerhoff (PB). He oversees all of PB's tunneling and underground projects in North and South America. He is a member of several tunneling and underground societies, including the UCA of SME and the International Tunnelling Association. He has experience in the project management, engineering management and construction management of multibillion dollar underground and tunneling projects, from feasibility and conceptual engineering through final design and construction. He was a principal author of the Federal Highway Administration's *Tunnel Design Manual*, the first of its kind in the United States. Munfah has been involved in the Central Subway in San Francisco, CA, the Access to the Region's Core in New Jersey, the East Side Access in New York, the Eurasia Tunnel in Istanbul, Turkey and the 63rd Street Connector in New York. Munfah is currently an adjunct professor at Columbia University and teaches a graduate-level course on the design and construction of tunnels and underground structures. He has written more than 40 articles and technical papers. He is recipient of several awards, including the American Council of Engineering Companies' Grand Conceptor Award.

Michael F. Roach

ROACH

As chief engineer of Traylor Brothers' Underground Division, Roach is responsible for construction engineering, cost estimates and CPM development and analysis. Throughout his 24-year career with Traylor Brothers, he has also worked as a field engineer, project engineer, project manager and quality assurance auditor.

A graduate of University of Michigan, Roach obtained his B.S. in civil engineering and passed the engineer-in-training exam in 1986. He has been recognized for his expertise in soft ground and hard rock tunneling, design work, grouting, precast and cast-in-place liners and ground conditions. As a part of Traylor's Underground Division, he has been instrumental in making the company into one of the nation's top contractors. Roach has held conference leadership roles with RETC and NAT and has written many publications.

Leonard A. Worden

During the past 40 years, Worden has founded more than a dozen successful companies and launched innovative products serving the heavy construction, telecom and defense industries. He founded the market-leading precast concrete products company in the Northeast

(Continued on page 34)

UCA Education Committee makes changes

David R. Klug, UCA of SME chair

The objective of the Executive Committee of the UCA of SME is to make the division responsive to the needs of the industry while being realistic on what can be done by industry volunteers who serve as committee chairs and committee members. The committee has recently made some changes that will affect how it responds to the needs of the membership and the underground construction industry.

The Education Committee is currently chaired by William Edgerton, president of Jacobs Associates of San Francisco, CA. Edgerton was recently elected vice chair of the UCA of SME and will be stepping down as chair of the committee. The new chair of the Education Committee will be David Chapman, president of Lachel & Associates in Morristown, NJ.

The education of new engineers and technicians is very important to the growth and future success of our industry. SME has decided upon a path that will make the association a tool in this process as our membership has the knowledge that must be transferred to the new generation of people entering into our industry. The new scope and mission of the Education Committee will make these industry resources available to educators. These may include traditional university courses, short courses at conferences, Internet course offerings or company in-house seminars.

The Education Committee will not develop specific industry programs but will focus on serving in a review capacity and provide input. This input will include the course offerings needed by the underground design and construction industry, at which levels various courses should be taught, the content of proposed courses and industry experts to lecture on specific subject matter.

Using the new focus of the Education Committee, Chapman will select committee members to assist him and the UCA Executive Committee in the new endeavor. The Education Committee will be restructured as a steering committee, it will not prepare course offerings. The primary tasks will include:

- Soliciting feedback from UCA members on desired educational programs.
- Determining the criteria that should apply for a UCA-approved course offering.
- Evaluating submittals from education providers, providing comments and approvals.
- Maintaining a list of approved course offerings.
- Maintaining a list of industry experts for specific industry lecture subjects.
- Maintaining a list of International Tunnelling Association programs that are available to the UCA members.

The objective is not to compete with academia but to provide access to the industry. Educators may request input from the UCA regarding proposed course offerings. The Education Committee will review the material provided, provide comments and approve the course offering. The education provider would be permitted to advertise the course offering as "UCA Approved."

New committee members

The committee is soliciting expressions of interest from industry personnel who desire to assist Chapman and contribute to the industry by serving on the Education Committee. New committee members will be selected by the new chair and UCA Executive Committee members. All committee members will be new, as the mission of the committee has changed. The goal is to have a diverse group from all sectors of the industry, owners, contractors, design engineers and suppliers.

If you desire to be a member of the UCA Education Committee, please send the UCA an expression of interest on or before July 15, 2011 with your name, mailing address, e-mail address, telephone, cell phone, company affiliation, a short biography, a short statement on how you can contribute to the committee and a short statement on what the UCA committee needs to do. Submit your application to Mary O'Shea, SME, 12999 E. Adam Aircraft Cir., Englewood, CO 80112-4167, phone 303-948-4211, e-mail oshea@smenet.org. If you have questions or want to discuss committee matters, contact David R. Klug, president, David R. Klug & Associates, phone 724-942-4670, e-mail dklug@drklug.com.

Meeting at RETC

The UCA Executive Committee will assist in choosing the new Education Committee members after a sufficient number of letters of interest have been received. This process should be complete by Aug. 1, 2011, at which time the new members will be notified.

The UCA Education Committee will hold a special meeting at 10 a.m. on June 22, 2011 in San Francisco, CA during the RETC that will be open to anyone. The meeting will be chaired by Klug and assisted by Edgerton and Chapman. The purpose is to outline a new strategy for the committee, give potential committee members an opportunity to ask questions and solicit industry input. Chapman will be formally installed as the new committee chair during the UCA Executive Committee meeting that will follow in the

(Continued on page 34)

PERSONAL NEWS

HAMID NAZERI (SME), Advanced Terra Testing, received the Richard S. Ladd Standards Development Award from ASTM International for the development of a rock mechanics testing standard on the measurement of rock abrasivity for tunneling purposes. He was recognized for the time and effort spent in preparing ASTM standard designation D7625 *"Standard Test Method for Laboratory Determination of Abrasiveness of Rock Using the CERCHAR Method."*


HAIG

BETHAN HAIG has joined Tam-Normet as a project manager for tunneling and mining in the United Kingdom. Haig is a chartered civil engineer with experience in the design of tunnels with Mott MacDonald. Most recently, she worked on the C121 sprayed concrete lining design contract of Crossrail. Her design experience includes the primary linings of the A3 Hindhead road tunnels using the numerical modeling techniques developed for the Crossrail lining design. She is a member of the British Tunnelling Society's Young Members Group. ■

UCA EXECUTIVE COMMITTEE

(Continued from page 32)


WORDEN

and the premier precast concrete tunnel liner company in North America. His companies have supplied precast concrete products for a variety of major highway and bridge projects.

Worden entered the precision precast concrete segmental tunnel liner business in 1991 by supplying segmental tunnel lining for the Boston Harbor Effluent Outfall Tunnel project. His tunnel segment production system produced segments with quality and efficiency. He formed CSI Tunnel Systems to supply tunnel segment design and production to more than 12 tunnel projects, including the Subway Transit Expansion project for the Toronto Transit Commission, the Big Walnut Augmentation/Rickenbacker Sanitary Interceptor project in Columbus, OH and the King County Brightwater Conveyance System Tunnels. CSI Tunnel Systems is currently involved in four segmental tunnel projects in California, Ohio, and New York City.

Worden is past chair of the National Precast Concrete Association (NPCA), a recipient of the Yoakum Award, the NPCA's highest honor for leadership and inspiration in the precast industry, and a past board member of the American Concrete Pipe Association. He is a member of various committees of the American Society for Testing and Materials and a member American Society of Mechanical Engineers. ■

AWARDS

ACEC honors Hatch Mott MacDonald projects

Four projects of Hatch Mott MacDonald (HMM) were finalists in the American Council of Engineering Companies' (ACEC) 45th Annual Engineering Excellence Awards competition.

- Overpeck Creek Relief Sewer for the Bergen County, N.J., Utilities Authority.
- Norfolk Southern Railroad's Heartland Corridor Project at locations in Virginia, West Virginia, Kentucky and Ohio (with team members STV; HDR Inc. and Anderson & Associates).
- Edison Force Main Tunnel project for the Middlesex County, NJ, Utilities Authority.
- North Dorchester Bay Combined Sewer Outfall Tunnel Project in Boston, MA (a joint venture of HMM and Shaw).

The projects were among 161 engineering projects recognized by ACEC as pre-eminent engineering achievements for 2010. Judging for the Engineering Excellence Awards, known as the Academy Awards of the engineering industry, took place in February 2011 by a panel of more than 30 engineers, architects, government representatives, media member and academics. Criteria for awards include uniqueness and originality, technical, social and economic value, complexity and success of the projects in meeting goals. ■

EDUCATION COMMITTEE

(Continued from page 33)

same room at 11 a.m. The Education Committee is re-forming itself to be more beneficial to the industry, while recognizing that our members are volunteers with limited time and resources. The committee believes that fully accredited academic programs are required for the tunneling industry, but that these are best left to academia. They have the personnel and financial resources to develop such programs. We want the new Education Committee to provide access to knowledgeable people who want to contribute to the future of the industry. ■

June 2011

19-22, RETC, San Francisco, CA. Contact: Meetings Department, SME, 12999 E. Adam Aircraft Circle, Englewood, CO 80112 USA, phone 800-763-3132 or 303-979-3461, e-mail sme@smenet.org, website www.smenet.org.

September 2011

19-21, Colorado School of Mines Tunnel Short Course, Golden, CO. Contact: Office of Special Programs and Continuing Education, Colorado School of Mines, 1600 Jackson Street, Suite 160A, Golden, CO 80401, phone 303-279-5563, fax: 303-277-8683, e-mail: space@mines.edu, website www.csmspace.com.

February 2011

19-22, SME Annual Meeting, Seattle, WA. Contact: Meetings Department, SME, 12999 E. Adam Aircraft Circle, Englewood, CO 80112 USA, phone 800-763-3132 or 303-979-3461, e-mail sme@smenet.org, website www.smenet.org.

More meetings information can be accessed at the SME website — http://www.smenet.org.

March 2012

27-29, INTERtunnel 2012, Lingotto Fiere, Turin, Italy. Contact: Romeland House, Romeland Hill, St Albans, AL3 4ET, Great Britain, phone 440-1727-814-400, fax 440-1727-814401.

14-16, International Symposium on Tunnel Safety and Security 2012, Roosvelt Hotel, New York, NY. Contact: SP Technical Research Institute of Sweden, Box 857, SE-501 15 Borås Phone +46 10-516 50 00, e-mail info@sp.se, website www.istss.se/en/Sidor/default.aspx.

27-31, NASTT's 2012 No-Dig Show, Gaylord Opryland Resort and Convention Center, Nashville, TN. Contact: Michelle Hill, Benjamin Media, Inc. 1770 Main St., P.O. Box 190, Peninsula,OH 44264-0190 USA, phone 330-467-7588, fax 330-468-2289, e-mail mmagyar@benjaminmedia.com, website www.benjaminmedia.com.

May 2012

18-23, ITA World Tunnel Congress, Bangkok Thailand. Contact: Thailand Underground & Tunnelling Group (TUTG), e-mail: info@wtc2012.com, website www.wtc2012.com. ■

UCA of SME Member Directory

Jarrett E. Carlson

Keith E. Caro
caro@pbworld.com

Jon R. Carpenter

Hugh P. Caspe

Rafael Castro
castro@jacobssf.com

Brad Cavitt
brad.cavitt@kiewit.com

David R. Chapman
dchapman@lachel.com

Mark A. Charlton
mcharlton@cowin-co.com

Michael L. Cherry
michaellcherry@gmail.com

Dwight Chewning
dwight.chewning@jacobs.com

Joseph B. Clare

Gordon T. Clark
clark@pbworld.com

Kyle L. Clark
kyclark@mines.edu

Robert Clarke
bclarke@asi-group.com

Thomas J. Clemens
tom.clemens@dsiunderground.com

Geoffrey T. Clemens
geoff.clemens@dsiunderground.com

Judy Cochran

Jacob A. Coibion
JacobC@SJLouis.com

Bradley K. Coleman
bassman454@hotmail.com

Phil Colton
philip.colton@parsons.com

Greg Colzani
gcolz@yahoo.com

Richard L. Conte
conter@pbworld.com

Austin M. Cooney
acooney@kennyconstruction.com

Joseph D. Cooper
amscooper@aol.com

Laine Coppola
lainec@cox.net

Edward J. Cording
cordingconsult@gmail.com

David H. Corkum
dcorkum@donovanhatem.com

Michael S. Corley
mcorley2@mix.wvu.edu

Arthur B. Corwin
acorwin@mtac.com

Noah S. Corwin
ncorwin@judlau.com

Claudio Cossio
claudio.cossio@cementation.us

Benjamin M. Cote
bcote@geiconsultants.com

John J. Cowin Sr.
jcowinsr@cowin-co.com

Sean Cox
scox@bradymining.com

Dolph Crawley
dandmcrawley@earthlink.net

Pablo Cremades
polco86@hotmail.com

Brad A. Crenshaw
bcrenshaw@nicholsonconstruction.com

John W. Critchfield
john.critchfield@jacobs.com

Shane Cross
crossmax2006@yahoo.com

David R. Crouthamel

Matthew R. Crow
matthew.crow@kbr.com

Sarah R. Dahlin
sdahlin@email.arizona.edu

Mike Daigh
mdaigh@daighcompany.com

John C. Daigh
jdaigh@daighcompany.com

George D. Daily
gdaily@hrgray.com

William F. Daly
dalyw@pbworld.com

Patricia C. Darnell
pdarnell@stacywitbeck.com

Charles W. Daugherty
daugherty@pbworld.com

Glenna Davenport
glenna.s.davenport@bhpbilliton.com

Gregg W. Davidson
davidson@jacobssf.com

Kenneth Davidson
davidsonk@pbworld.com

David A. Day
dday@dlzcorp.com

William A. Dean
bdean@frontierkemper.com

Daniel A. DeAntonio
ddeantonio@cartech.com

Hubert Deaton
hubert@schnabel.com

Jeramy B. Decker
jeramy.decker@kiewit.com

Don W. Deere

Larry DeGraff
larry.degraff@dsiunderground.com

Thomas M. DeGrio
deconco25@yahoo.com

Don E. Del Nero II
don.delnero@ch2m.com

Candace R. DeLeon
cddj@chevron.com

Erik S. Denver
edenver@heintzmann.com

Sean R. Dereski
sean.dereski@mines.sdsmt.edu

Nicolas S. Dhillon
ndhillon@rogers.com

Joe A. DiBridge
joedibridge@wholesaleminesupply.com

Deborah Dickson
dicksond@herrenknecht.com

Bryan A. Diffley

Robin B. Dill
rob.dill@aecom.com

John D. DiPonio
jdiponio@jaydee.com

Thomas S. DiPonio
tdiponio@jaydee.com

Michael A. DiPonio
madiponio@jaydee.com

John T. DiPonio
jtdiponio@jaydee.us

Randall C. Divito
randall.divito@hatchmott.com

Chris W. Dixon
chris.dixon@tutorperini.com

Malcolm Dixon
malcolm.dixon@ghd.com.au

Peter F. Donahue
donahuep@pbworld.com

Thomas A. Donnelly
thomas.donnelly@hdrinc.com

Peter M. Douglass
pmdouglass@aol.com

Ted Dowey
decsyst@aol.com

Barry R. Doyle
barry.r.doyle@mwhglobal.com

Ian J. Duckworth
ian_duckworth@fmi.com

Steven K. Duke
steve_duke@geopentech.com

Steve Dunlop
steve.dunlop@mti.ca

Paul W. Dutton III
Dutton@jacobssf.com

Elizabeth Dwyre
dwyre@pbworld.com

Gerald L. East

Larry Eckert
lawrence.eckert@parsons.com

William W. Edgerton
edgerton@jacobssf.com

David F. Egger
eggerdf@bv.com

Eric D. Eisold
eeisold@bradshawcc.com

Refik Elibay
refik.elibay@jacobs.com

Amanda Elioff
elioff@pbworld.com

Christopher Engquist

Yucel Erdem
erery@superonline.com

Soren D. Eskesen
sde@cowi.dk

Randall J. Essex
randy.essex@hatchmott.com

Louis Falco
lfalco@csigroup.com

Terry L. Fallesen
terry.fallesen@sce.com

Ke Fan
fan@pbworld.com

Ray Farley
burbankray@aol.com

Ebrahim Farrokh
exf170@psu.edu

Conrad W. Felice
conrad.felice@cwfelicellc.com

Michael S. Feroz
mikeferoz@aol.com

David P. Field
david.field@hatchmott.com

Jef J. Figueroa
jeffigueroa@mines.utah.edu

Joshua Fink
joshua.fink7@gmail.com

Mitchell L. Fong
fongm@pbworld.com

Roozbeh Foroozan
rzforoozan@gmail.com

Matthew E. Fowler

Steven B. Fradkin
sbfradkin@gmail.com

Glen D. Frank
gfrank@jaydee.us

Paul A. Franzen
paul.franzen@barnard-inc.com

Luke P. Frash
lfrash@mines.edu

S Thomas Freeman
tom_freeman@geopentech.com

UCA of SME Member Directory

Eldon L. Abbott
abbott@pbworld.com

Kenneth E. Abbott
kenabbott@att.net

Ian Abbott
ianabbottaz@yahoo.com

Alan C. Abrams
alan.abrams@atkn.com

Lee W. Abramson
lee.abramson@hatchmott.com

Donald Ackerman
dackerman@wlhailey.com

Aaron R. Adkins
aradkins@vt.edu

Muhamad Ahmarudin
muhamad_ahmarudin@fmi.com

Murray M. Aitken

Yasser Akbarzadeh
Yakbarza@mines.edu

Maynard Akkerman
makkerman@akkerman.com

Nieves C. Alfaro III
nieves.alfaro@kbr.com

Michael E. Allen
mallen@jaydee.com

Michael R. Allen
mravff@mst.edu

Gary A. Almeraris
gary.almeraris@skanska.com

Jerry Amoah
jsa9@njit.edu

Paul Ampey
pampey@prestige-gunite.com

Georgios Anagnostou
georg.anagnostou@igt.baug.ethz.ch

Julian A J Anderson
julian.anderson@us.rlb.com

Koehler Anderson
koanders@mines.edu

Igor A. Andreyev
igor.andreyev@jacobs.com

Nadeem Anwar
mails2nadeem@yahoo.com

John A. Arciszewski
johnalex765@hotmail.com

Francis J. Arland
farland@mrce.com

Jean-Luc Audureau
jean-luc.audureau@vinci-construction.com

Frederick A. Auld
aauld@alanauld.co.uk

Bill Austell
bill@coluccio.com

Timothy S. Avery
tsavery@haywardbaker.com

Taner Aydogmus
taner.aydogmus@ilf.com

Alireza Ayoubian
alireza.ayoubian@gza.com

John G. Babcock

Lars H. Babendererde
lb@babeng.com

Jeffrey L. Bachhuber
bachhuber@lettis.com

Timothy P. Backers
tbackers@jaydee.us

Doug W. Backstrom
doug@minex-intl.com

Davood Bahrami
dbahrami@unr.edu

Tom Bak
6tb2@queensu.ca

Khosrow Bakhtar
kbakhtar@aol.com

James G. Ball
jball@socal.rr.com

Mike Ballou
mlballou@comcast.net

William E. Bamford
wbamford@unimelb.edu.au

Carl D. Barchet

Lynn E. Barr
lebarr@sonic.net

Yoan Barriga
yoan.barriga@pucp.edu.pe

Robert A. Bauer

Benjamin M. Beard
ben.beard@riotinto.com

John C. Becker
jbecker@bepc.us

Claude Bedard
c.bedard@euclidcanada.com

Christopher K. Bennett
chris.bennett@aecom.com

Mark C. Benson
mark.benson@wgint.com

William M. Bergeson
william.bergeson@aecom.com

Brian Bergman
bbergman@harwest.com

Wesley M. Bermel
wbermel@judlau.com

Francois G. Bernardeau
bernardeaufg@cdm.com

Michael J. Beus
mike@safehoist.com

Joginder S. Bhore
waxahach@aol.com

George T. Biro
george.biro@lecsteel.com

Todd Bjornsen
todd.bjornsen@aecom.com

Kenneth W. Blair
kblair@traylor.com

Raymond Blanchard
blanchardrj@halcrow.com

Randall C. Blanton
rcblanton@comcast.net

Karl T. Bloom
kbloo@abc-industries.net

Caroline I. Boerner
caroline.boerner@barnard-inc.com

Kitso B. Bogopa
0kb17@queensu.ca

Brenda M. Bohlke
bbohlke@myersbohlke.com

Marco D. Boscardin
marco@boscardinconsulting.com

Christopher Bottoms
cbottoms.mines@gmail.com

John K. Bowen
jbowen@jderenzo.com

Nicholas Bowerman
bowerman.n@gmail.com

Thomas P. Bowers
bowerst@liro.com

Ryan T. Bowhay

Mark A. Bowling
minador@yahoo.com

Jeff Boyd
jeff.boyd@mine.queensu.ca

Joe D. Bradshaw
joedbradshaw@gmail.com

Lester M. Bradshaw Jr.
lester.bradshaw@bradshawcc.com

Troy T. Bradshaw
tbradshaw@sakconst.com

James Brady
bucorp@att.net

Raymond J. Brady
raymond.j.brady@mwhglobal.com

James J. Brady

Alfred H. Brand
abrand@mrce.com

Steve Brandon

Steven R. Bratton
sbratton@boartlongyear.com

Kurt Braun
kbraun@l-7services.com

John J. Breedlove
jjb51heico@heintzmann.com

Christopher D. Breeds
cbreeds@subterra.us

Donald Brennan
beac@comcast.net

Jack E. Brockway
brockway.jack@herrenknecht.com

Kevin W. Brooks
kbrooks@jennmar.com

Michael Brooks
michael.brooks@flsmidth.com

Todd Brown
tbrown@bradshawcc.com

Robert W. Brown

Robert S. Brown Jr.

Michael Bruen
michael.p.bruen@mwhglobal.com

Timothy M. Bruner

Walter G. Brusey
wbrusey@panynj.gov

Ted H. Budd
tbudd@kennyconstruction.com

Matthew Budin

Richard L. Bullock

John C. Bullock

Werner Burger
burger.werner@herrenknecht.de

George K. Burke
gkburke@haywardbaker.com

Timothy T. Burke Jr.
tburke@greenstreak.com

Jack J. Burke
jburkecon@cox.net

Harry A. Bursey
harry@warrenequipment.com

Andrew H. Bursey
burs323@yahoo.com

Brad R. Bush
brad.bush@barnard-inc.com

David Caiden
david.caiden@arup.com

D. C. Camp
camp@jacobssf.com

Benjamin D. Campbell
ben.campbell@barnard-inc.com

Charles D. Campbell

Robert P. Cannon
bobby.cannon@dsiunderground.com

Richard Capka
richard_capka@hotmail.com

Andrew S. Carey
andrewcarey44@gmail.com

Gordon K. Carlson
gordon_carlson@fmi.com

UCA of SME Member Directory

Christian Frenzel
cfrenzel@mines.edu

Brian Fulcher
brian.fulcher@jfshea.com

Stephen Furtek
steve.furtek@phila.gov

Vojtech Gall
vgall@gzconsultants.com

Anthony Gallo
agallo@judlau.com

Margaret Ganse
peggy.ganse@tunnelingsolutions.com

Jesus Garcia
jgarcia7@email.arizona.edu

Jessica L. Garcia
jgarcia@mines.edu

Chuck Gardner
cgardner@hgcpm.com

Evan A. Garich
garich@pbworld.com

Greg Garner
rggarner@pbsj.com

Brian L. Garrod
brian.garrod@hatchmott.com

Chris Gause

Thomas Gelormino

Leo F. Gentile
leo.gentile@jacobs.com

Dean C. Gibbons
gibbonsdean@hotmail.com

Baylor P. Gibson
mngrbpg@gmail.com

Paul H. Gilbert
pgil6@comcast.net

Michael B. Gilbert
gilbertmb@cdm.com

Timothy R. Gillespie
gillespie.tim@sika-corp.com

Marco C. Giorelli
mcgiorelli@aol.com

Pierre Girard
pierre.girard@lecsteel.com

Lucy Glodkowski
lucyg@dawnunderground.com

Benjamin J. Goertz
bgoertz@mymail.mines.edu

Henry L. Goldberg
hlgoldberg@goldbergconnolly.com

Michael Goldstein
mgoldstein@schiavone.net

Brian E. Gombos
bgombos@wadetrim.com

Jairo Gomez
jairo.gomez@mosaicco.com

Roberto Gonzalez
gonzalezr@robbinstbm.com

Roberto Gonzalez Izquierdo
rglez@moldeint.com

Robert Goodfellow
goodfellowrjf@bv.com

Christoph M. Goss
christoph.goss@deereault.com

Richard J. Gradnik
richard@gradnik.com

Pete Graham
pgraham@detroitsalt.com

Daniel H. Gravelle
dan.gravelle@us.atlascopco.com

James Grayson
jgrayson@vtcjv.com

Wayne Green
wayne.green@york.ca

Michael A. Greenberg
greenberg516@aol.com

Marc H. Greenberg
greenmh@vt.edu

Willmont Griffin
unitedstatesmari@aol.com

Matthew T. Griffiths
matthewgriffiths@consolenergy.com

Nyree B. Grimes
nyree.grimes@pobox.com

Jaime R. Guaman
jguamanguevara@gmail.com

Adalberto Guerrero Pérez
ing.aguerrero@gmail.com

Joseph D. Guertin
joe.guertin@gmail.com

Katarina R. Gump
kgump1@mix.wvu.edu

Ulf G. Gwildis
gwildisug@cdm.com

Arash Habibijavanbakht
jht3b@mail.mst.edu

Jean Habimana
habimana@pbworld.com

Brian G. Hagan
bhagan@jaydee.us

Vahid Haji
vhaji@hatch.ca

Craig Haley
chaley@greenstreak.com

Gregory W. Hallett
greg.hallett@sandvik.com

David Hamilton

Howard J. Handewith

Spencer J. Hankins
shankins4@gmail.com

Kanaan Hanna
khanna@zapatainc.com

William H. Hansmire
hansmire@pbworld.com

Mark Hanson
mhanson@pirnie.com

Douglas Harding
hardingd@robbinstbm.com

Mick Hardwick
mick.hardwick@mti.ca

Brian V. Harris
bharris@mymail.mines.edu

Keith Harrison
keith.harrison@cementation.ca

Warren L. Harrison
wharrison@wlhconstruction.com

John Hart

Gary M. Hartsog
ghartsog@alphaengineer.com

Sean Harvey
seanpharvey@me.com

Youssef Hashash
hashash@uiuc.edu

Jason S. Hatcher
jhatcher@jennmar.com

Kevin Hatchmeister
khatchmeister@golder.com

David J. Hatem
dhatem@donovanhatem.com

David A. Haug
dhaug@lacsd.org

Gregory M. Hauser
ghauser@jaydee.us

Andre Hawks
ahawks@brierleyassociates.com

John Hawley
john.hawley@hatchmott.com

Clay E. Haynes
haynesce@bv.com

Donald C. Hegebarth
donhegebarth@comcast.net

Douglas J. Heinz
dheinz@kennyconstruction.com

Gary B. Hemphill
gary_hemphill@hotmail.com

Raymond W. Henn Jr.

Jaime Hernandez
jhern92@gmail.com

Ronald Heuer
ronheuer@mc.net

Christopher C. Hickey
chickey@dumasmining.com

Lachlan Hill
u4127421@anu.edu.au

Donald E. Hilton

Cary Hirner
hirnerc@bv.com

Alan G. Hobelman II
ahobelman@taisei.com

William M. Hodder
whodder@jaydee.us

Allen W. Holbert
alholbert@windstream.net

Jon M. Hollman

Brianna Home
homeb@robbinstbm.com

Lok Home
homel@robbinstbm.com

Luke A. Hooten
lukehooten@gmail.com

Alan Howard
ahoward@brierleyassociates.com

Patrick S. Hudd
patrick.hudd@cementation.ca

Gregory W. Hudnall Jr.
snoboardfreak04@gmail.com

Geoffrey A. Hughes
geoffhughes1000@gmail.com

James H. Hughes III
jhughes@harsco.com

Steven W. Hunt

Jon Hurt
jon.hurt@arup.com

Nick A. Hynd
nick.hynd@stantec.com

Jamie Ibarra
jamie.ibarra@basf.com

Dan Ifrim
dan.ifrim@aecom.com

Ademir R. Ikeda
ademir.ikeda@terra.com.br

John M. Iles
john@pacificboring.com

Roger Ilsley
roktek@aol.com

Mark S. Immonen

Lars C. Ingerslev
ingerslev@PBworld.com

Jon B. Isaacson
jon.isaacson@hatchmott.com

Byron M. Ishkanian
illig@aol.com

Bernt I. Ivarsson
bernt@rocvent.com

Leon J. Jacobs
LJacobs@FrontierKemper.com

Donald P. Jacobs
donaldjaco@aol.com

Maria C. Jaime
MariaJaime@consolenergy.com

Peter Jakobs
peter.jakobs@hochtief.de

Carlos A. Jaramillo
carlos_jaramillo@urscorp.com

Hamid Javady
hamid.javady@aecom.com

Frank Jenkins
fajenkin@bechtel.com

Marcus R. Jensen
marcus.jensen@snwa.com

Russell Jernigan

J S. Jin

Nicholas J. Joens
nicholas.joens@kiewit.com

Carl L. Johnson
cjohnson@traylor.com

Mark C. Johnson
johnsonmc@halcrow.com

Richard M. Johnson
rjohnson@hntb.com

Albert C. Johnson
ajohns49@mix.wvu.edu

Murray C. Johnson
murray@rgjohnsoninc.com

William H. Johnson
bill.johnson@kiewit.com

Bruce V. Johnson
bruce.v.johnson@odot.state.or.us

Clinton Johnson
cjohnson@aquaticsciences.com

Gary Jones
gjones@press-seal.com

David Jurich

Jon Y. Kaneshiro
jon.y.kaneshiro@parsons.com

John Kaplin
jkaplin@gilbaneco.com

David K. Kasper
dkasper@mmsd.com

Burton P. Kassap
burtkassap@comcast.net

Clifford J. Kassouf

Philip J. Kassouf
philk@triad-engineering.com

Lawrence J. Keefe
larrysr@ljkeefeco.com

Janette A. Keiser
jan@keisergroup.com

John E. Kelleher
kelleher@schauenburg-us.com

Brian Kelley
brian.kelley@keellc.com

Eugene Kelley
eugene.kelley@gcinc.com

Tim P. Kelsey
tkelsey@jaydee.com

Matt Kendall

Francis S. Kendorski
frank@agapito.com

William Kenik
tanel360@hotmail.com

John Kennedy
john.kennedy@atkn.com

Patrick B. Kenny
pkenny@kennyconstruction.com

Serguei Kenzap
skenzap@hatch.ca

Todd M. Kilduff
tkilduff@brierleyassociates.com

Taehong Kim
kimta@pbworld.com

Thomas J. King
tjking145@comcast.net

Jon Kirk
jon.kirk@ch2m.com

Wojciech Klecan
wojciechklecan@jjg.com

Steve Klein
klein@jacobssf.com

Fritz J. Klingler
fklingler@nthconsultants.com

David R. Klug
dklug@drklug.com

Jonathan D. Klug
jklug@drklug.com

Brad Knight
brad.knight@basf.com

Michael H. Kobler
mkobler@osumcorp.com

Rick R. Kraft

Steven Kramer
steven.kramer@arcadis-us.com

Doug R. Krebs
drk@press-seal.com

Kurt A. Kroner
kkroner@kronerenvironmental.com

Michael A. Krulc
mkrulc@traylor.com

Gerd Kruscke
gerd.krusche@geodata.at

Darin Kruse
darin.kruse@cobaltcc.com

Victor Kuchler
kuchler@fnal.gov

Alan K. Kuhn

Ronald Kurta
acikurta@charter.net

Terese Kwiatkowski
tkwiatkowski@gza.com

Thomas P. Kwiatkowski
tkwiatkowski@jennyeng.com

Robert W. Laakso
boblaakso@sympatico.ca

Lauro L. Lacerda
lauro.lacerda@basf.com

Michael I. Larosa
mlarosa@vt.edu

Juergen Laubbichler
jlaubbichler@dr-sauer.com

Christopher Laughton
chris.laughtonassociates@gmail.com

Colin A. Lawrence
clawrence@hatchmott.com

Seong Won Lee
swlee@kict.re.kr

William D. Leech
wdl@undergroundplus.com

Zane C. Leonard

Mun Leong
leong@jacobssf.com

Monica LeVan
mnl3kb@mst.edu

Scott W. Lewis

Carl R. Linden
carl_linden@urscorp.com

Eric S. Lindquist
elindquist@brierleyassociates.com

Dan Liotti
danliotti@midwestmole.com

Fabio Liscidini
fabio.liscidini@skanska.com

Stephen Liu
tunnelguy@gmail.com

David Logan
david.logan@macdow.com.au

Nathan M. Long
nlong@jaydee.com

Walter M. Lorence
wlorence@geo-mechanics.com

Daniel A. Louis
dan_louis@urscorp.com

Rick P. Lovat
rplovat@L2Advisors.ca

Jose Luis
jose.fenoglio@rizzoassoc.com

Boro Lukajic
tac@interlog.com

Gerald E. Luttman
luttman@pbworld.com

Anthony M. Lynn
tlynn@berkeleyengineering.com

John C. Mac Gregor III
john.macgregor@am.dynonobel.com

Kenneth MacGregor
kmacgregor@harwest.com

Jim Macozek
jim@jmacbuilding.com

Christopher P. Madden
chris@pacificcoastpump.com

Jeff Maffei
jmaffei@judlau.com

Daniel Magill
daniel.magill@avantigrout.com

Derek Maishman

Shawn Maltais
smaltais@wausau-everest.com

Patrick L. Mann
pat@magnumtunneling.com

William S. Mariucci
bill.mariucci@kiewit.com

James M. Marquardt

W Allen Marr
wam@geocomp.com

John K. Marr

John D. Marrington
jmarrington@dmcmining.com

Jamie L. Martens
jamartens@hntb.com

Thomas F. Martin
martint@pbworld.com

Bernard W. Martin
martinb@pbworld.com

William F. Martin Jr.

Julio C. Martinez
jmartinez@schiavone.net

Bruce A. Matheson
bmatheson@miningequipmentltd.com

Mario Mauro
mmauro@treviicos.com

Jon Henri Mayer
jhmayer@dr-sauer.com

Peter J. McCallum
peterm@aptecusa.com

Joseph McCann
jmccann@mtac.com

Gary L. McClellan

Gevan L. McCoy

Keith McDonald
keith.mcdonald@degussa.com

James A. McDonald
jmcdonald@sahealy.com

Kevin C. McDowell
sales@bmcdowell.com

Robert McFadden
rmcfadden@cogeco.ca

A J. McGinn

Michael McHugh
mmchugh@mtac.com

James McKelvey
mckelveyjg@bv.com

Steve McKelvie
stephen.mckelvie@hdrinc.com

Michael P. McKenna
mckenna@jacobssf.com

Jim McMahon
jmcmahon@frontierkemper.com

Donald R. McMullin

Christopher McNally
cmcnally@mcnally.ca

Abdul-Ghani M. Mekkaoui
agmekkaoui@jaydee.com

Gabriele Mellies
mellies@sympatico.ca

Vincent Mendive
vmendive@thiessenteam.com

Jose M. Mendivil IV
jmmendiv@email.arizona.edu

Sean A. Menge
sean.menge@kiewit.com

Dwight A. Metcalf
dwight.metcalf@kiewit.com

Kirit B. Mevawala
kirit.mevawala@2avesubway.com

Matthew E. Meyer
mmeyer@langan.com

Hans J. Meyer
hmeyer@utcoverseas.com

Daniel F. Meyer

Juma J. Mgumbwa
jmgumbwa@mirarco.org

Paul C. Miclea

Robert O. Middour
rmiddour@middourconsulting.com

Jason Miller
jasonmiller@midwestmole.com

David G. Millett
david.millett@orica.com

Thomas Mills
arthur722@aol.com

Kevin T. Mininger
kevinmininger@yahoo.com

Serge Moalli
smoalli@frontierkemper.com

Alfred Moergeli
info@moergeli.com

Mohsen M. Mohkam
m.mohkam@wanadoo.fr

James E. Monsees
monsees@pbworld.com

James A. Morrison
jim.morrison@kiewit.com

Faranak Mousavi
fara_mousavi@yahoo.com

Chris Mueller
muellercg@bv.com

David K. Mueller
dmueller@mtac.com

Amitabha Mukherjee
mukherjee@pbworld.com

Nasri A. Munfah
munfah@pbworld.com

Jeffrey C. Murphy
jmurphy@dlz.com

Ron Myers
sguerra@liunapsw.org

Mike J. Nadon
mike.nadon@cementation.us

Sharma Narasimharajan
sharma.narasimharajan@jacobs.com

Verya Nasri
verya.nasri@aecom.com

Jhon E. Navarro
edu.navarro@pucp.edu.pe

Charles R. Nelson
crn@cnaengineers.com

Roger R. Nelson
roger.r.nelson@gmail.com

Rory Neubauer
rneubauer@halmarinternational.com

Al Neumann
ammeumann@laynegeo.com

John E. Newby
NewbyJE@cdm.com

Zakeyo Ngoma
zakeyo.ngoma@pse.com

John Nicely
jnicely@wlhaily.com

Stanley Niemiec
sniemiec@jennyeng.com

Bjorn Nilsen

Joe O Carroll
ocarroll@pbworld.com

Daniel P. O Connor

Tony J. O Donnell
tony.odonnell@kiewit.com

Rick L. Odle
rick.odle@talbertmfg.com

Dennis Ofiara
ofiarad@robbinstbm.com

Shemek Oginski
oginski@yahoo.com

Faruk Oksuz

Gregg M. Olsen
golsen@jaydee.com

Raymond Oneglia

Hirokazu Onozaki

Manley Osbak
manley@thecrossingcompany.com

Jerry Ostberg
jerry.ostberg@parsons.com

Kyle R. Ott
ott@pbworld.com

Steven Otto
sotto@golder.com

Christopher Ottsen
chris.ottsen@mwhglobal.com

Stephen R. Owen
steve112547@gmail.com

Levent Ozdemir
lozdemir1977@aol.com

Robert J. Palermo
robert.palermo@gza.com

Richard A. Palmer
rpalmer@superna.com

Carlos Paredes Sanchez
cparedes@pucp.edu.pe

Anil Parikh
anil.parikh@2avesubway.com

Harvey W. Parker
harveyparker@compuserve.com

Karen Parker

Alan J. Paskoff
apaskoff@mtacc-esa.info

Robert X. Pastor

Victor F. Paterno
victor.paterno@skanska.com

Douglas A. Patterson
dapatterson@dir.ca.gov

Michael T. Pearce
mpearce@ninyoandmoore.com

Matthew Pence
matthew.pence@mines.sdsmt.edu

Thomas W. Pennington
PenningtonT@pbworld.com

Derek J. Penrice
derek.penrice@hatchmott.com

John J. Peregoy
peregoy1@juno.com

Adam Perney
acperney@yahoo.com

Tony Pestonatto
tpesto@msn.com

Jeffrey P. Petersen
jeff.petersen@kiewit.com

Ben V. Petersen
benp@plsincsurvey.com

Thomas Peyton
peyton@pbworld.com

Donald J. Phelps
don.phelps@hatchmott.com

Don Phillips
don.phillips@arup.com

Colin Pigott

Dominic Pillari
dpillari@cruzcontractors.com

Rafael M. Pina
rpina@langan.com

Robert Pintabona
robert.pintabona@mwhglobal.com

John Plattsmier
john.plattsmier@hdrinc.com

Edward S. Plotkin

Seth Pollak
seth.pollak@arup.com

Russell M. Pollard
rpollard@michels.us

Robert E. Pope Jr.
rpope@miningequipmentltd.com

Matthew Pope
mpope@miningequipmentltd.com

Thierry Portafaix
thierry.portafaix@vinci-construction.com

Miles Porter
mporter2772@msn.com

Dennis Poulton

Ross E. Pray

Jacob R. Prezkuta
jprezkut@mines.edu

Stephen Price
steve.price@gcinc.com

Tyler B. Proffitt
tproffitt@heintzmann.com

David F. Proudfoot
dave.proudfoot@orica.com

Richard Prust
richard.prust@arup.com

Biao Qiu
qbiao@mix.wvu.edu

Richard Raab
rraab@frontierkemper.com

Klaus F. Rabensteiner
klaus.rabensteiner@geodata.at

Ali Rahnama
rahnama@nmt.edu

Gregory L. Raines
gregory.raines@mwhglobal.com

Pablo G. Ramoz Valdez
p565@hotmail.com

Mark W. Ramsey
mark.ramsey@kiewit.com

Stephen T. Ranger
sranger@asrcenergy.com

Joshua R. Ratliff
jratliff@mines.edu

Robert Rautenberg
brautenberg@kennyconstruction.com

Thomas C. Reardon
treardon@prestige-gunite.com

Valerie R. Rebar
valerie_rebar@urscorp.com

Mark A. Rebert
mrebert@miswaco.slb.com

Stephen C. Redmond
sredmond@frontierkemper.ca

Michael Rehbock-Sander
mrehbock@amberg.ch

John J. Reilly
jjreils@attglobal.net

David L. Rendini

M Lee Renegar
lrenegar@yahoo.com

Robert A. Reseigh

Joe A. Ribecky
joe.ribecky@conforms.com

Donald P. Richards

Thomas L. Richardson
richardsontl@halcrow.com

Klaus Rieker
klaus.rieker@wf-ib.de

Denis Rienguette
drienguette@mar-inc.com

Galyn Rippentrop
ripp3m@gmail.com

Hannah A. Rippley
hrippley@mines.edu

Michael Rispin
mike.rispin@normet.fi

Paul C. Rizzo
paul.rizzo@rizzoassoc.com

Michael Roach
mroach@traylor.com

Lyle Roarke

Richard J. Robbins

Bradford Roberts
broberts@gza.com

Donna M. Roberts
robertsd@pbworld.com

Robert A. Robinson
rar@shanwil.com

Mike Robison
mike.robison@jjg.com

Joe Roby
robyj@robbinstbm.com

Richard A. Rogers
drogers@frontierkemper.com

James N. Rogers
jrogers@genchem.com

Walter David Rogstad
drogstad@frontierkemper.com

Diego H. Rojas
a20060279@pucp.edu.pe

Victor S. Romero

Logan J. Ronhovde
logan.ronhovde@gmail.com

Judd A. Roseberry
jroseberry@richwood.com

J Kenneth Rossi
krossi@epcconsultants.com

Brett Rossini
brett@wekaba.com

Jamal Rostami
rostami@psu.edu

Wolfgang Roth
wolfgang_roth@urscorp.com

Blake D. Rothfuss
rothfuss@jacobssf.com

John T. Rowlett
tom.rowlett@pgenv.com

Douglas S. Roy
droy@gza.com

Curtis F. Rozelle
crozelle@jaydee.us

Arlan Ruen
arlan.ruen@ruendrilling.com

Henry A. Russell Jr.
russell@pbworld.com

Bruce E. Russell
bruceerussell@yahoo.com

Reg P. Ryan
regr@jwgunite.com

Michael V. Ryan

Thomas Saczynski
tsaczynski@brierleyassociates.com

Samer Sadek
ssadek@hntb.com

Richard A. Sage
Richard.Sage@SoundTransit.org

Vincent A. Sambrato
vsambrato@frontierkemper.com

Kirk R. Samuelson
kirk.samuelson@kiewit.com

Heiner J. Sander
heinersander@ilfusa.com

Jeremy S. Saperia
jsaperia@traylor.com

Pekka S. Sarkka
pekka.sarkka@concave.fi

Gerhard Sauer
washington@dr-sauer.com

Paul J. Scagnelli

Michael J. Schafer
michael.j.schafer@mwhglobal.com

Dan Schall
dan.schall@barnard-inc.com

Scott R. Schendel
info@re-systemsgroup.com

Paul C. Schmall
pschmall@mtac.com

Carl H. Schmuck

Peter S. Schneidkraut
tunnels523@aol.com

Alex Schoepf

Daniel W. Scholz
dscholz@anchorcm.com

Dale W. Schriever
dwschriever@laynechristensen.com

Richard A. Schulkins
r.schulkins@utt.mapei.com

Michael S. Schultz
schultzms@cdm.com

James P. Schumacher
jschumacher@thiessenteam.com

Joshua P. Schurger

Thomas Schwind
tschwind@dr-sauer.com

James F. Seal

Ben Seling
ben.seling@kiewit.com

Robert H. Sell
selllumberco@aol.com

Barrie Sellers
geokon@geokon.com

Kathryne E. Sewester
kest55@mail.mst.edu

Ali Shafiei
ashafiei2@gmail.com

Ardalan Shahkar
ashahkar@nmt.edu

Kamane Shandavu
Kamane.Shandavu@lumwanamine.com

Lewis D. Shapiro
lshapiro@jaydee.us

Jerry P. Shaw
jshaw@sakconst.com

Peter O. Shea
peter.shea@jfshea.com

Fred A. Sherrill
surecrete@gmail.com

Gregg Sherry
gsherry@brierleyassociates.com

Mina M. Shinouda
mshinouda@jaydee.com

Steven N. Short
short.steve@herrenknecht.com

Austin Shrewsbury
adshrews@vt.edu

Arthur D. Silber
arthur.silber@hatchmott.com

Tony Simmonds
tony@geokon.com

Ryan L. Sinclair
rlsvxd@mst.edu

Steve Skelhorn
sskelhorn@mcnallycorp.com

Alan R. Slaughter
georgian1899@aol.com

Casey J. Slaughter
cjscgb@mst.edu

Timothy P. Smirnoff

James D. Smith
jsmithpe@rochester.rr.com

Ronald W. Smith
ron.smith@dsiunderground.com

Paul J. Smith
smithpj@bv.com

Marcus J. Smith
marcus.smith@mines.sdsmt.edu

Wayne L. Smith
wayne.smith@cementation.ca

Michael Smithson

Christopher P. Snee
chris@sneegeoconsult.com

Larry L. Snyder
lsnyder200@cs.com

Nikolas K. Sokol
nik.sokol@arup.com

Anukornchaikul Somchai
somchai@jaydee.us

Ketan R. Sompura
sompura.ketan@sika-corp.com

Justine V. Sorensen
justine.sorensen@mines.sdsmt.edu

Jacob E. Sorenson
sorenso9@unr.nevada.edu

Erick Soto Galindo
esoto@antamina.com

Augusto A. Sotomayor
a20067137@pucp.edu.pe

Christopher A. Sowers
csowers1@mix.wvu.edu

UCA of SME Member Directory

Paul G. Spedding
paul@pgsandassociates.com

Randy S. Spencer
rspencer@heintzmann.com

Lucian P. Spiteri
lspiteri@mtac.com

David L. Stacey
dstacey@jaydee.com

John M. Stanbury
jstanbury@mtac.com

Bruce T. Stanley
stanleyb@kaycee.net

Richard S. Staples
r.staples@delcan.com

Patrick J. Stephens
office@pigcoinc.com

Robert J. Stepper
rstepper@goldenpredator.com

Glen Stevens
glen.stevens@verizon.net

Robert R. Stier
bob.stier@kiewit.com

Anthony F. Stirbys
anthony.stirbys@parsons.com

Neil C. Stitt
neil.stitt@mti.ca

John M. Stolz
stolz@jacobssf.com

Andrew M. Stone
stone@jacobssf.com

Thomas C. Storey
carl.storey@mti.ca

Clifford E. Stout
cestout@mtech.edu

Patrick M. Stratton

Adam J. Stremcha
astremcha@mcnallycorp.com

James P. Strobel
jstrobel@yonkerscontractingco.com

Katelyn P. Stroup
katelyn.stroup@mines.sdsmt.edu

Peter Stump
pstump@net66.com

Jacek B. Stypulkowski
jstypulkowski@MRCE.com

Edmond Sum
eds@transbaycenter.org

Fidelis T. Suorineni
fsuorineni@mirarco.org

Andrew Swank
aswank@wlhailey.com

Jeffrey R. Swanstrom
jeff.swanstrom@odot.state.or.us

Matt L. Swinton
matt.swinton@kiewit.com

Morris W. Sykes

Ali Tarokh
ali_trkh@yahoo.com

Peter C. Tatnall

Gary E. Taylor
getaylor@haywardbaker.com

George R. Teetes
gteetes@lachel.com

Roy Teifeld
teifeldr@aol.com

Andrew Thompson
andy.thompson@hatchmott.com

Todd Thompson
tthompson@hatch.ca

Gary Thorinson
thorinson.gary@abcventilation.com

Steve Thorogood
steve.thorogood@dsiunderground.com

Luis Tisnes
luis.tisnes@cavotec.com

Tolga Togan
totogan@hotmail.com

Lucas M. Tolley
ltolley@siu.edu

Vincent F. Tonc
vincetonc@bigskyhsd.com

Fulvio Tonon
tonon@mail.utexas.edu

Raymond Town
raymondtown@msn.com

John W. Townsend
john.townsend@hatchmott.com

Bradford F. Townsend
townsend@ksc.th.com

Scott Trainor
strainor@thiessenteam.com

Michael T. Traylor
mtraylor@traylor.com

Walter R. Trisi
trisi_walter@lovat.com

David F. Tsztoo
dtsztoo@sfwater.org

Rob Tumbleson
rtumbleson@akkerman.com

Seamus Tynan
stynan@mcnallycorp.com

Shimi Tzobery
Shimi.Tzobery@Parsons.com

Chad A. Underwood
cunderwood@engineeringpartners.net

Scott D. Ureel
scott.ureel@gmail.com

Christopher D. Van Arsdale
cdvanars@mtu.edu

Leo L. Van Sambeek
leo.vansambeek@respec.com

Zephaniah Varley
varley@pbworld.com

Guido Venturini
venturini@seaconsult.eu

Rick Vincent
fov1@cornell.edu

Valeri Vinyar
val.vinyar@gmail.com

Michael G. Vitale
michael.vitale@hatchmott.com

Theodore Von Rosenvinge IV
ted.von@geodesign.net

Robert J. Vrabel

Roland C. Walker

Matthew W. Wallace
matthew.wallace@vrsim.net

Eric C. Wang
ewang@judlau.com

Xiaohai Wang
wangx@cdm.com

Pete L. Wang
pwang@jaydee.us

David R. Wanhatalo
davewtcc@gmail.com

Mike Wanhatalo
mwanhatalo@bradshawcc.com

Wayne L. Warburton
wayne.warburton@jacobs.com

Nathan J. Ward
nathan.ward@rizzoassoc.com

Patrick J. Ward

Ian J. Ward McNally
ian.ward-mcnally@hatchmott.com

Lee C. Warnock
lee.warnock@hatchmott.com

Curtis W A Watson
8cwaw@queensu.ca

William S. Watters

Allan S. Wattson
aswattson@palconsult.com

Jeff Weakly
jeff@superexcavators.com

Jean-Marc E. Wehrli
jwehrli@traylor.com

Ed Weiner
eweiner@mixonsite.com

Kurtis Weins
kurtisweins@gmail.com

Timothy C. Wellert
tim.wellert@kiewit.com

Edward Wellman
ewellman@cnitucson.com

Drew J. Wheeler
wheele54@gbcnv.edu

Karl J. Wickenheisser
kwick@rbcbearings.com

Joe Wiedemann
jwiedemann@brierleyassociates.com

Tim E. Wiggins
tim.wiggins@kiewit.com

Alexander Williams
williams@williamsae.com

Lawrence A. Williamson
larry.williamson@hatchmott.com

Sarah H. Wilson
wilson@jacobssf.com

Garth L. Wilson
consult.garth@q.com

Mike Wongkaew
mike.wongkaew@hatchmott.com

Leonard A. Worden
lworden@csigroup.com

Samuel R. Wozniak
swozniak@vt.edu

Shane H. Yanagisawa
syanagisawa@vpfk.com

Paraskevi Yiouta-Mitra
antipaxos@metal.ntua.gr

George D. Yoggy
gyoggy@att.net

Mohamed A. Younis
mayounis@engineer.com

Zach Zastoupil
mxzach@hotmail.com

Kurt Zeidler
kzeidler@gzconsultants.com

Randy K. Zeiger
randy.zeiger@amec.com

Brian H. Zelenko
zelenko@pbworld.com

Thomas Zeller
tom.zeller@respec.com

Alan J. Zeni
alan.zeni4@gmail.com

Donald R. Zeni

Daniel Zerga
dzerga@ilfoak.com

Brett R. Zernich
bzernich@traylor.com

Miguel A. Zevallos Mendez
miguel.zevallos@pucp.edu.pe

Shujing Zhang
shujing6@interchange.ubc.ca

Sanja Zlatanic
zlatanic@pbworld.com

Jozef Zurawski
joez@dawnunderground.com

UCA of SME Corporate Members

Akkerman Inc

Envirosystems Manufacturing LLC

ASI Group Ltd

Geodata Group

Atkins North America Inc

Geokon Inc

CDM

Guy F Atkinson Const LLC

David R Klug & Associates Inc

Harvey Parker & Assoc

Dr G Sauer Corp

Hayward Baker Inc

UCA of SME Corporate Members

HDR Engineering Inc

Normet Americas Inc

HNTB Corp

Obayashi Corporation

J F Shea Co Inc

Prestige Concrete Products

Jacobs Associates

Ruen Drilling Inc

Laborers Employers Coop & Educ Trust

SubTerra Inc

Mueser Rutledge Consulting Engrs

Wayss & Freytag Ingenieurbau AG

MWH Global Inc

UCA of SME Sustaining Members

ARUP

Arup

DYWIDAG-SYSTEMS INTERNATIONAL DSI

DSI Underground Systems, Inc.
American Commercial Division

DSI Underground Systems Inc

BARNARD CONSTRUCTION COMPANY, INC.
INTEGRITY ■ INNOVATION ■ PERFORMANCE

Barnard Construction Co Inc

GZA

GZA GeoEnvironmental Inc

BASF
The Chemical Company

BASF Admixtures Inc

Hatch Mott MacDonald

Hatch Mott MacDonald

BLACK & VEATCH
Building a world of difference.®

Jacobs Engineering Group Inc

Black And Veatch Corp

BRADSHAW CONSTRUCTION CORP.
www.Bradshawcc.com
(410) 970-8300
TUNNELING SPECIALISTS
TBM • Shotcrete
Microtunneling • Pipejacking

Jay Dee

Bradshaw Construction Corp

Jay Dee Contractors Inc

BRIERLEY ASSOCIATES
Creating Space Underground

KENNY

Brierley Associates LLC

Kenny Construction Co

Kiewit Construction Co

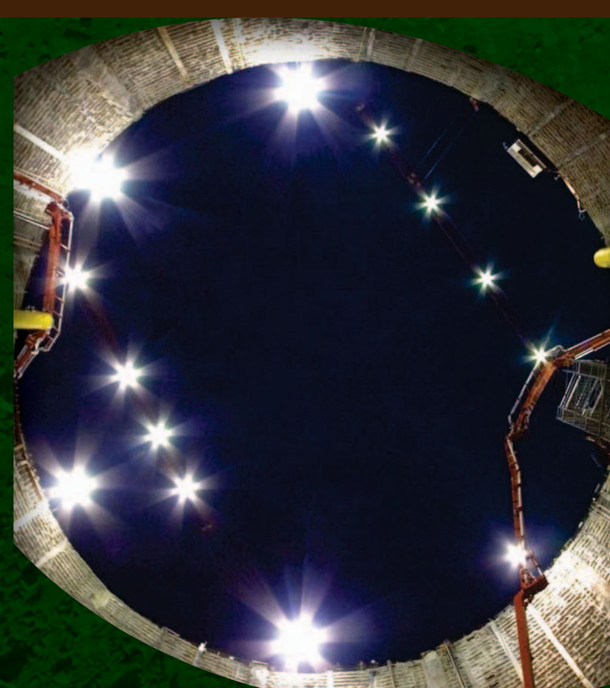
PB Americas Inc

Moretrench American Corp

The Robbins Co

Parsons Corp

W L Hailey & Co Inc



T&UC CLASSIFIEDS

BUSINESS OFFICE

SME - 12999 E. Adam Aircraft Circle, Englewood, CO 80112
800-763-3132 • Advertising: x243
Direct: 303-948-4243
Fax: 303-973-3845
www.smenet.org

EDITOR
Steve Kral
kral@smenet.org

SENIOR EDITOR
Bill Gleason
gleason@smenet.org

PRESS RELEASES
Steve Kral
kral@smenet.org

ADVERTISING AND PRODUCTION/ MEDIA MANAGER
Johanna McGinnis
mcginnis@smenet.org

PRODUCTION DESIGNER
Nate Hurianek
hurianek@smenet.org

ADVERTISING SALES OFFICES

HOOPER JONES
CENTRAL, NW U.S.
847-486 -1021 • Cell: 847-903-1853 • Fax: 847-486-1025 • hooperhja@aol.com

MARSHA TABB
EAST, SOUTH, WEST U.S.
215-794-3442 • Fax: 215-794-2247 • marshatabb@comcast.net

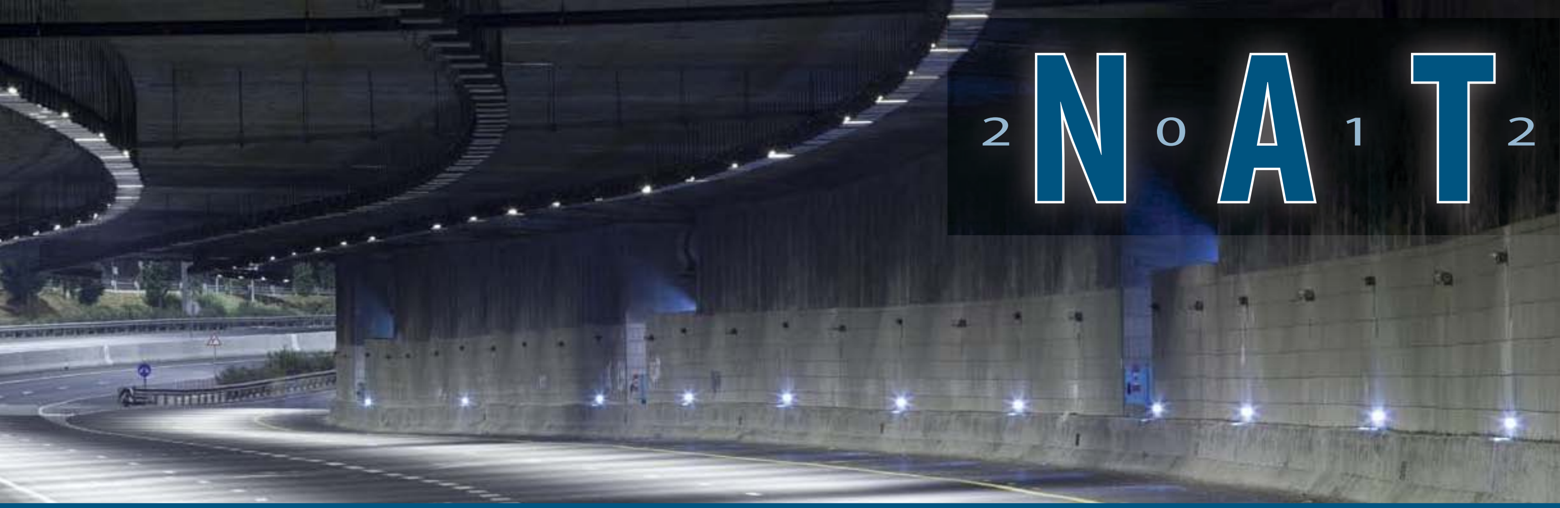
LEWIS BONDER
CANADA
514-485-3083 • Fax: 514-487-0553 • lbonder@miningpublications.com

PATRICK CONNOLLY
U.K. AND EUROPE
44 1702-477341 • Fax: 44 1702-477559 • patco44uk@aol.com

GUNTER SCHNEIDER
SCANDIN. / EUROPE
49 2131-511801 • 49 2131-4038973 • info@gsm-international.eu

JOHANNA MCGINNIS
ASIA, RUSSIA, UKRAINE, AFRICA, MID. EAST, LATIN AMER., AUSTRALIA
303-948-4243 • Fax: 303-973-3845 • mcginnis@smenet.org

WWW.TUCMAGAZINE.COM



CALL FOR PAPERS

TUNNELING: DRIVING VALUE

June 24-27, 2012 • JW Marriott Indianapolis • Indianapolis, IN, USA

The 2012 NAT Organizing Committee has issued a Call for Papers.
Prospective authors should submit the following by JUNE 30, 2011:

• Abstract of 100 words or less •
• The topic to which it applies •
• Complete contact information for corresponding author •
• Project name •

TOPICS FOR CONSIDERATION

- Tunnel Boring Machines
- Ground Conditioning & Modification
- Equipment Automation
- Conventional Tunneling
- NATM/SEM
- Caverns
- Small Diameter Tunneling
- Shaft Construction
- Emerging Technologies
- Risk Management
- Tunnel Lining Design and Precast Segment Advances
- Fire & Life Safety
- Vulnerability & Security
- Rehabilitation
- Cost Estimating & Scheduling
- Design & Planning
- Contracting & Payment
- Alternative Delivery Methods
- Financing, Insurance & Bonding
- Third Party Liability
- Labor Management & Training
- Case Histories
- Future Projects

Please forward to:
NAT
Online: www.smenet.org (under the meetings tab for NAT)
Attn: Tara Davis, SME
12999 E. Adam Aircraft Circle
Englewood, CO 80112

For additional information on exhibiting, sponsorship or general inquiries, contact
SME, Meetings Dept.
Phone: 303-948-4200
meetings@smenet.org
www.smenet.org