



Gall Zeidler Consultants

Geotechnics | Tunnel Design | Engineering

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Vojtech Gall, Ph.D., P.E.

Principal Tunnel Engineer

Years of Experience

31

Education

Ph.D., Civil Engineering, University of Maryland
M.Sc., Mining Engineering, The University of Alabama
M.Sc., Civil Engineering, Technical University (RWTH) Aachen, Germany

Professional Registrations

Missouri, 2015 (2015039537), Utah, 2014 (8941548-2202), Kentucky, 2012 (28566), Florida 2011 (73563), District of Columbia, 2011 (906346), Ohio, 2009 (74141), California, 2008 (C 73414), Colorado, 2007 (41345), Illinois, 2005 (29298), Michigan, 2005 (6201052822), North Carolina, 2005 (031304), New Jersey, 2003 (GE04454700), New York, 2003 (081226), Maryland, 2003 (29298), Texas, 2001 (88716), Washington, 2000 (36752), Massachusetts, 1997 (40318), Alaska, 1997 (CE 9628), Pennsylvania, 1996 (PE-050281-E), Virginia, 1995 (025740)

Professional Associations

International Tunneling Association, ITA Working Group 19 – Conventional Tunneling; American Society of Civil Engineers; Society for Mining, Metallurgy, and Exploration, Inc.; American Concrete Institute; American Underground Construction Association; Disputes Review Board Foundation; American Rock Mechanics Association; International Society for Rock Mechanics

Key Qualifications

Dr. Gall has over thirty years of experience in the design, construction, and construction management of tunnels and underground structures. His expertise encompasses soft ground, mixed-face, and rock tunneling for transit and utility structures utilizing TBM, conventional tunneling (SEM / NATM), and cut-and-cover techniques. These frequently employ ground improvement measures to facilitate mined tunneling by means of grout injections, specialty fore-poling systems and ground freezing. He frequently serves on expert review panels dedicated to the investigation and improvement of tunneling schemes ranging from initial inception stages through final design development at bid document level. His peer review services relate to a wide variety of facilities ranging from hydropower schemes in remote settings to complex tunnel structures at shallow overburden in difficult, over-built urban settings. Selected, representative transit projects include:

Railroad/Transit

- *Hudson River Tunnel Project, Amtrak, Secaucus, New Jersey to New York, New York:* The Hudson River Tunnel Project which is part of the Gateway Development Program will increase Amtrak's North East Corridor (NEC) and NJ Transit's commuter rail service between New Jersey and New York Penn Station. The project includes the construction of two new TBM single-track tunnels through the

Palisades and underneath the Hudson River. This will involve TBM (~28.5 ft dia.) and conventional (~34 ft dia.) tunneling in both hard rock and soft ground. Upon completion of the new tunnels, the existing twin-track North River Tunnels will undergo rehabilitation. Gall Zeidler Consultants is providing Program Management Support Services for Amtrak led by Dr. Gall. The scope includes providing input for the Environmental Impact Statement, review of the project construction schedule, construction staging and logistics, cost estimating, contract packaging, review of design drawings and specifications, procurement documents, as well as evaluating construction documents for at-grade and viaduct structures.

- *Gallery Place-Chinatown Station Passageway, Washington Metropolitan Area Transit Authority (WMATA), Washington, D.C.:* WMATA released a Request for Information (RFI) regarding the overall project feasibility and recommended project approach for constructing a diagonal passageway at the Gallery Place - Chinatown Station. The new passageway would allow passengers to bypass the crowded tunnel junction with the Green and Yellow Line, as well as, provide additional area to alleviate platform crowding and facilitate efficient movement through the station, especially in the critical area on the westbound Red Line platform. The passageway would require the construction under historic buildings along G Street and 7th Street NW and cutting of the station concrete vault walls at the Red Line platform and the mezzanine above the Green and Yellow Line tracks. Dr. Gall lead the team in the development of preliminary design level drawings, calculations and reports for the SEM passageway, including a detailed break-in of the station vaults.
- *West Seattle-Ballard Link Extension, Sound Transit, Seattle, Washington:* Phase 1 (Alternatives Development) of the three project phases aims to identify the preferred tunnel alignment for the West Seattle-Ballard Extension. Phase 2 and Phase 3 covering the Draft EIS and Conceptual Engineering and Final EIS/ROD and Preliminary Engineering, respectively, will further develop the preferred alternative. Dr. Gall is advising on medium and large TBM Single Bore vs. Twin Bore alignments and designs, underground station construction schemes, side-by-side vs. stacked alignments and stations, tunneling impacts to the existing infrastructure, as well as, TBM/SEM Engineering, Cost Estimating, and Value Analysis. The TBM diameters under consideration range from ~19 ft (twin bore) to ~60 ft (large bore).
- *Bart Silicon Valley, Phase II Single Bore Tunnel Technical Studies, Santa Clara Valley Transportation Authority, San Jose, California:* The BART Silicon Valley Phase II Extension project is a 6-mile (9.7 kilometers) extension from the current Phase I Berryessa Station terminus through Downtown San Jose to a new station and terminus in Santa Clara. This extension includes 5.0 miles (8.0 kilometers) of running tunnels through San Jose; four stations, of which three are underground and one at grade station two intermediate ventilation structures, and East and West tunnel portals. For the Single Bore Study, GZ addressed industry experience with large bore tunnels nationally and internationally, developed SEM construction of adits to the Single Bore, including ground improvement and street impacts, and assessed the tunneling induced settlements of the Single Bore along the alignment. In addition, Dr. Gall is supporting the Project Management Team overseeing the development of the 56 ft (17 m) diameter, Single-Bore, double-track tunnel with center platforms housed within the TBM Tunnel.
- *Riyadh Metro Project (Lines 1 and 2), ArRiyadh Development Authority (ADA), Riyadh, Kingdom of Saudi Arabia:* The Riyadh Metro Project introduces an efficient and sustainable mass transportation matrix in Saudi Arabia's capital and largest city, Riyadh. The metro network will link sites of mass activities and provide a clean and practical means of transportation. The project encompasses six lines split into five packages. The six new lines will consist of about 112 miles (180 kilometers) of tunnels between the proposed 90 stations. The underground running tunnels are built by a combination of EPB TBMs and Sequential Excavation Methods (SEM) techniques. Dr. Gall carried out quality control and risk management services for the Line 1 and Line 2 underground works.
- *California High-Speed Rail, San Francisco to Anaheim, California:* The California High-Speed Rail project will bring true high-speed train service to the United States for the first time. Once completed, the project will link the mega regions of San Francisco and Los Angeles in less than 3 hours. Eventually

the system will expand north to Sacramento and south to San Diego totaling 800 miles with up to 24 stations throughout California. Over 45 miles of the alignment are currently planned as underground structures consisting of 31 ft diameter hard-rock TBM tunnels, SEM tunnels, and Cut & Cover structures. Dr. Gall is serving as a Lead Tunnel Advisor on behalf of the Rail Delivery Partner.

- *Northgate Link, Seattle, Washington:* Northgate Link is a 4.3 mile (6.9 kilometer) extension of Washington Sound Transit's light rail system. The line will connect the Northgate, Roosevelt, and Udistric neighborhoods to downtown Seattle and the airport. Construction began in late 2012 with demolition of Roosevelt station, and the line is scheduled to begin operation in 2021. Dr. Gall was the principal engineer in charge of SEM tunneling services.
- *Los Angeles Regional Connector, Los Angeles, California:* Los Angeles County Metropolitan Transportation Authority is proposing to construct a subway system, Regional Connector LA Metro, located in Downtown Los Angeles. The project consists of inbound and outbound tunnels, as well as three underground stations. The tunnels will be excavated using Tunnel Boring Machine (TBM) tunneling methods along with a crossover cavern between the inbound and outbound tracks to be constructed utilizing Sequential Excavation Method (NATM / SEM) techniques. Ground conditions include the Fernando Formation (clay stones and siltstones). Dr. Gall led the design services for the Design/Build bid for the SEM cavern and SEM cross passages.
- *The Northeast Maglev (TNEM), Washington D.C to Baltimore Maryland:* The Northeast Maglev is a proposed project to build a maglev line connecting major cities along the northeast coast. The completed project will extend from Washington, D.C to New York City, New York. The alignment will eventually be extended to Boston, Massachusetts. Dr. Gall is serving as a lead Tunnel Designer for the ~50 foot diameter TBM Tunnel.
- *U230 Link Contract University Link Light Rail TBM Tunnels Project, Sound Transit, Seattle, Washington:* As Principal Tunnel Engineer, Dr. Gall provided expert consulting to the contractor and oversaw the development of construction drawings for the cross passage excavation. The geological conditions on site required the conceptualization of a systematic depressurization scheme to lower the groundwater pressure in the immediate area of the excavation.
- *Washington Metropolitan Area Transit Authority (WMATA), Medical Center Cross-over Tunnel Waterproofing Design, Washington, D.C.:* Water influx from the surrounding rock above the tunnels and mined station cavern continues to cause various control system malfunctions. The project entails the design of a new waterproofing system within the cross-over cavern to eliminate tunnel leakage. Dr. Gall is responsible for providing expert engineering design services for the assessment of the installed rock bolts placed over 30 years ago, need for additional rock bolts to supplement the existing support, the tunnel waterproofing system, the drainage system and the new final liner for the existing tunnel.
- *New Jersey Transit Trans Hudson Express Tunnels, Newark, New Jersey, to New York, New York:* New railway tunnel and terminus station in Manhattan and two new 1.5-mile long tunnels under the New Jersey Palisades and the Hudson River. Highly varied geological conditions include soft glacial lake deposits, estuarine deposits, hard Jurassic diabase, sandstone, and various hard rocks including Manhattan Schist. Cross passages under the Hudson River require pre-stabilizing by ground freezing and NATM tunneling. Dr. Gall led the preliminary design for SEM tunneling and ground freezing as well as the rock caverns in Manhattan Schist and in the Palisades. The initial support included various rock bolt types, lengths and patterns in combination with initial shotcrete linings.
- *New York Metropolitan Transportation Authority, Number 7 Line Extension, New York, New York:* The \$2.0 billion Extension of the 7 Line Subway from Times Square to the West side of Manhattan consisted of the construction of two 22-foot diameter tunnels driven by tunnel boring machines (TBMs) approximately 4,800 feet in length each and one station structure, approximately 1,200 feet in length, constructed as a rock cavern with rock bolts and shotcrete for initial support. Dr. Gall provided technical lead for / advise on design and subsequently construction management of tunnels and station structures.

- *Virginia Department of Rail and Public Transportation (VDOT) and Metropolitan Washington Airports Authority (MWAA), Dulles Corridor Rapid Transit Project, McLean/Dulles, Virginia:* Dr. Gall provided tunnel consulting and design services related to tunnel alternative analyses and tunnel engineering at Tysons Corner and at Washington Dulles International Airport utilizing cut-and-cover, TBM and NATM soft-ground and rock tunneling designs for running tunnels and an underground station at Dulles Airport.
- *New Jersey Transit Authority Hudson-Bergen Light Rail System Weehawken Tunnel, North Bergen, New Jersey:* In the framework of a Value Engineering Change Proposal (VECP), Dr. Gall provided a shotcrete final lining and portal support of excavation design to the contractor of this project. A special feature of the shotcrete final lining was the implementation of micro polypropylene fibers to enhance the fire resistance of the lining. The rock portal support included long tiebacks along with rock bolts.
- *Metropolitan Transportation Authority (MTA) / Long Island Railroad (LIRR), East Side Access Project, New York, New York:* Dr. Gall provides the technical lead for and advises on the design of tunnels using hard rock tunnel boring machines and drill-and-blast methods in Manhattan and soft ground SEM tunneling in Queens. Rock support comprises rock dowels in the TBM running tunnels and long, resin grouted rock bolts in all caverns constructed using drill-and-blast and road header excavation techniques. The project encompasses the Manhattan running tunnels with a length of approximately 25,000 feet, cross over caverns and two large station caverns for direct LIRR service to Manhattan's Grand Central Terminal.
- *Sound Transit, Beacon Hill Station and Running Tunnels, Seattle, WA:* Dr. Gall provided construction support services to the contractor including working drawings for soft ground portal supports, break-out eye for the TBM drive, excavation and support sequence drawings for SEM tunnel structures, and station tunnel measures to facilitate "walking of TBM" through the station platform tunnel.
- *Massachusetts Bay Transportation Authority (MBTA) Contract E02CN15, Russia Wharf Segment, Boston, Massachusetts:* Design of binocular bus/light railway NATM tunnel to be constructed underneath historic Russia Wharf Building in marine clay, organic clay, fill material in conjunction with ground freezing. Conceptual and detail design of ground freezing, design of excavation and support sequence, instrumentation and monitoring program, shotcrete and concrete lining, waterproofing system, connections to box tunnel structures. Dr. Gall provided tunnel construction support services.
- *MTO Contract B221, Wilshire/Normandie Station and Running Tunnels, Los Angeles, California:* Dr. Gall's provided expert witness services related to the utilization of a HDPE membrane waterproofing system for running tunnels and station.
- *Washington Metropolitan Area Transit Authority (WMATA) Outer Branch Route, Section F-6b, Washington, DC:* Design of two parallel 1,500-foot long NATM tunnels through clays and sandy material. Development of regular tunnel cross section of about 350 square feet, layout of two different excavation and support sequences to account for the two different soil layers, P1 clays and P2 sands. Design of the shotcrete lining, waterproofing and concrete inner lining. Development of structural calculations for the linings and analysis of subsidence for buildings affected by the tunnel operation.
- *Washington Metropolitan Area Transit Authority (WMATA) Greenbelt Route, Sections E4a and E3a, Washington, DC:* Waterproofing design for Georgia Avenue-Petworth and Columbia Heights stations constructed in cut-and-cover and top-down construction methods. Use of reinforced and non-reinforced PVC waterproofing membranes around entire structure (closed system). Waterproofing installation against support of excavation walls consisting of soldier piles and lagging as well as slurry walls as part of permanent structures.
- *Washington Metropolitan Area Transit Authority (WMATA) Greenbelt Route, Sections E4b and E3b, Washington, DC:* Waterproofing design for cut-and-cover ventilation, emergency access shafts and cross-over structures. Use of non-reinforced PVC waterproofing membranes around entire structure (closed system). Waterproofing installation against support of excavation walls consisting of soldier

piles and lagging as well as secant piles.

- *Washington Metropolitan Area Transit Authority (WMATA) Greenbelt Route, Section E4b, Washington, DC:* Constructability review and inspection during construction for 20-foot diameter single track tunnels driven according to NATM principles under the Rock Creek Cemetery in Washington D.C. Constructability review comprised selection of site installation for shotcrete plants, mucking areas and selection of tunneling equipment. Due to the sensitivity of the Rock Creek Cemetery, special pre-support measures were analyzed, including grouted spiles ahead of the face using chemical grouts, methods of dewatering, appropriate initial and final tunnel support.
- *Washington Metropolitan Area Transit Authority (WMATA) Greenbelt Route, Section E3b, Washington, DC:* Feasibility study for an over/under alignment (stacked scheme) of two single-track, shield-driven tunnels in soft ground/mixed face conditions. Recommendations led to adoption of the scheme by the Washington Metropolitan Transit Authority.
- *Rupertus Tunnel, Salzburg, Austria:* Twin NATM tunnels for the Austrian Railway Authority in gravel, silt and sandy materials, including two cut-and-cover sections using the canopy construction technique. Design and structural design computations using embedded frames with emphasis on backfilling of the shotcrete canopy and crossing of construction vehicles with low cover.
- *Dallas Area Rapid Transit (DART) Light Rail System, Dallas, Texas:* Development of a tunnel inspection manual for all underground structures of DART's light rail system; including underground station and adjacent ancillary rooms, ventilation and emergency access/egress structures, mined and cut-and-cover running tunnels and their cross passages. Developed procedures for a regular inspection program as well as irregular and emergency inspections, a defect rating system including permanent rock dowels and a detailed inventory based on accepted formats including FTA's TCRP (Transit Cooperative Research Program) Synthesis 23, Inspection Policy and Procedures for Rail Transit Tunnels and Underground Structures.
- *Dallas Area Rapid Transit (DART) Line Section NC-1B, CityPlace Station, Dallas, Texas:* Dr. Gall led the preliminary and final SEM design for CityPlace station in limestone (Austin chalk) including two station tunnels, cross passages, service rooms, escalator tunnels as well as emergency shafts and tunnels. The tunnels and mined underground station included systematic rock bolt supports for both initial and final linings.
- *Washington Metropolitan Area Transit Authority (WMATA) Red Line, Section B11a, Washington, DC:* Construction support services for Section B11a of the Washington, D.C. Metro Red Line in Wheaton, Maryland rendered to the project owner; two 5,400-foot long single-track NATM tunnels, approximately 20 feet in diameter through mixed face and hard rock conditions and two deep shafts. Tunnels, shafts and cross cuts were supported using systematic rock bolt patterns and shotcrete lining.
- *Dallas Area Rapid Transit (DART) North Central Rail Lines, Segments NC1-A1 & NC1-A2, Dallas, Texas:* Structural design computation for the tunnel linings of the DART light rail tunnels in soft ground, mixed face and Austin chalk for two alternative designs: NATM and conventional (TBM). Subsidence analyses and investigations of the impact of tunneling operations on adjacent structures including piers, buildings, and sewer lines. Both alternatives included installation of systematic rock bolt patterns.
- *Crossrail Project, London, U.K.:* In the position of General Consultant to the Crossrail project, which encompasses approximately 8 miles of soft ground tunnels (mainly London clay) underneath the center of London, including five mined stations. Development of design criteria for soft ground tunnels and stations using sequential excavation methods (NATM). Subsequently engaged in the design of all NATM mined stations and bifurcation structures as well as construction management services on behalf of Crossrail, the project owner.
- *Brasilia Metro, Brasilia, Brazil:* Twin NATM tunnels for the Brasilia Metro in porous clays. Redesign of excavation and support sequence to minimize surface and subsurface settlements using hip-sidewall

drift approach. Structural design computations for the modified cross-section and specifications.

Highway Tunnels

- *Istanbul Strait Road Crossing Project, Istanbul, Turkey:* The Istanbul Strait Road Crossing Project, also called the Eurasia Tunnel Project, will alleviate the traffic congestion in and around the city of Istanbul. With the total length of 9.1 miles (14.6 kilometers), the project will connect the cities of Kazlıcesme and Goztepe on the European and Asian sides of Turkey, respectively. Construction included Conventional Tunneling (SEM) approach tunnels and cross passages, ventilation shafts, cut-and-cover structures, and a 3.4 mile (5.4 kilometer) 45 foot diameter Tunnel Boring Machine (TBM) tunnel beneath the Bosphorus Strait. The TBM tunnel will consist of a double-deck road tunnel with two lanes on each deck. Ground conditions include quartz, quartz arenite, arkose, conglomerates, sandstones, dolomites, limestones, shales and mudstones, as well as checking water pressure. The project will be built entirely within a highly-active seismic zone. Dr. Gall led the SEM tunneling engineer services and provided technical support on the TBM design.
- *Florida Department of Transportation, City of Miami, Port of Miami Tunnel Project, Miami, Florida:* Twin tunnels provide a direct underground connection from the Port of Miami at Dodge Island via Watson Island to I-395 and all other highways in and around Miami. The tunnels were bored with a single 42-foot diameter tunnel boring machine (TBM) that has been designed specifically for the geotechnical conditions on site. Dr. Gall provided expert consulting services for the project and oversaw the independent assessment of the construction effects on the existing structures on Dodge Island above the tunnel alignment. This assessment included independent two- and three-dimensional finite element modeling of the affected structures. Additionally, he led inspection services to document the existing condition of the structures prior to the TBM excavation beneath Dodge Island.
- *City of Billings, Zimmerman Trail Tunnel Project, Billings, Montana:* Zimmerman Trail is a historic roadway that was originally constructed in the late 1800s for the purpose of expediting livestock. A tunnel has been proposed to eliminate the concern of the unstable slope adjacent the road. The proposed road tunnel will consist of 14-foot lanes with 8-foot shoulders for bidirectional traffic. Excavation through the rock will be done utilizing the sequential excavation method (SEM) with controlled blasting. Tunnel ground support will include rock dowels and reinforced shotcrete. After excavation and support is completed, a waterproofing membrane will be installed on the roof and sidewalls creating a drained system followed by a cast-in-place reinforced concrete final lining.
- *Caldecott Tunnel Improvement Project, Oakland, California:* The existing Caldecott Tunnel consists of three two-lane tunnels that connect Alameda and Contra Costa counties via State Route 24 (SR-24). The project included the construction of a fourth tunnel with seven cross passages to one of the existing tunnels using the Sequential Excavation Method (SEM). All tunnel initial support included systematic installation of rock bolts and initial shotcrete lining. Dr. Gall provided SEM expertise during construction to the Project Construction Management team led by Caltrans.
- *Caltrans District 4 Devil's Slide Tunnels, San Pedro Mountain on US Highway 1 between Half-moon Bay and Pacifica, California:* The Devil's Slide dual tunnels were constructed using NATM in complex, weak rock conditions. Dr. Gall led the integrated on-site consulting services to the contractor, which included preparation of shop drawings for excavation and support sequences, portal canopy, waterproofing and final linings, and evaluation of NATM instrumentation and monitoring results. Tunneling involved systematic rock bolt and shotcrete lining for initial support.
- *Singapore Land Transport Authority Fort Canning Tunnel and Realignment of Stamford Road, Singapore:* Historic park area and an overburden cover of only 10 to 32 feet above the proposed Fort Canning Tunnel posed challenges for design and construction. The initial design that called for construction with cut-and-cover methods was rejected and substituted by an NATM design utilizing a two-pass lining system for the mined portion of the tunnel.
- *Boston Central Artery / Tunnel (CA/T), Contract CI9E1, Boston, Massachusetts:* Mined Tunnel Option (MTO-NATM) design for two-lane ramp tunnels (approximately 1,400 square feet excavation cross

section area) in urban area and rail yard in marine clay, organic silt and fill material. Design of excavation and support sequence, instrumentation and monitoring program, shotcrete and concrete lining as well as the waterproofing system. Construction required utilization of various ground improvement and specialty construction techniques including the doorframe slab method, a horizontal pipe dewatering system and groundwater cut-off using secant jet grout walls and slurry walls.

- *Boston Central Artery / Tunnel (CA/T), Contract C11A1, Boston, Massachusetts:* Value engineering change proposal for a mined tunnel alternative according to the NATM for MBTA's Red Line South station underpinning. The design proposed the use of a between 60 to 72 feet wide NATM tunnel drive under the station structure with only some 10 feet of ground cover. The design included installation of a pre-support grouted arch umbrella and excavation and support in multiple drifts using the sidewall drift method. Extensive numerical modeling to demonstrate that the impact on adjacent structures, namely One Financial Center, South Station and Federal Reserve Bank, would be within CA/T project defined limits supported the design. A systematic risk analysis was performed for the project evaluating the various tunnel construction methods.
- *Pennsylvania Turnpike Commission, Allegheny Tunnels By-Pass Study, Somerset, Pennsylvania:* Study of by-pass alternatives for the existing Allegheny Mountain tunnels. Based on the need to improve the current alignment with respect to safety and to accommodate future traffic growth, a study into traffic improvements was performed, including rehabilitation and widening of existing tunnels to the construction of two new 3-lane and 4-lane tunnel configurations. Tasks included development of tunnel configuration (cross section, and excavation and support), portal locations, assessment of tunnel construction cost, construction scheduling, as well as operation and maintenance cost at a feasibility study completion level.
- *Kaoshiung-Pingtun Tunnels, Second Freeway Project, Taiwan, Republic of China.:* Design of two 5,577-foot long three-lane NATM highway tunnels through weak rock formations, including fractured shales, sandstones and plastic mylonites, and faulty areas in earthquake active regions. Development of regular cross sections, excavation sequences and initial support support using systematic rock bolting and shotcrete, structural computations and specifications.
- *Texas Turnpike Authority, Addison Airport Tunnel, Dallas, Texas:* Preliminary design and cost estimate for 1,650-foot long, two-lane NATM road tunnel under existing runways in mixed face conditions and limestone (Austin Chalk) with rock bolts and shotcrete for initial support. Use of the doorframe slab method to reduce surface disruptions to airport traffic.
- *Pennsylvania Turnpike Commission (PTC), Lehigh Tunnel No. 2, Allentown, Pennsylvania:* Engineering support services during construction of the 4,300-foot long two-lane highway NATM tunnel, including three cross passage ways to the existing Lehigh Tunnel No. 1, through the central part of the Appalachian Mountains in shale, limestone, and sandstone. The support included rock bolts and shotcrete followed by a waterproofing membrane and final unreinforced concrete lining.

Tunnel Rehabilitation/Refurbishment/Repair

- *Tunnel Water Infiltration Remediation Design Multiple Lines, Washington Metropolitan Area Transit Authority, Washington, DC:* WMATA's tunnels throughout the system have experienced water infiltration since their original construction in the 1970's, which has led to deterioration and operational impacts of the structure, the track, and the rails systems within. GZ, under the direction of Gannett Fleming Parsons, was tasked with completing an investigation of the leakage within the tunnels, developing a design package to halt the water infiltration, and provide on site support during construction. Dr. Gall was the Engineer of Record for the design, leading the team developing the design documents.
- *Tunnel Water Intrusion Mitigation, Bay Area Rapid Transit (BART), San Francisco, California:* BART requested the services of the HNTB+FMG Design Team, including sub-consultant Gall Zeidler Consultants, to perform tunnel water intrusion inspections, a state of the art review of infiltration mitigation efforts, and recommending which of those efforts are applicable to the

infiltration. Dr. Gall lead the team which performed inspections and developed the report outlining leak remediation recommendations.

- *Tuscarora Tunnel Rehabilitation, Fannettsburg, Pennsylvania:* The Tuscarora Tunnels consist of two tunnels carrying eastbound and westbound traffic. Each tunnel is approximately 5,326 feet in length with portal buildings on each end, where the mechanical systems are housed. Tunnel rehabilitation includes the complete removal of the existing ceiling and the installation of new waterproofing, drainage system and shotcrete final lining with lattice girders providing a template for the shotcrete application. The other involves inserting drain pipes into every construction joint. Dr. Gall managed the development of the rehabilitation design through bid and contract documents.
- *Liberty Tunnels Rehabilitation, Pittsburgh, Pennsylvania:* The Liberty Tunnels are almost 100 year old road tunnels located just outside of Pittsburgh. The tunnels underwent significant rehabilitation measures, including the replacement of aging ventilation arch walls; the arch walls act as tunnel-shaped jet structures for fresh air supply to the inside of the tunnel. The design of the arch wall included lattice girders and shotcrete concept that provided the contractor with a solution for schedule restraints given the tight construction window allowed. Dr. Gall managed the development of the design which was awarded the American Shotcrete Association 2014 project of the year.
- *PATH System Rehabilitation, New York, New York:* Consultant for construction ventilation; development of contract documents (specifications, layouts), check of contractor's ventilation design.
- *Rehabilitation of the Bergen Tunnels, New Jersey Transit, Bergen, New Jersey:* Outline design for the re-lining of an approximately 120-year old brick and stone masonry lined tunnel according to NATM with systematic rock bolting and shotcrete. Development of the geotechnical investigation program, layout of excavation and support sequences, recommendations on waterproofing, drainage system and final, concrete lining layout.
- *Fan Plant No. 7235, 125th Street, New York, New York:* Design for and site supervision of remedial grouting for waterproofing.
- *City of Alexandria, Cameron Run Tunnels Rehabilitation Project, Alexandria, Virginia:* Rehabilitation design for seven 20-foot diameter, each about 175 feet long, storm water drains beneath the CSX railroad embankment at Cameron Run in the City of Alexandria. These approximately 25-year-old tunnels, supported by corrugated steel liner plates exhibited inward lining deformations of up to approximately two feet. Rehabilitation design foresaw implementation of a jacking device to partially expand the exiting deformations to an optimized and hydraulically required perimeter, supported by steel sets and shotcrete. Rehabilitation is carried out beneath operating rail tracks in two stages to assure sufficient water flow for the Cameron Run. The services include construction management.
- *Port Authority of Allegheny County (PAT), Berry Street Tunnel, Pittsburgh, Pennsylvania:* Value engineering change proposal (VECP) design for the Construction Company for enlargement of approximately 2,650 feet of existing 130-year-old horseshoe brick-lined tunnel (26-foot diameter) into a two-lane busway tunnel (40-foot diameter) using NATM. Project management for design of excavation and support sequence, instrumentation and monitoring program, systematic rock bolting and pre-support spiling, shotcrete and concrete lining, waterproofing system, cut-and-cover structures built by the shotcrete canopy method. Project management and oversight during construction period.
- *East London Line Thames Tunnel, London, U.K.:* Refurbishment of approximately 1,200 feet of existing 150-year-old twin side-by-side horseshoe brick-lined tunnels using the observational (NATM) approach. Development of the structural calculations and design of the shotcrete and concrete inner linings as well as the waterproofing.
- *Pennsylvania Turnpike Commission (PTC), Allegheny Tunnel No. 1, Somerset, Pennsylvania:* Study of a rehabilitation alternative: use of a longitudinal ventilation system using booster fans in connection with a remedial waterproofing system applied at the tunnel arch using flexible membrane techniques and drainage with protective shotcrete lining. Assessment of ventilation requirements based on

calculations and review of European tunnel case histories.

- *Pennsylvania Turnpike Commission (PTC), Lehigh Tunnel No. 1, Allentown, Pennsylvania:* Construction supervision related to implementation of a rehabilitation waterproofing applied in the airduct of the tunnel, which was built in 1957. The waterproofing comprises of a flexible plastic membrane, insulation layers and a sidewall drainage system in the air duct.

Other Facilities

- *Central Trunk Line South, Unit 4 / Phase 2, Los Angeles, CA:* The CTLS tunnel is currently under construction, which is owned by Los Angeles Department of Water and Power. The project is located in northern Los Angeles underneath the crossing of Riverside Drive and Whitsett Avenue. The site is generally underlain by alluvial sediments consisting of alternating layers of silty and clayey sands, and sandy silts and clays. The sandy soils are generally medium dense to very dense, and the fine-grained materials are very stiff to hard. Due to space restrictions, the alignment of the proposed tunnel has relatively sharp curves on either end and, thus, cannot be constructed by pipe-jacked micro tunneling methods. Hence, the tunnel will be constructed by “hand-mining” with the Sequential Excavation Method (SEM). The tunnel is advanced by excavating 3-ft long rounds with a small excavator. Each round consists of heading and bench excavations, which are immediately supported by a thin layer of fast-curing “flashcrete” and followed up by applying a 7-inch thick shotcrete liner with steel lattice girders at 3 feet intervals. Dr. Gall managed the SEM site support services.
- *Integrated Pipeline Project, Trinity River Tunnel, Dallas, Texas:* The Tarrant Regional Water District (TRWD) and the City of Dallas Water Utilities (DWU) have partnered to develop the Integrated Pipeline project, which will eventually extend 150 miles from Lake Palestine to Lake Benbrook. The project will be constructed over 20 years, and began in the fall of 2014 with the first construction contract. Once complete, the pipeline will integrate the TRWD’s existing pipeline to the DWU water system and provide an additional 350 million gallons per day capacity to North Central Texas. A critical part of the pipeline project involves crossing beneath the Trinity River with a 2614 feet long tunnel segment. Dr. Gall managed bid design services on the Trinity River Tunnel segment.
- *Alto Maipo Hydroelectric Power Project, San José de Maipo, Chile:* Alto Maipo Hydroelectric Power project comprises the design and construction of two run-of-the-river hydroelectric plants arranged in hydraulic sequence located in the high-altitude area of the Maipo River basin, 50 km southeast of Santiago, Chile in the municipal district of San José de Maipo. The project will capture flow from the Colorado river basin in the north and the Volcán and Yeso river valleys in the south. The majority of the works will be underground, including powerhouse caverns, headrace and tailrace tunnels, access tunnels, surge and pressure shafts and other water adduction systems. The tunnels of the project will be excavated mostly in volcanic and volcanoclastic rocks under high hydrostatic pressure and ground cover reaching 6,500 feet (2,000 meters). Upon completion, the power plants will be capable of generating a combined total output of 531MW of electricity. Dr. Gall is leading the independent expert review services provided to the project contractor, Strabag, in close cooperation with the owner, AES Gener.
- *DC Clean Rivers Project – Anacostia River Tunnel, Washington, D.C.:* The Anacostia River Tunnel (ART) Project is a part of the District of Columbia Water and Sewer Authority's (DC Water's) Long Term Control Plan (LTCP) for combined sewer overflow (CSO) discharges to the Potomac and Anacostia rivers, as well as Rock Creek within the District of Columbia. The ART includes an approximately 12,300 foot (3,750 meter) long tunnel with a 23 foot (7 meter) inside diameter extending from the CSO 019 North Drop Shaft (CSO 019N-DS) at the upstream end to the Poplar Point Junction Shaft (PP-JS) at the downstream end. The Inter Shaft Connector Tunnel (ISCT) is part of the Anacostia River Tunnel Project. The ISCT connects two drop shafts (CSO-019N-DS and CSO-019S-DS) and is approximately 102 feet (31 meters) in length and has finished 23 foot (7 meter) diameter. The Inter Shaft Connector Tunnel (ISCT) will be excavated conventionally using New Austrian Tunneling Method / Sequential Excavation Method (NATM / SEM) techniques. Ground conditions include fill, alluvium, the Patapsco / Arundel Formation, and the Patuxent Formation (soft soils, clays, sands, gravels). Dr. Gall led the ISCT final design services followed by the SEM on-site construction support.

- *Bingham Canyon Mine Underground Development, Salt Lake City, Utah:* While constructing drainage tunnels at the Bingham Canyon Mine, Rio Tinto has encountered several severely faulted areas, which has lead to poor ground conditions. This project includes the development of geologic support selection criteria for the various ground conditions, as well as producing design documents for each support category. Each support category included a systematic rock bolt pattern and shotcrete for final support. Ground conditions include bedrock (quartzites, limestones, skarns, siltstones, and hornfels) and intrusive igneous rocks (monzonites, quartz monzonite porphyries, latites, and quartz latite porphyries).
- *Washington, DC Dulles International Airport, Automated People Mover System (APM), D2 Development, Dulles, Virginia:* Program and Construction Management Services for the Metropolitan Washington Airports Authority (MWAA). These services are related to the design oversight and subsequent construction management and inspection of all underground work for the East and West Domestic Corridor APM tunnels (Package 3E and 3W), the Pedestrian Walkback Tunnel and the West Utility Building tunnel. These structures are constructed by cut-and-cover, TBM and NATM construction methods. Cut-and-cover techniques were used for the construction of stations. All SEM tunneling and cut-and-cover construction included installation of rock bolts. The work also included installation of miscellaneous utilities using micro tunneling techniques. Water mains, electrical conduits and communication lines are installed within steel casings under taxiways and runways and grouted in place. Following completion of the structures the construction management and inspection work relates to finish-out work including electrical and mechanical installations.
- *University of Virginia Steam Tunnel and Storm Water Improvements, Charlottesville, Virginia:* Alternative shaft arrangement study, detailed design, specifications, structural design calculations, instrumentation and monitoring, construction phase services.
- *Indian Creek Drainage Basin Segment IV, Atlanta, Georgia:* Shaft feasibility study, detailed design, specifications, structural design calculations and construction support services.
- *Washington DC, Dulles Washington International Airport, Walkback Tunnel, Dulles, Virginia:* Detailed design for a Pedestrian Walkback Tunnel (approximately 1,076 square feet excavation cross section area) beneath airport taxi lanes and taxi ways in residual soil, weathered and competent siltstone. Design of NATM excavation and support sequence, instrumentation and monitoring program, reinforced shotcrete with rock bolts and concrete linings, and waterproofing system. The mined tunnel option replaced an initially planned cut-and-cover construction at comparable bid cost. The taxi lanes and ways remain operational while tunneling was carried out underneath.
- *Pocoima Dam Spillway Modification, County of Los Angeles, California, Department of Public Works:* Redesign of the final tunnel lining for the enlargement of a spillway tunnel in a value engineering frame work. Comparison of in-situ rock conditions exposed upon tunnel enlargement with ground conditions depicted in the contract documents warranted a redesign of the final tunnel lining. The redesigned lining consisted of 8-inch shotcrete lining vs. a 15-inch cast-in-place, double-layered reinforced concrete.
- *Interquarry Tunnel, Luckstone Quarry, Leesburg, Virginia:* Design of this about 800 square foot cross section and 300 feet long rock tunnel connecting two quarries through diorite. Layout of NATM excavation and support sequence, shotcrete lining, systematic rock bolting, monitoring instruments, preparation of bid documents, including drawings and specifications. Site supervision during construction.

Tunnel Ventilation

- *Ovit Highway Tunnel Ventilation Design, General Directorate of Highways (KGM), İkizdere, Rize Province / İspir, Erzurum Province, Turkey:* The Ovit Highway Tunnel is a 12.6 kilometers (8 miles) long twin road tunnel between İkizdere, Rize Province and İspir, Erzurum Province in Turkey. The project has two NATM tunnel bores, each with two lanes. The maximum overburden is about 850-900 meters (2,790-2,950 feet), while the average overburden ranges from about 400-500 meters (1300-1640 feet). The tunnels have cross passages located every 250 meters (820 feet). The ventilation system for

the twin tunnel is of the longitudinal type with jet fans located in the cross section and an air exchange station for the uphill, eastbound tube. In an emergency, the air exchange station can be used as a smoke extraction point for either tube. Dr. Gall led the development of all alternative tunnel rehabilitation design concepts.

- *Lindbergh Tunnels at Lambert - St. Louis International Airport, St. Louis, Missouri*: Review tunnel ventilation design (CFD analysis) for recommendation on airport specific location.
- *Route 29 Tunnel, New Jersey*: Third party review of ventilation design according to the longitudinal ventilation system using jet fans. In particular review and recommendation on the design, fire scenario and escape ways.
- *Atlantic City / Brigantine Connector Tunnel, New Jersey*: Preparation of a ventilation system analysis for a two-lane each direction cut-and-cover, approximately 2,000-foot long vehicular box tunnel. The analysis included airflow modeling and calculation of requirements for a longitudinal jet fan based ventilation system for specified traffic and emergency (fire) situation and recommendations for a jet fan layout. The analysis was carried out in close cooperation with the Institute for Internal Combustion Engines and Thermodynamics of the Technical University Graz, Austria.

Technical Expert Services

- *Soto Norte Project, Sociedad Minera de Santander S.A.S. (Minesa), Bucaramanga, Colombia*: Minesa plans to commission the Soto Norte Project to reach a gold deposit located ~34 miles (~54 km) northeast of Bucaramanga. The project aims to produce more than 9 million ounces of gold over a lifetime of approximately 26 years, with an estimated investment of \$1 Billion over the next 5 years. Approximately 4.3-mile-long (6.9 kilometers) tunnel is required to reach the gold deposit from the chosen portal area. Excavation of the tunnel will be carried out by a combination of conventional tunneling and Hard-Rock Tunnel Boring Machine (TBM) tunneling methods; throughout the alignment, several faults will be encountered where high groundwater inflow is expected. Dr. Gall is the Design Lead providing SEM/TBM tunneling advisement services, development of technical specifications, procurement support, and a review of the rock support design that uses systematic rock bolting for both conventional and TBM tunneling.
- *Westside Purple Line Extension Section 2, Los Angeles County Metropolitan Transportation Authority (Metro), Los Angeles, California (2017-present)*: The Westside Purple Line Extension Section 2 is part of an approximately 9-mile-long (14.5 kilometers) westerly extension of the LA Metro Purple Line. The project will extend the line from its current terminus at the Wilshire/Western Station to a new terminus at the West Los Angeles Veterans Affairs Hospital. The construction of Section 2 is planned to be accomplished utilizing Pressurized-Face Tunnel Boring Machines (TBMs) to construct two circular tunnels approximately 22 feet in diameter. GZ is supporting the Beverly Hills Unified School District (BHUSD) who has raised concerns on the tunneling impacts to the school's campus by analyzing preliminary settlement and damages, developing tunneling strategies for encountering both active and abandoned oil wells within the BHUSD, and addressing all design and construction aspects to the underground scheme.
- *Ruta del Sol Road Project, Villeta / Guaduas, Columbia*: The Ruta del Sol Road Project stretches over 620 miles (1000 kilometers) and will eventually connect Colombia's capital city of Bogotá to the Caribbean coast, while connecting several towns and cities along the way. The alignment includes a two-lane highway, as well as several bridges, tunnels, high cuts and embankments. Construction on Tramo 1, Sector 1 (13.4 miles, or 21.6 kilometers long) of the Ruta del Sol Project, which connects the municipalities of Villeta and Guaduas in Cundinamarca Department, has yet to begin due to concerns regarding slope stability along the alignment, which winds through mountainous terrain susceptible to landslides and mass movements; these risks may have been exacerbated by excessive rains that affected the area during the 2010-2011 La Niña phenomenon. Ground conditions include marine sedimentary rocks (predominantly shales, mudstones, and siltstones) and terrestrial sedimentary rocks (sandstones, conglomerates). Fissile marine shales are some of the most common materials along the project

alignment, and are highly susceptible to weathering and erosion. The project area is seismically active and includes perched groundwater conditions.

- *Esti Hydropower Project, Chiriqui, Panama:* The Esti Hydropower Scheme was constructed in Panama's Chiriqui Province between 2000 and 2003, using drill-and-blast excavation methods. Complex geological and topographical conditions encountered during construction required the realignment of the headrace tunnel to prevent hydrofracturing under shallow cover. Sections of the headrace tunnel, which connects the waters of Barrigon Reservoir to the scheme's Powerhouse, have since collapsed, leading to a long standstill of the plant's operations. Ground conditions include highly-weathered volcanic tuffs. Dr. Gall served as the owner's tunneling expert for the determination of the causes of the collapsed tunnel section.
- *St. Louis Metro, MetroLink Cross County Extension, St. Louis, Missouri:* The MetroLink Extension, Facilities 2 contract included 1.32 miles of dual track cut-and-cover tunnels with two below-grade stations which extended the Metro's Blue Line from Kingsland Avenue to Ritz Carlton Drive. The tunnels were constructed in 2004 with cast-in-place base slabs and tunnel walls, and precast concrete roof segments. Dr. Gall provides expert witness services to the owner's representative regarding tunnel leakage that occurred after the construction of Tunnels 2 and 3.
- *San Francisco Municipal Transportation Authority, Central Subway Project, and Chinatown Station:* The station is part of Phase 2 of the Third Street Light Rail Transit (LRT) Project. The overall project is 1.7 miles long and includes two single-track TBM tunnels and several stations, including the Chinatown Station and Crossover caverns, which are to be built by SEM. Ground conditions include the Colma Formation, a complex, interbedded sequence of estuarine and nearshore sediments and the Franciscan Mélange, a heterogeneous mixture of small to large masses of different rock types, including sandstone, shale, siltstone, greenstone, and various metamorphic rocks. Dr. Gall provided Expert Peer Review Services during the design phase and currently serves as an advisor to the construction of Chinatown Station.
- *Tennessee Valley Authority (TVA), Raccoon Mountain Pumped Storage Plant (PSP), Chattanooga, Tennessee:* The proposed relocation of the four main unit transformers requires the development of new isolated phase bus (IPB) chambers, stub tunnels, and shafts. Dr. Gall is part of the Independent Expert Review Board and helps to evaluate existing conditions, determine impacts, and provide construction recommendations for the underground work. The project is located mainly within a limestone formation that requires systematic rock bolting for tunnel and cavern support.
- *Metropolitan Transit Authority (MTA) and MTA Capital Construction (MTACC), South Ferry Terminal for the No. 1 Subway, New York, New York:* During the latter part of its construction, South Ferry underground station and adjoining ancillary structures and tunnels experienced water leakage into the finished underground space. Dr. Gall represented MTACC to assess the leakage manifested in conjunction with the waterproofing system chosen. The review work concluded in a findings report that was utilized by MTACC in presentations to the dispute review board (DRB).
- *New Jersey Transit Authority, New York Metropolitan Transportation Authority, Trans-Hudson-Express (THE) Tunnel and No. 7 Line Extension Interface Study New York, New York:* The area at which the proposed Trans-Hudson-Express tunnels run underneath the No. 7 Line Extension tunnels is referred to as the Interface. Dr. Gall led the expert services assessing the impact of THE tunnel construction on the No. 7 Line Extension tunnels at the interface. The host rock and its structural behavior were examined as a result of the envisioned tunneling techniques of both projects. For THE tunnels, TBM tunneling with rock bolts as initial support was envisioned. A three-dimensional numerical analysis employing a state-of-the-art ubiquitous joint model (UJM) was used to support the investigation along with a hazard and risk analysis. The rock bolt supports were specifically considered in the modeling.
- *Washington State Department of Transportation SR 520 - Bridge Replacement and HOV Program, Seattle, Washington:* Feasibility study for "Tunnels at East Montlake and the Arboretum Conceptual

Design and Cost Estimate" also known as "Alternative K". This alternative envisions an interchange connection from the main SR520 alignment, and includes a tunnel for the main road along the Arboretum. Providing expert tunnel design and construction review and recommendations on the evaluated proposed alternative, including technical feasibility, design concepts and construction methods, options, issues and risks as well as related geotechnical considerations and impacts on surrounding areas. In particular developed a concept for two, approximately 50-foot diameter SEM tunnels under Montlake cut to be constructed with the aid of ground freezing for ground stabilization and ground water cut-off.

- *Washington Dulles International Airport, Automated People Mover System (APM), Dulles, Virginia: Independent Expert Peer Review of designs for the West Utility Building tunnel, East Domestic Corridor and West Domestic Corridor.*

Technical Papers and Publications

- MODERN URBAN TUNNELLING – RESPONDING TO SOCIAL NEEDS. Geomechanik Kolloquium 2019, Geomechanik und Tunnelbau 12(5): 434-439, Salzburg, Austria, October 10 – 11, (Zeidler, K. & Gall, V.)
- SHALLOW SEM TUNNELING WITH LIMITED CLEARANCE TO EXISTING STRUCTURES: DESIGN, CONSTRUCTION AND OBSERVATIONS. 2019 Rapid Excavation & Tunneling Conference, Chicago, IL, June 16-19, (Yang, H., Penrice, D., Klary, W. & Gall, V.)
- SCMAGLEV - FAST AND INNOVATIVE MODE OF TRANSPORTATION IN THE NORTHEAST CORRIDOR – TUNNELING CHALLENGES. 2019 Rapid Excavation & Tunneling Conference, Chicago, IL, June 16 – 19, (with Syrtariotis, N., O’Brien, T., Crawford, C. C. & Henley, D.)
- THE GATEWAY PROGRAM – THE HUDSON RIVER TUNNEL PROJECT IN NEW YORK, NEW JERSEY. 2019 Underground Construction Prague, Prague, Czech Republic, June 3 – 5, (with Nasim, M.)
- CONVENTIONAL TUNNELING IN URBAN AREAS. 2019 World Tunnel Congress, Naples, Italy, May 3 – 9, (Munfah, N., Gall, V., Klary, W., & O’Brien, T.)
- SCMAGLEV PROJECT — FAST AND INNOVATIVE MODE OF TRANSPORTATION IN THE NORTHEAST CORRIDOR. North American Tunneling Conference, Washington, D.C., June 24 – 27, 2018, (with Pyakurel, S., Syrtariotis, N., Crawford, C., Sfintescu, L. & Henley, D. J.)
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- DESIGN AND CONSTRUCTION ASPECTS OF PNEUMATICALLY APPLIED CONCRETE FINAL TUNNEL LININGS. 2016 World Tunnel Congress and 42nd ITA General Assembly Proceedings, San Francisco, CA, April 22-28, (with Thompson, A., Valdivia, A., Cao, W., Cicileo, C., & Schabib, J.)
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- RECENT TRENDS IN CONVENTIONAL TUNNELING (SEM/NATM) IN THE US. 2016 World Tunnel Congress and 42nd ITA General Assembly Proceedings, San Francisco, CA, April 22-28, (Munfah, N., Gall, V. & Matthei, S.)

- LARGE CROSS SECTIONS FOR SOFT GROUND AND SOFT ROCK CONVENTIONAL TUNNELING PROJECTS IN URBAN AREAS – RECENT DEVELOPMENTS IN THE US. 2015 World Tunnel Congress and 41st ITA General Assembly Proceedings, Dubrovnik, Croatia, May 22-28, (with Munfah, N. & Matthei, S.)
- IMPACT OF THE 2010–2011 LA NIÑA WEATHER PHENOMENON ON TERRAIN STABILITY AND UTILIZATION OF LONG TUNNELS FOR MITIGATION ALONG THE RUTA DEL SOL PROJECT ALIGNMENT IN COLOMBIA, SOUTH AMERICA. North American Tunneling Conference, Los Angeles, CA, June 22-25, 2014 (with Nitschke, A., Giraldo, A., & Blessing IV, R.)
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- LOW COST AUTOMATIC DATA ACQUISITION AND ANALYSIS FOR UNIAXIAL ROCK TESTING, Proceedings, Geotech 88, Lakewood, Colorado, Oct. 1988 (with Park., D Patton, S.)

Lectures

- NATM and SEM, Underground / Tunneling Fundamentals, Practice, and Innovations 2019, Colorado School of Mines Tunneling Short Course, Golden, Colorado, October 14-17, 2019.
- NATM/SEM Design and Construction, Breakthroughs in Tunneling 2019, Colorado School of Mines Tunneling Short Course, Denver, Colorado, September 9-11, 2019.
- The Gateway Program – the Hudson River Tunnel Project in New York, New Jersey, Keynote; ITA-AITES 14th International Conference Underground Construction, Prague, Czech Republic, June 3-5, 2019.
- NATM and SEM, Underground / Tunneling Fundamentals, Practice, and Innovations 2018, Colorado School of Mines Tunneling Short Course, Golden, Colorado, October 15-18, 2018.
- NATM/SEM Design and Construction, Breakthroughs in Tunneling 2018, Colorado School of Mines Tunneling Short Course, Denver, Colorado, September 10-12, 2018.
- NATM and SEM, Underground / Tunneling Fundamentals, Practice, and Innovations 2017, Colorado School of Mines Tunneling Short Course, Golden, Colorado, October 18-21, 2017.
- NATM Design and Construction, Breakthroughs in Tunneling 2017, Colorado School of Mines Tunneling Short Course, Chicago, Illinois, August 14-16, 2017.
- NATM/SEM from Design to Construction, Breakthroughs in Tunneling 2016, Colorado School of Mines Tunneling Short Course, Boulder, Colorado, September 12-15, 2016.
- Principles of SEM/NATM in Rock, Underground / Tunneling Fundamentals, Practice, and Innovations 2016, Colorado School of Mines Tunneling Short Course, Golden, Colorado, June 20-23, 2016.
- NATM/SEM from Design to Construction, Breakthroughs in Tunneling 2015, Colorado School of Mines Tunneling Short Course, Golden, Colorado, September 14-17, 2015.
- Versatile Tunneling Methods for Difficult Soft Ground Conditions in Urban Areas, The 9th Andean Seminar on Tunnels and Underground Works, Bogotá, Columbia November 6 & 7, 2014
- Case History: Devil’s Slide Tunnels and Caldecott 4th Bore, Breakthroughs in Tunneling 2014, Colorado School of Mines Tunneling Short Course, Golden, Colorado, September 15-17, 2014.
- Case History: Devil’s Slide and Caldecott 4th Bore, Breakthroughs in Tunneling 2013, Colorado School of Mines Tunneling Short Course, Golden, Colorado, September 18-20, 2013.
- Non-Disruptive Alternatives for Grade Separation Projects in Urban Settings Using Very Shallow Conventional Tunneling, Keynote; ITA-AITES 12th International Conference Underground Construction, Prague, Czech Republic, April 22-24, 2013.
- Case History: Tysons Corner Station and Tunnels, Breakthroughs in Tunneling 2012, Colorado Schools of Mines, Golden, Colorado, September 19-21, 2012.

- Design and Construction of the Dulles Corridor Metrorail Project NATM Tunnels at Tysons Corner, Virginia, 2012 North American Tunneling Conference, Indianapolis, Indiana, June 24-27, 2012.
- Waterproofing, Roofing and Heating Insulation AquaStop – 2012, Keynote; Achieving Dry Underground Space-A Strategic Approach, Saint-Petersburg, Russia, May, 29-30 2012.
- SEM/NATM Tunneling in Design and Construction, Kentucky Chamber of Transportation Tunneling Seminar, Frankfort, Kentucky, December 5 & 6, 2011
- Design and Construction of the Dulles Metrorail Project NATM Tunnels at Tysons Corner, Virginia, British Tunneling Society, Institution of Civil Engineers, London, U.K., November 17, 2011
- Urban Tunneling Under Shallow Cover, Forum Geotechnik, RWTH University Aachen, Germany, November 19, 2009
- Concrete Lining & Shotcrete Sequential Excavation (SEM) for Shaft Construction, Shaft Design and Construction Short Course, Sponsored by the Underground Construction Association of SME, Atlanta, Georgia, September 10-11, 2009
- Introduction to FHWA Road Tunnel Design and Construction Manual, SEM Tunneling (P09-0388), Workshop 133, Sponsored by the Tunnels and Underground Structures Committee (AFF60), Transportation Research Board (TRB) 88th Annual Meeting, Washington, DC, January 11-15, 2009.
- Waterproofing Shotcrete / Cast-in-Place Liners, 2007 George A. Fox Conference, “Waterproofing of Underground Structures: An East Coast Perspective” New York City, New York, January 30, 2007.
- West Utility Building Tunnel – NATM at Washington Dulles International Airport, 2006 George A. Fox Conference New York City, New York, January 24, 2006.
- State-of-the-Art in the Application of Sequential Tunneling Methods (NATM), Parsons Brinckerhoff Quade and Douglas New York 2005 Tunneling Seminar, Newark, New Jersey, June 14, 2005.
- Utilization of Lattice Girders in Underground Shotcrete Support, Engineering Assessment of Lattice Girder Options, Presentation to American Commercial, Inc., Bristol, Virginia, October 1, 2002.
- Softground Tunnels for Transportation, Water and Wastewater Conveyance, Recent Innovations in the Science of Underground Development, Annual Meeting of the American Association for the Advancement of Science, Boston, Massachusetts, February 2002.
- Flexible Approaches for Urban Tunneling, ASCE Metropolitan Section Annual Seminar of the Construction Group, Innovative Construction Means and Methods, Cooper Union, New York City, New York, March 6-7, 2000.
- NATM in Soft Ground for Big Digs, American Society of Civil Engineers Annual Convention, Boston, Massachusetts, October 18-21, 1998.
- State-of-the-Art in Design and Construction for Vehicular Tunnels, Tunneling Seminar by Invitation of the Chilean Ministry of Public Works, Santiago, Chile, November 19-20, 1996.