

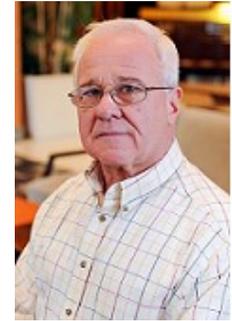
# RAYMOND W. HENN

## OWNER

Mr. Henn has more than 44 years of heavy and underground construction experience with a concentration in shafts and tunneling, hydroelectric, water and wastewater, and transportation projects. During his career, Mr. Henn has held positions from field engineer through superintendent to construction manager and chief consultant on both direct-hire construction, and construction management assignments. The projects have ranged in value from \$2M to \$1.8B. He has a strong background in general civil construction, mass and specialty concrete placement, grouting programs, deep foundations, as well as shaft and tunnel excavation, and final linings. Mr. Henn's underground experience includes conventional drill and blast, tunnel boring machine, roadheader, sequential excavation methods and trenchless excavation methods in hard rock, mixed-face, and soft-ground conditions. He has experience with deep shaft and large chamber excavations, as well as pressure tunnels. He has worked extensively with cast-in-place and precast concrete, shotcrete, and various types of pipe tunnel lining systems. His foundations background consists of mass excavations, geotechnical and structural grouting, sheet piling, construction dewatering, post tension anchors, rock bolting, soldier pile and lagging, structural slurry wall construction, and drilled shafts.

Mr. Henn provides consulting to engineers, contractors, owners, attorneys and insurers for heavy and underground construction projects. He provides specialty construction consulting services in areas of underground grouting, constructability and claims avoidance reviews, performing claim evaluations and negotiations, litigation support, expert witness services, construction methods and equipment evaluation, cost and scheduling, cycle time estimates, and value engineering. He has also conducted tunnel condition surveys. Additionally, Mr. Henn has served on 34 Dispute Review Boards and as an Arbitrator on construction cases. Mr. Henn is past President of the American Underground Construction Association. He is the recipient of the ASCE's 2002 Roebling Award in Construction Engineering, the Underground Construction Association of SME's 2008 Outstanding Individual Award and is a Distinguished Member of SME – Class of 2013. Mr. Henn is also an Adjunct Professor at the Colorado School of Mines where he teaches classes in tunneling, underground construction, and grouting. He has authored three ASCE text books on grouting for underground construction.

- Dispute Review Boards. Mr. Henn has served on 34 DRBs; he has been chairman on 17 of the boards. The total construction value for the 34 projects is over \$1.7 billion.
- Expert Witness. Mr. Henn served as an expert witness on 17 cases.
- Arbitration. Mr. Henn served as an arbitrator for two construction cases.
- Construction Appraiser. Mr. Henn served as an appraiser on a microtunneling case.
- Value Engineering Teams. Mr. Henn has been a member of 19 value engineering teams.
- Risk Assessment Teams. Mr. Henn has been a member of a risk assessment team for a large transit tunnel project.



### Education

Ph.D., Mining and Earth Systems Engineering, Colorado School of Mines, 2005  
Certificate of Advanced Studies in Alternative Dispute Resolution University of Denver, 1998  
Professional Degree in Engineering (Civil), University of Wisconsin, 1996  
M.S., State University of New York, Engineering/Construction Management, 1988  
B.A., City University of New York, Geology, 1974  
A.A.S., City University of New York, Construction Technology, 1971

### Professional Registration

Professional Geologist: Colorado, Indiana and Minnesota

### Professional Societies

American Society of Civil Engineers  
Society of Mining Engineers  
International Society of Explosive Engineers  
Dispute Resolution Board Foundation  
The Beavers  
The Moles

## RELEVANT PROJECTS

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### **Three Rivers Protection and Overflow Reduction Tunnel Project, Ft. Wayne, IN.**

Mr. Henn worked with the contractor, Salini-Impregilo/Healy JV, during the project's bidding stage by performing quantity takeoffs, developed means and methods, and providing man-hour estimates for the various grouting methods required for the project. The JV was the successful bidder at \$188M. During construction Mr. Henn is providing construction engineering and submittal preparation support for the pre-excitation grouting program. Pre-excitation grouting is required for the Pump Station/Work / Retrieval Shafts and the Tail/ Starter/Retrieval Tunnels, as well as other underground excavations such as audits and small chamber excavations. The three shafts range in excavated diameters from 29 ft. to 69 ft. and range in depth from 142 ft. to 230 ft. The three shorter tunnels range in excavated diameter from 19 ft to 21 ft. There also are six audits and six drop shafts. The running tunnel is 24,500 ft. long, excavated with a 19 ft. diameter Slurry TBM.

### **Denver Water Conduit No. 16 Replacement Project, Golden, CO.**

Mr. Henn is providing construction engineering and submittal preparation support to Michels Tunneling for their \$7M Conduit 16 Project. The project includes 10-shafts and five 8.5 ft. diameter tunnels excavated in soil and rock. The tunnels cross under I-70, Highway 93, Highway 58, BNSF Railroad Mainline, and BNSF Railroad Spur Line. The construction engineering support includes SOE for shafts and tunnels, thrust block designs, required jacking forces, grouting plan developments for ground treatment using chemical grouting, and contact/secondary/backfill grouting of the tunnels.

### **Hecla Mining, Coeur d'Alene, ID.**

As a Tunnel Consultant, Mr. Henn advised Hecla Mining on the tunneling methods and groundwater control options for the development of two gold mines in Montana. Each mine is located under a National Forest and each would require an approximately 3-mile long access tunnel. There are concerns of lowering of the groundwater table under the forest, as well as the life cycle costs of dewatering and water treatment of the mines. Mr. Henn reviewed with Hecla the current state of the practice in engineering and technology of TBMs, precast concrete segmental tunnel linings systems, pre-excitation and post-excitation grout materials and grouting methods, and mine plug design. All of this was done with a focus on controlling groundwater during tunnel excavation and for the life of the mines.

### **Burfell Extension Hydroelectric Project, Burfell, Iceland**

Mr. Henn performed a constructability review of the hydroelectric facilities' excavations and linings for the headrace and tailrace tunnels, access tunnels, two raise bore shafts and underground powerhouse. He also reviewed the overall construction schedule.

### **New Irvington Tunnel Project, San Francisco Bay Area, CA.**

As a Consultant to the contractor Mr. Henn worked with the project team (contractor, owner, construction manager and designer) to develop repair procedures to address buckling of the steel pipe tunnel liner. The New Irvington Tunnel is in rock and was excavated as a 13 ft-9 inch wide x 13 ft-1 inch high horseshoe shaped tunnel, 18,660 ft. long. It was excavated using both roadheader and the drill and blast methods from four headings. The 8 ft. diameter steel pipe was installed the entire length of tunnel and had been backfill grouted, contact grouted, and skin grouted before the first buckle occurred. After an investigation of the condition of the backfill it was determined that the annulus backfill cellular grout was deficient. A three stage grout replacement program was developed which utilized Type III Portland cement and ultrafine cement grouts. A six hole ring pattern of grout injection holes was drilled and grouted every 25 feet along the steel pipe. Grout injection pressure ranged from 60 psi through 150 psi. The steel pipe will be subjected to approximately 370 feet of groundwater head when put in service.

**Twin Tunnels Widening Project, Idaho Springs, CO.**

As Tunnel Construction Manager, Mr. Henn first performed constructability reviews during design and developed construction costs and schedules. During construction he supervised the tunnel construction engineering and inspection program. The Twin Tunnels consist of two vehicular tunnels each with two travel lanes along Interstate I-70 in Idaho Springs, Colorado. The project included demolition of the existing reinforced concrete tunnel lining, drill and blast rock excavation to create a third travel lane, and the placement of a new cast-in-place reinforced concrete tunnel lining.

**Lebanon and Everett Mine Tunnels, Georgetown, CO**

As Project Manager, Mr. Henn is responsible for both a control survey and condition survey of the existing Lebanon and Everett Mine Tunnels. These silver mines were first developed in the 1880s, mining operation continued through the 1940s. The mines are currently owned by History Colorado and are operated as tourist mines. The mines see approximately between 20,000 and 25,000 visitors per year. However, the only means of access and egress is through each of the mines' portals. These mines are not currently connected to each other. The Everett Mine Tunnel is only open for 200 feet from its portal due to a cave-in of the tunnel crown or the tunnel intersecting an old ore chute. The scope of the work is to reopen the Everett to its full length by mucking it out and installing rock support as needed. Additionally, a cross passageway tunnel will be designed and excavated utilizing the drill and blast method to connect the two tunnels, thus providing a secondary means of emergency egress.

**Lake Mead Intake No. 3, Las Vegas, NV.**

As a Tunnel Consultant and Expert Witness for the contractor, Mr. Henn worked on a rock failure that caused an inflow of water and fault gouge materials into the TBM's 26-ft x 26-ft drill and blast starter tunnel, as the starter tunnel passed through a fault zone. The inflow, charged by a 400-ft head of water, partially filled the starter tunnel, TBM erection chamber, access shaft and tail tunnel. A large scale program of drain hole drilling, rock reinforcement and grouting were employed in an attempt to re-establish the starter tunnel.

**Tala Hydroelectric Project, Bhutan**

As the Drilling and Grouting Consultant, Mr. Henn led a team under a design/build contract arrangement to analyze, design and repair leaks in the reinforced concrete invert slab of the 40 feet diameter surge shaft. The shaft invert slab is located at a water depth of approximately 590 feet. The shaft could not be dewatered to perform the repairs. The leakage was found coming from three open pipes which had been left in the slab during the original construction. The team designed and fabricated custom stainless steel pneumatically inflatable packers. The packers had rubber seals around the perimeter and once fully inflated and deformed within the pipes created a permanent plug. The packers were installed into the pipes using a remote operated vehicle (ROV). Additionally the team developed a horizontal drilling and consolidation grouting program for grouting the rock below the surge shaft invert slab. Drilling and grouting will be performed from a nearby adit approximately 154 feet away.

**Water Treatment Plant No. 4, Austin, TX.**

As part of the CM at Risk Team, Mr. Henn was responsible for the project's underground construction. The construction includes: a lake tap shaft; a 30-ft diameter, 425-ft deep access shaft; five raise bore pump shafts, 7-ft diameter, 360-ft deep; four rock tunnels totaling approximately 72,000 LF; a chamber excavation; a 9-ft diameter, 155-ft deep blind bored shaft and four additional deep/large diameter land based shafts.

**Seymour Capilano Twin Tunnel Project, North Vancouver, Canada**

As a Consultant to the contractor, Mr. Henn performed a cycle time estimate for the construction access shaft excavation and lining, evaluated probe hole drilling and pre-excavation grouting requirements for the project, and assisted in preparing and presenting differing site condition claims to the Dispute Review Board for the shaft excavation. Mr. Henn continued to assist the contractor on construction related matters dealing with rock support, issues associated with rock bursts, steel pipe tunnel lining installation, as well as cost and scheduling. The project included: a 37.5-ft diameter, 590-ft deep drill and blast construction access shaft; two 12.5-ft diameter TBM rock tunnels totaling 46,000 linear feet; two 13-ft diameter, 886-ft deep raise bore shafts; and steel lining a portion of each tunnel.

**4th Caldecott Tunnel, Oakland, CA.**

As Consultant to the contractor during bidding, Mr. Henn independently developed the excavation sequences, equipment selection, excavation and initial support quantities, excavation/rock reinforcement/lining cycle times, and roadheader pick wear estimates for this 47-ft wide by 30-ft high by 3,250-ft long rock highway tunnel using SEM construction. After contract award, Mr. Henn continued to work with the contractor's team during construction.

**DART, Light Rail Starter System, North Central Line Section, Dallas, TX.**

As Site Construction Manager, Mr. Henn was responsible for construction management and inspection services for the project. The work consisted of 32,150 linear feet of 21.5-ft, mixed-face and rock tunnels utilizing TBM, roadheader, and NATM excavation methods. The project also included numerous shafts, two underground stations, cross passageways, and chamber excavations. An additional three miles of U-wall, cut-and-cover construction, elevated and at-grade track, two above ground and one depressed passenger stations, and ventilation and utility structures. Construction costs for the North Central Line Section were \$170M; the total project costs were \$844M.

**Highway 160, Wolf Creek Pass Tunnel, CO.**

As Construction Consultant, Mr. Henn was responsible for the drill and blast excavation of a new 47-ft wide by 27-ft high highway tunnel in mountainous terrain. The tunnel was sequentially excavated using rock bolting and shotcrete as initial support. The final tunnel was waterproofed and lined with 12-in. of cast-in-place reinforced concrete.

**Freeport Mine Development Clarksville, PA.**

As Senior Consultant, Mr. Henn was responsible for assisting with the designs and providing constructability input for a 20ft. by 20ft. x 3,200 ft long slope excavated at 14 degree. There is also a 20 by 40ft. x 880 ft deep shaft. Both the slope and the shaft are designed to be excavated using drill and blast methods. A critical aspect of the project is that both the slope and the shaft will be excavated through a coal pillar in a mined out and flooded coal seam. This fact requires an extensive pre-excavation grouting program from the surface as well as a probe hole drilling and pre-excavation grouting program from the excavation face.

**Holbrook Basin Potash Mine Project, AZ.**

As Senior Consultant, Mr. Henn was responsible for developing a preliminary design of a 12ft by 20ft x 11,750 ft long decline, excavated at a 12% grade with alternating car passes and cut-outs approximately every 500 feet for a Potash mine. Mr. Henn also developed construction costs and schedule for the mine development. Additionally, Mr. Henn looked at a shaft option utilizing two shafts, one 24-ft diameter and one 18-ft diameter. Each shaft would be equipped with a drum hoist and steel head frame.

**Nine Mile Point Power Station, Oswego, NY.**

As Civil/Structural Superintendent, Mr. Henn supervised a large, direct-hire craft labor and supervisory work force, as well as numerous subcontractors. He was responsible for all of the civil/structural work on the project. In addition to the on-site civil work, he was responsible for offsite ancillary facilities construction. The offsite construction included construction of a rubble mound breakwater entailing quarry operations and casting of concrete dolosse; excavation and lining of the water intake tunnels and four lake tap shafts; fabrication, transportation, and sinking of two intake structures; construction of a natural draft hyperbolic cooling tower; and a reinforced concrete chimney.

**Raystown Hydroelectric Project, Huntingdon, PA.**

As Civil/Structural Superintendent, Mr. Henn was responsible for installing caissons and cofferdams, powerhouse excavation, excavating and concrete lining of a pressure tunnel, foundation treatment and grouting, installation of a 12-ft diameter welded steel penstock, and constructing a concrete intake structure and powerhouse equipped with two turbine generators.

**TARP Project, Chicago, IL.**

As Construction Engineer for the contractor, Mr. Henn was responsible for rock excavation of shafts, tunnels, and chambers. The shafts ranged in size from 8-ft to 28-ft diameter, up to 320-ft deep, and the tunnels ranged from 8-ft to 37-ft diameter. Duties included blast pattern design, selection of drilling and mucking equipment, planning and scheduling the excavation and equipment erection sequences, supervising erection of a hoist/headframe and rotary car dump, TBM erection coordination, and reporting production and cost data.

**Rock Island Dam Project, Wenatchee, WA.**

As Construction Superintendent, Mr. Henn supervised the spillway gate relocations. He managed subcontractors performing installation of cellular cofferdam, demolition of the existing reinforced concrete dam and spillway, rock excavation for a new 8-unit powerhouse, foundation grouting, and mass concrete placements.

**Cadyville Hydroelectric Project, Plattsburgh, NY.**

As Site Construction Manager, Mr. Henn was responsible for installation of a cofferdam, the demolition and reconstruction of a concrete intake structure, and the installation of 6,000 linear feet of 14-ft diameter fiberglass penstock, as well as modifications to the turbine generators.

**Rocky Reach Hydroelectric Project, Wenatchee, WA.**

As Site Construction Manager, Mr. Henn was responsible for construction management and field engineering of the dam stabilization program utilizing foundation grouting, post-tensioned anchoring, and structural concrete repair and replacement.

**Raystown Hydroelectric Power Plant, Huntingdon, PA.**

As Project Manager, Mr. Henn analyzed field geotechnical and settlement data, developed a repair procedure and field supervised the grouting placement operations at the plant site. The grouting repair of the powerhouse floor slab and foundation material was performed utilizing low mobility, permeation and contact grouting methods. The powerhouse's 22-inch thick reinforced concrete floor slab is free-floating and poured on random rockfill and has been experiencing differential settlement for years.

**Kent Falls and Rainbow Falls Hydroelectric Projects, Plattsburgh, NY.**

As Site Construction Manager, Mr. Henn was responsible for the repair and replacement of water control gates, 5,900 linear feet of 14-ft diameter welded steel penstock, and various concrete hydraulic structures. He also designed and supervised the foundation grouting program.

**Thompson Falls, Bradley Lake, Roosevelt Dam, Victoria Dam, Blue River, and Mechanicville Hydroelectric Projects, Summit and Mount Hope Pumped Storage Projects.**

As Construction Specialist, Mr. Henn was responsible for performing constructability reviews, developing construction costs and schedules, construction methods evaluation, reviewing concrete lining and grouting issues, and helping in preparation of bid documents.

**South Platte Interceptor, Adams County, CO**

As tunnel consultant to the design team, Mr. Henn assisted with selection of tunneling and shaft construction methods, construction scheduling and costing as well as constructability reviews. The project has five tunnels ranging in excavated diameters from 48 inch through 108 inch. The total length of the tunnels is approximately 4,790 feet. The geology consists of fine to coarse alluvium with cobbles and boulders.

**Conduit No. 16 Replacement, Jefferson County, CO**

As tunnel consultant to the design team, Mr. Henn assisted with selection of tunneling and shaft construction methods, construction scheduling and costing as well as constructability reviews. The project has five tunnels (two under active BNSF railroad lines, two under state highways and one under an interstate highway) all with excavated diameters of 10 feet. The total length of the tunnels is approximately 2,300 feet. The geology consists of fine to coarse alluvium with cobbles and boulders and clay stone rock.

**Utah Junction/Clay Street Outfall Tunnels, Adams County, CO.**

As tunneling consultant, Mr. Henn worked on the tunnel crossings under a Union Pacific railroad embankment. Two parallel projects were designed concurrently including a 10 foot pedestrian/bike tunnel and 4 adjacent storm drain tunnels. Project challenges include shallow cover for the pedestrian tunnel with only one tunnel diameter or less from the crown to the active tracks, saturated ground conditions under the embankment, potentially contaminated soil due to past landfill activities, and difficult construction access.

**Lemay WWTP Tunnel, St. Louis, MO.**

As a Consultant to the contractor, Mr. Henn assisted with tunnel excavation method evaluation and equipment selection for a 16-ft diameter tunnel under nine sets of railroad tracks in very weak silts and clays transitioning into full face rock.

**Sherman Street Utility Tunnel, Denver, CO.**

As Project Manager, Mr. Henn was responsible for the condition assessment and design of the repairs to the reinforced concrete cut-and-cover utility tunnel serving the state capital complex in downtown Denver, CO.

**Fossil Creek Drainage Tunnels, Fort Collins, CO.**

As Project Principal, Mr. Henn was responsible for design, developing cost and schedule estimates and overseeing various construction activities. The project consisted of two 10-ft diameter soft ground tunnels excavated using a digger shield which was jacked from the portal under an active Union Pacific Railroad embankment using a one-pass steel pipe lining system. The 10-ft diameter pipes were then contact grouted.

**Avenue 45 – Arroyo Drive Relief Sewer, Los Angeles, CA.**

As a Consultant to the contractor, Mr. Henn helped during bidding by providing geotechnical evaluation, construction cost estimating, scheduling, and development of production rates for a 6,350-LF, 9.5-ft diameter EPB tunnel in soft ground and rock utilizing precast concrete segment lining system. After award, Mr. Henn assisted the contractor with backfill grouting system design and various other tasks associated with the EPB and the precast concrete segments. He assisted with a DSC for the cut-and-cover portion of the project.

**Duncan Canyon Line A across I-15, Fontana, CA.**

As Tunneling Consultant, Mr. Henn was responsible for developing a pre-excitation ground improvement grouting program, tunneling methods, and lining systems for the 290 LF, 13.5-ft diameter tunnels through young alluvium with cobbles and boulders under highway I-15. Also included was the installation of a 9-ft ID carrier pipe with cellular backfill and contact grouting.

**System Conveyance and Operation Program Force Main, City of Henderson, NV.**

As Tunneling Consultant, Mr. Henn was responsible for assisting with the design for the installation of a 1,200-LF, 48-inch diameter carrier pipe utilizing MTBM tunneling methods.

**West Corridor RTD Light Rail, Denver, CO.**

As Tunnel Design Consultant, Mr. Henn was responsible for an approximately 280-ft long, 22-ft diameter soft ground tunnel, which utilizes a pre-drilled pipe umbrella canopy with sequential excavation methods under Interstate 70.

**McCullough Lateral, Las Vegas, NV.**

As Principal, Mr. Henn was responsible for the planning and preliminary engineering of a five mile rock tunnel, as well as several shorter soft ground tunnels for water conveyance. The tunnels are estimated to be 14-ft diameter.

**Hanging Lake Tunnel, Glenwood Canyon, CO.**

As the Representative for the insurer, Mr. Henn was responsible for the oversight of the condition assessment, design and construction repairs for the reinforced concrete cut-and-cover I-70 highway tunnel.

**Lake Pleasant, Phoenix, AZ.**

As Construction and Tunneling Specialist, Mr. Henn was responsible for the design and construction management of a 9.5-ft x 9.5-ft, 1,700-ft long rock tunnel excavated by drill and blast, and roadheader methods. Initial support was steel ribs and lagging, rock bolts and shotcrete. The final liner was a 78-in. diameter steel carrier pipe backfilled with cellular concrete and contact grouted.

**Stapleton Redevelopment, Denver, CO.**

As Construction and Tunneling Consultant, Mr. Henn was responsible for a 42-in. diameter auger bore sanitary sewer and an 89-in. diameter MTBM storm sewer under highway-270.

**Diamond Avenue (RT 66), Evansville, IN.**

As a Design and Construction Consultant, Mr. Henn was responsible for an 11-ft diameter, 5,200-ft long EPBM tunnel excavated in silts and clays. An 8-ft inside diameter RCP storm sewer was installed and backfilled with cellular concrete.

**Portland Westside CSO, Portland, OR.**

As Tunnel Consultant for Multnomah County, Mr. Henn evaluated tunnel excavation and lining methods, and settlement issues for the 18,150 LF, 17-ft diameter soft ground tunnels. The tunnels were excavated with two slurry tunnel boring machines and lined with a bolted gasketed precast concrete segmented liner system.

**TREX Project, Denver, CO.**

As Construction Auditor, Mr. Henn was responsible for the EPBM excavation of a 15-ft diameter rock and soft ground storm water tunnel. The tunnel was lined with a one pass doweled and gasketed precast concrete segmental liner system.

**South Mountain Water Transmission Line Tunnel, Phoenix, AZ.**

As Tunneling Specialist, Mr. Henn was responsible for the TBM excavation of approximately 6,060 linear feet of 8-ft diameter hard rock tunnel. The tunnel also passes through two reaches of soils. A 48-in. diameter pressure carrier pipe was installed in the tunnel and backfilled with cellular concrete.

**Pipeline 3 Relocation, San Diego, CA.**

As Project Manager, Mr. Henn was responsible for the overall construction management of the project. The project includes the excavation of three shafts and an 11-ft diameter tunnel through rock, mixed face, and soil conditions. A 72-in. diameter welded steel pressurized carrier pipe was installed in the tunnel and backfilled with cellular concrete. The project also included cut-and-cover carrier pipe installations.

**North Weinbach Avenue Storm Sewer, Evansville, IN.**

As Senior Construction Manager, Mr. Henn was responsible for the overall construction management of the project that includes supervision of the resident engineer and the inspection staff. The project consists of approximately 8,800 linear feet of 11-ft diameter, soft ground tunnel. The tunnel was excavated with an EPBM working in both the open and closed modes utilizing ribs and boards as initial support. A 96-in. diameter RCP storm sewer was installed within the tunnel and backfilled with cellular concrete.

**LA Metro Eastside Extension, Los Angeles, CA.**

As Construction Consultant, Mr. Henn examined the use of EPBMs for the project with special attention on production rate, surface settlement issues, ground treatment, one pass bolted gasketed precast concrete lining systems, and muck handling and disposal. He also reviewed contract packaging, construction costs and schedules, and performed constructability and claims avoidance reviews. The project consisted of approximately 42,000 linear feet of 22-ft diameter, soft ground transit tunnels and four cut-and-cover stations in heavily urbanized downtown Los Angeles.

**Valley Creek Pipeline 2A, San Diego, CA.**

As Construction and Tunneling Specialist, Mr. Henn assisted the design and construction management teams with the 8-ft by 8-ft, 900-ft long, drill-and-blast excavated rock tunnel and the installation of a 60-in. diameter welded steel carrier pipe which was backfilled with cellular concrete.

## HONORS AND AWARDS

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- Recipient of the American Society of Civil Engineers 2002 Roebling Award for Advances and Innovations in Construction Engineering
- Recipient of the Underground Construction Association of SME's 2008 Outstanding Individual Award
- Inducted as a Distinguished Member of the Society of Mining Engineers – Class of 2013

## PROFESSIONAL SOCIETY AND COMMITTEE ACTIVITIES

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- Co-session Chair for Underground Construction and Tunneling at the SME's Annual Conference 2013
- Session Chair for the Shaft and Tunnel Program at the SME's Annual Conference 2010
- Past President of the American Underground Construction Association (AUA) 2002-2004
- Conference Chair for North American Tunneling 2004 (NAT 2004)
- Member of the Organizing Committee for North American Tunneling (NAT 2008)
- Chairman of the AUA Committee on Backfilling and Contact Grouting of Tunnels and Shafts
- Member of the UTRC Committee on Groundwater in Tunnels

## SPECIAL STUDIES AND COURSES

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- Dispute Review Board Administration and Practice
- The Dispute Review Board Chairing Workshop
- American Arbitration Association, Construction Arbitrator I and II
- 40-hour Value Engineering
- 40-hour OSHA Hazardous Waste
- 8- hour Confined Space

## PAPERS & PUBLICATIONS

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- "Cellular Backfill – A Review of Some of the Basics", Proceeding of Rapid Excavation and Tunneling Conference, 2017.
- "Widening of Twin Tunnels", Proceedings of North American Tunneling Conference 2014.
- "Denver Water Tunnel Inspection Manual", Served as part of the team writing the 2008 manual and again as lead author on the 2013 update to the manual.
- "2011 Permeation Test Results for Grouts Made with Ultrafine Cements" Tunneling & Underground Construction Magazine, December 2011.
- "Versatility of Roadheader In Tunnel Construction", Tunnels and Tunneling Magazine, June 2011.
- "2010 Permeation Test Results for Grouts Made with Ultrafine cements" Tunneling & Underground Construction Magazine, December 2010.
- "Tunneling in Variable Rock Conditions, Flexibility is Key", Proceedings of the NASTT 2010 No Dig Conference, Chicago, IL.
- Ultrafine Cement in Pressure Grouting, Textbook Published by the American Society of Civil Engineers, 2010.
- "2009 Permeation Test Results for Grouts Made with Ultrafine Cements", Tunneling & Underground Construction Magazine, December 2009.
- "The Determination: To Grout or Not to Grout", Trenchless Technology Magazine, October 2009.
- "Flexibility Tames Variable Conditions", Tunnels and Tunneling Magazine, March 2007.
- "Tunnel Inflatables", Proceeding of North American Tunneling Conference, 2006.

- “Additional Test Results for Comparison of Penetration of Grout Made with Various Ultrafine Cement Products,” Proceedings of Rapid Excavation and Tunneling Conference, 2005.
- “Development of an Inflatable Circumferential Dam and Segment Support System for Controlling Water Flow in the Annulus of Segmentally Lined TBM Excavated Rock Tunnels”, Doctor of Philosophy Thesis, 2005.
- “Ultrafine Cement: A Critical Component of a Grouting Program”, Tunnels & Tunneling International Magazine, April 2005.
- “Chapter 16 Grouting of Underground Structures”, Practical Handbook of Grouting, James Warner, PE, Wiley, 2004.
- AUA Guidelines for Backfilling and Contact Grouting of Tunnels and Shafts, Textbook Published by the American Society of Civil Engineers, 2003.
- “Innovative Long Distance Pumping of Backfill Material and Contact Grout for the South Mountain Reach 3B Tunnel Project”, Proceedings of North American Tunneling Conference, 2002.
- “Comparison of Penetration Results of Grouts Made with Various Ultrafine Cement Products”, Proceedings of Rapid Excavation and Tunnel Conference, 2001.
- “Weinbach Soft Ground Tunnel: Lessons Learned”, Proceedings of Rapid Excavation and Tunneling Conference, 2001.
- “Ultrafine Cement Grouting Demonstrations and Testing”, AEG News, Association of Engineering Geologists, 2000.
- “Urban Tunneling Through Variable Geologic Conditions – A Case Study of the Pipeline 3 Relocation Project at State Route 125/94, San Diego, California”, Proceedings of North American Tunneling Conference, 2000.
- “Successful Urban Rock Tunneling in Spite of Encountering Gasoline, Cleaning Solvents and Methane Gas”, ASCE Geotechnical Special Publication No. 90, 1999.
- “Dispute Review Boards: An ADR Form for the Construction Industry”, The Colorado Lawyer Magazine, 1999.
- “Clarifying Grouting Requirements Associated with Soil and Rock Tunnel Liners”, Proceedings of North American Tunneling Conference, 1998.
- Practical Guide to Grouting of Underground Structures, Textbook published by American Society of Civil Engineers, 1996.
- “Keys to Successful Construction Management in Underground Construction”, Proceedings of the International Conference on North American Tunneling, 1996.
- “A Temporary Bridge System Utilizing Precast Concrete Construction”, Master of Science in Engineering Thesis, 1988.
- “Dam Stabilization: Field Installation of Large Post-Tensioned Anchors”, Hydro Review Magazine, North American Hydroelectric Industry, 1985.
- “Shotcreting in Underground Mine Construction”, Mining Engineering Magazine, Society of Mining Engineers, 1984.