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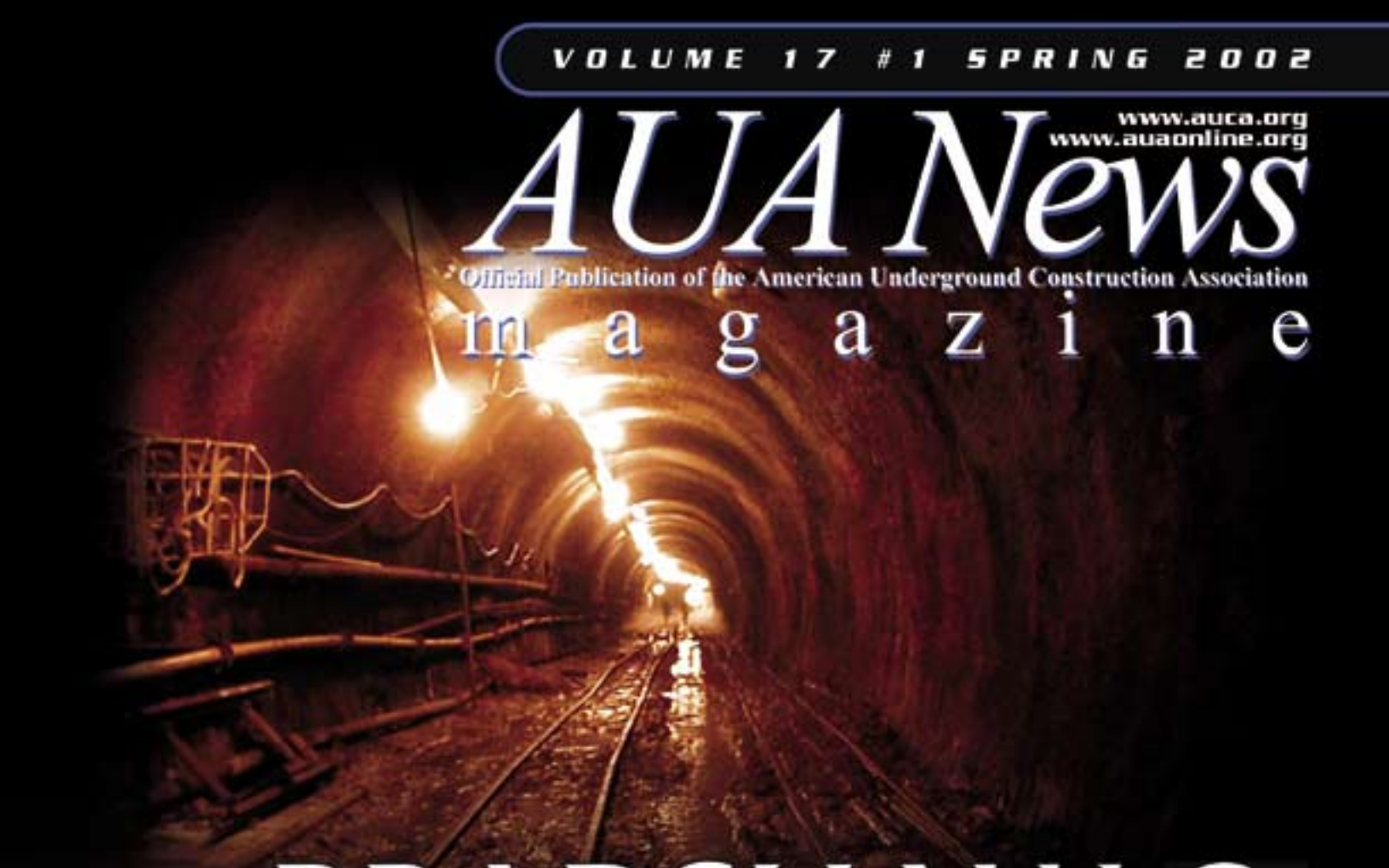


BRADSHAW
CONSTRUCTION CORPORATION

TUNNELING SPECIALISTS

Les and Joe Bradshaw

Feature Story
Rocky Mountain Consultants

BRADSHAW
CONSTRUCTION CORPORATION

An Emerging Leader in Underground Construction

Written By Luanne Mattson

With the ever-growing need for infrastructure improvements in America's cities, Bradshaw Construction Corporation may be in high demand for years to come. The company specializes in tunneling. In fact, that's all they do.

Throughout the company's history, Bradshaw has used every tunneling technique in a variety of projects. This has positioned the company as a tunneling expert that many owners, engineers, and contractors look to when faced with public works projects that require underground expertise. Bradshaw uses new as well as traditional techniques, depending on the particular project's demands.

From Maine to Florida to Kansas, Bradshaw has tunneled its way through countless projects and has emerged as a leader and innovator in underground construction.

The company was formed in 1982 by Les Bradshaw Sr. and is now headed by his sons, Les Bradshaw Jr. and Joe Bradshaw. Prior to that, Les Sr. and a partner formed and operated Eastern Tunneling in the early 1960s.

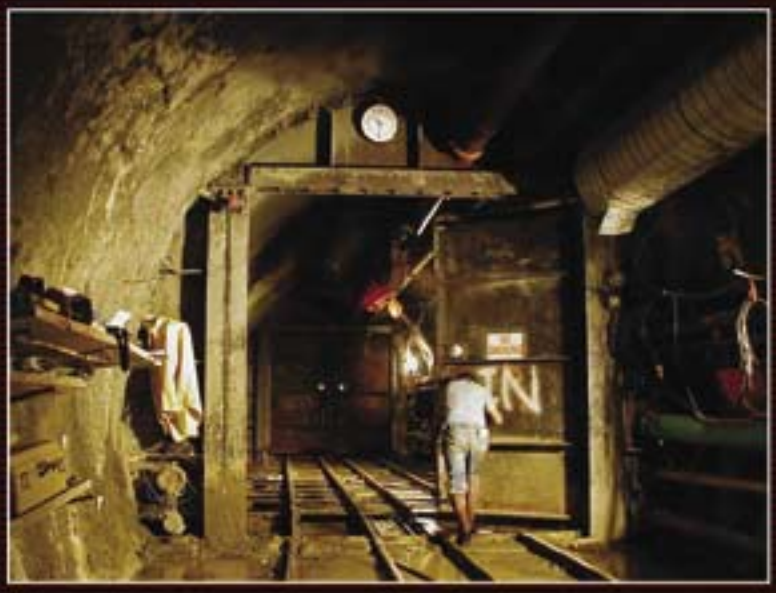
To say that the younger Bradshaws grew up in the 'trenches' isn't exactly correct. The company tries to avoid trenches whenever possible. Using tunneling techniques instead of trenches can be much safer and tend to cause less disruption to the public. Projects that dig trenches disrupt more surface area, exposing hundreds of feet of earth. Also, trenching typically requires street closures and/or detours as well as relocation, replacement and protection of existing utilities. By tunneling under existing roads and utilities, owners can reduce costs.

Les, Jr. and Joe Bradshaw have taken over operations of the company and have continued their father's mission of providing high quality, cost-effective tunnel construction services to the utility and transportation industries. The company achieves its mission by combining superior craftsmanship with innovative engineering and construction technology.

A Can-Do Company

Bradshaw Construction strives to apply the most appropriate tunnel technology to each project based on its purpose, subsurface conditions and surface restrictions. The company's management team is proud of its ability to construct almost any type of tunnel. From small wood-box tunnels to liner-plate to large NATM shotcrete-lined tunnels; from auger bores to rib-and-board shield tunnels; from conventional pipe jacking to slurry and earth pressure balance microtunneling; and from drill and blast to rock TBMs, Bradshaw Construction has a solution.

Because of Bradshaw's extensive background and experience, the company is expert in tunneling technologies



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Above: Custom-built NATM airlock designed in-house by Matt Hoke.

Cover Photos: Initial NATM tunnel lining and final cast-in-place concrete tunnel. Atlanta GA.

and project management. President Les Bradshaw Jr.'s goal is for Bradshaw Construction to be seen as a company that can tackle any tunneling project. The range of the projects the company has worked on in its 20 years is evidence that Bradshaw is meeting that goal.

From midwinter micro-tunneling in Maine to EPB burrowing under the Hillsborough River in Tampa, Bradshaw Construction's current projects span the states and cover the spectrum of underground construction techniques.

The Hillsborough River tunnel was accomplished by jacking 100-inch Permalock steel casing behind a Lovat TBM equipped with a screw auger to withstand hydrostatic and earth pressures of up to 1.8 bar in the mixed geology of limestone, chert and clay under the river. In Portland, Maine, Bradshaw Construction is using micro-tunneling to complete the Burnham Street Branch of the Libbytown Storm Drain. Other projects they have completed using micro-tunneling include the Cohas Brook Interceptor in Manchester, New Hampshire, and the Chesapeake Avenue Sewer in the company's hometown of Baltimore.

Of the company's more challenging projects, one in Atlanta has put its expertise to good use. The project consisted of a 2,000-foot tunnel directly adjacent to the housing areas on the Georgia Tech and Georgia State University campuses. The undertaking's location was its biggest challenge. The housing units rise up to seven stories at the edge of the tunnel, so keeping the cover intact was of primary concern. Working 30–50 feet below the surface and 15–25 below the groundwater table, the soft ground and mixed face soil conditions posed additional challenges. Bradshaw's engineering team studied the project to determine the methods that would safely work. Typically, de-watering could be used in this type of instance, but based on a report on the types of soils underground, this technique may have caused the exact problem the company was trying to prevent.

Instead, Bradshaw Construction used compressed air tunneling (to increase the stand-up time of the soil) in combination with the New Austrian Tunneling Method (NATM). Although each technique by itself is not necessarily innovative, putting the sophisticated technique of compressed air together with NATM is unusual. Bradshaw is the only company in North America that is using both in combination. Jet grouting and groundwater recharge were also used on the project to protect the adjacent structures, under the watchful eye of project engineer, Andy Bursey.

Value engineering has become a routine component of Bradshaw's execution of projects. Together with its employees and consul-

Left: City of Atlanta's CM, Michael Cutts, and superintendents Frank Jones and Kevin Murphy. Atlanta, GA.

Bottom: Superintendent Bob Welch and crew start slurry micro-tunneling using Ackerman MTBM. New Hampshire.

tants from nationally recognized engineering firms, Bradshaw continually strives for the best. When employees see improvements that could be made, they work with the owner and design engineer to incorporate those changes. In each case, Bradshaw employees propose a variation on the designed tunneling method based on their interpretation of the conditions and requirements of the project.

For the construction industry's future, Joe Bradshaw compares the changes to the tunneling industry that rapid tunnel boring machine development has brought to the changes in every day life we have all seen brought about by the advent of the personal computer. The mechanization of the tunneling industry, combined with the aging infrastructure of America's cities, has broadened the applicability of tunneling in many places throughout the US. Since the early 1990s, tunneling techniques have become an increasingly dominant force in public works projects, primarily because of reduced disruption and cost of the new technologies.

Superintendents Get it Done

With 75 employees, Bradshaw Construction has been a leader in underground construction projects for many of its 20 years. Richard Hawes and Eric Eisold, the company's senior managers, credit much of its success to its superintendents.

"They get it done," says Eisold, simply describing one of Bradshaw Construction's basic philosophies. And autonomy has been a key to the company's success. Les Bradshaw echoes that sentiment.

"We run a 'far flung' operation from our central office in Maryland," he says. "We take the time to choose our employees carefully, from front-line supervisors to the office staff who support them, then we give them the autonomy they need to get the job done. They, in turn, take pride in doing their jobs right, and the company benefits as a whole."

"They get it done," says Eisold, simply describing one of Bradshaw Construction's basic philosophies.

Top: Launch Lovat TBM under Pentagon.

Bottom: Superintendents Jack Jones, J.R. Beachy and crew hole through under the Pentagon. Washington, D.C.

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