Blending Design and Construction

by Craig A. Shutt

FINLEY served as the primary engineering-design firm for Saddlebrook Construction Inc., which builds bridges for The Cliff Communities, a series of high-end residential communities in the Carolinas. The bridges consist of precast, prestressed concrete voided slabs transversely post-tensioned, with spans ranging from 25 ft to 60 ft.
Photo: Saddlebrook Construction Inc.

FINLEY Engineering has grown rapidly by blending bridge design and construction needs into a successful whole

Only 6 years old, FINLEY Engineering Group Inc. has experienced rapid success both nationally and internationally with a wide range of bridge projects. The key to its success, Managing Principal Craig Finley says, comes from blending bridge design skills and construction engineering to maximize constructability.

That approach has helped the Tallahassee, Fla.-based firm grow from one employee when it opened its doors in late 2004 to 30 employees today. The company has experienced 30% to 70% annual growth since then, and this year anticipates growing by another 80%. "We have the backlog of projects to make that happen," Finley says. "The only thing hampering us is finding good people."

Even that challenge will be eased by the company's reputation, which saw it named one of the nation's 25 Best Structural Engineering Firms to Work For in 2008 by *Structural Engineer* magazine.

The company got started after Finley resigned as head of the Bridge & Tunnel Division of Parsons Corp. The firm in 2001 had acquired Finley McNary Engineers, which Finley co-founded. "I had always wondered what it would be like to work for a mega-sized, engineering-contracting firm," he explains. "We had a lot of successes during my time there. One day I'd do engineering work, the next day contracting work, and every day was exciting."

50 Projects in 50 Months

But he spent more time on traveling and paperwork than engineering and projects. "I missed being involved in innovative bridge work that coupled design and construction." That hasn't been a concern since, as FINLEY's client list quickly grew, along with its staff. In 2005, the firm added Jacques Combault as technical director; Cheryl R. Martin joined in 2005 as principal in charge of finance and administration, and Jerry M. Pfuntner came aboard in 2007 as principal senior bridge engineer and assistant technical director. In its first 50 months, FINLEY was involved in the design and construction engineering on 50 bridge projects.

"The biggest benefit we offer clients is a combination of strong engineering skills with a technology background, which creates a practical approach to construction," Finley explains. "When we start to design a bridge, a key element is how it can be constructed faster and more efficiently. We have

the ability to work with both designers and contractors to adapt a bridge design so that potential construction issues are identified and addressed early in the process. To add value, we believe all bridge designs must identify and address these critical engineering requirements."

The firm rarely performs traditional construction engineering work, he stresses. "The typical impression is that a construction engineer provides the means and methods, or the procedures, for how the bridge will be constructed," he explains. "We try to incorporate the contractor's means and methods into the design. It requires a higher level of understanding of the construction process than that usually done by bridge engineers."

An example is the I-64 Kanawha River Bridge in West Virginia. Completed this year, the project's 760-ft-long main span features the longest concrete box-girder span in the United States. Pfuntner, FINLEY'S lead bridge engineer on the project, provided technical support and construction engineering consulting during the prebid phase and then supplied full construction engineering services during construction. The services included modifying plan details to improve constructability, design assistance, and preparing the construction analysis, construction manual, geometry-control manual, and working drawings. For more on the project, see the article in the Winter 2009 issue of *ASPIRE*.™

Design-Build Plays to Strengths

The rise of design-build projects has played to the company's strengths, Finley notes. "The change in procurement to favor design-build delivery systems allows owners to take advantage of contractors' unique skills, and our skills often complement the contractor's own." About 80% of the company's projects are contractor-led, which includes design-build projects and aiding with a value-engineering idea proposed by the contractor.

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The Palmetto and Dolphin Expressway (SR 826/836) infrastructure project in Dade County, Fla., includes four high-level segmental bridge ramps constructed in the balanced cantilever method. The project includes a total of 46 bridges. Rendering: Touchstone Architecture.

The company is doing more work with bridge owners, including state DOTs. "Owners are seeing the value of moving projects ahead more quickly and addressing the means and methods early in development. Some of our work with DOTs involves preliminary studies that are pure design or cost estimating."

One early analysis occurred with a 280-ft-long approachway bridge and two accessway bridges (485 ft and 487 ft long) in the Delaware River for the new Conoco Phillips ship dock near their refinery in Trainer, Pa. Working with Hudson Construction Consultants, FINLEY provided conceptual, preliminary and final design work, analyzing three superstructure alternatives (structural steel beams, precast concrete beams, and precast segmental sections). The design-build project was designed with prestressed concrete beams, a precast

FINLEY served as construction engineering consultant on the I-64 Bridge over Kanawha River in Kanawha County, W.Va. The bridge features the longest concrete box-girder span in the United States at 760 ft, plus 460-ft and 540-ft side spans and five approach spans. Five piers are situated on land and two on the river's edge. Photo: Brayman Construction Corporation.

The new ship dock at Conoco Phillips' facility in Trainer, Pa., features a 280-ft-long approachway bridge with typical spans of 45 ft, two accessway bridges with lengths of 485 ft and 487 ft, and typical spans of 60 ft. The bridges, for which FINLEY served as engineer of record and provided conceptual studies and alternatives, feature precast, prestressed concrete beams and a precast concrete deck. Photo: Hudson Construction Consultants.

concrete deck, and constructed on a tight timeframe.

In addition to constructability and the speed of construction that is inherent in that goal, owners are looking for aesthetics and durability in their bridges today. The aesthetic designs that FINLEY provides can be seen in the scenic bridges created for The Cliffs Communities, a series of high-end residential developments in North and South Carolina. The bridges, ranging in span lengths from 25 ft to 60 ft, feature precast, prestressed concrete voided slabs transversely post-tensioned. Aesthetic details include rock veneer facing on all barriers, natural preservation of creek beds, and an arched stone façade with matching lighted end posts.

Added Durability Needed

Durability, especially minimizing cracks and crack widths, also is a key goal. Service life is a very important issue to owners. They want to boost service life from 50 years to 75 and even to 100 years. An example of the durability being achieved is apparent in the Indian River Inlet Bridge in Delaware Seashore State Park in Sussex County, Del. FINLEY provided construction engineering and the erection equipment design for Skanska USA Civil Southeast Inc. The 2600-ft-long cable-stayed bridge features a 900-ft-long clear span over the inlet and 1700 ft of bridge decking over land.

The bridge will have a minimum 100-year service life, achieved in part with the help of maintenance procedures that include extensive corrosion analysis and a corrosion control plan. A "zero tension" requirement for all members both during construction and for the completed bridge supports the 100-year service life.

International Success

FINLEY has had significant success overseas, with work in the Middle East and Africa. It has completed three projects, comprising 16 precast segmental bridges, in Israel alone. These include the Benyamina Bridges, composed of eight spans of short line, match-cast precast concrete segmental girders erected in balanced cantilever. The firm also worked on Road 431, a portion of the Cross Israel Highway that comprises four precast concrete segmental box-girder bridges.

"Israel is very developed in its use of concrete materials and techniques," he says. "American concrete technology is easily transportable for companies that work closely with American firms. The United States does a good job of being a leader in the world for concrete bridge designs."

FINLEY also is pursuing opportunities in South America. "Some say that North American bridge professionals need to

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The 2600-ft-long Indian River Inlet Bridge in Sussex County, Del., was designed to achieve a 100-year service life with the help of a detailed evaluation of several aspects, including a latex-modified concrete overlay, low permeability concrete, and epoxy-coated reinforcement. Pretensioned and post-tensioned precast concrete transverse deck beams span between the cast-in-place concrete edge girders. Photo: Skanska USA Civil Southeast Inc.

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either focus intensely on Canada and the United States or package our skill sets to work internationally. I think we're good at doing both, and we see a lot of potential, especially in the southern hemisphere," according to Finley.

The firm maintains a balance between North American and international clients. Several U.S. projects to start soon will tip that balance back after several years of international business dominating. "We're a small company, so it's easier for us to be successful with two or three projects in other parts of the world. We can adjust quickly to take on new projects."

The company's work in the United States is increasing, in part due to the American Recovery and Reinvestment Act (ARRA) of 2009. FINLEY is currently working on a $36-million cast-in-place runway ramp at the Tampa International Airport that was one of the first ARRA projects approved. The 300-ft-long bridge features cast-in-place, post-tensioned, haunched box girders.

FINLEY is working with the joint venture of Community Asphalt Corporation, Condotte America Inc. and The de Moya Group Inc. on the $558-million Palmetto and Dolphin Expressway (SR 826/836) infrastructure project in Dade County, Fla., an ARRA-funded project that will include four high-level segmental bridge ramps that traverse the interchange's core. The bridges vary from 1100 ft to 2540 ft long and from 46 ft to 48 ft wide. All of the bridges are supported on 24-in. square precast, prestressed concrete pile foundations and cast-in-place concrete piers and caps. The precast concrete segmental ramps will be constructed using the balanced cantilever method with a launching gantry by DEAL/Rizzani De Eccher USA. BCC Engineering is the lead designer for the project.

"A competitive economy helps our business," Finley notes. "Owners and contractors are interested in finding someone who can identify efficiencies or a better way to construct the project. Our business is stronger when the competition is tougher."

More of the firm's projects involve segmental construction. Finley continues, "We have a lot of background with segmental concrete projects, and the demands that owners are placing on bridges often lead in that direction. They want to fabricate bridges away from the site, minimize impact on traffic, and create long-term serviceability."

Improvements in erection technology have aided this work. "The sophistication of equipment has changed rapidly. Launching gantries, travelers, heavy-duty cranes, all have really advanced quickly."

"We're very interested in preservation work. It's an exacting area, and it has a lot of potential, because there are new materials being used. The ability to come back to a project 20 years later and make some improvements represents a good market for us and is a growth area." Grouting specifications in particular have improved in recent years, he notes, and some of the segmental bridges that followed earlier guidelines have needed retrofitting with new materials that will last much longer.

With these growth areas targeted, the company is looking to open a second office on the West Coast, possibly in the Northwest, by September. "I think we're missing an opportunity there without having an office that allows us to stay closer to our clients."

Achieving this goal will require adding new people, which should be aided by the *Structural Engineer* award. The firm follows an open-book management style, posting its financial results, and sharing a percentage of profits. "We're small enough that we can create a personal touch and work with each employee to create flexibility in hours and benefits that suit their needs. That approach helps everyone stay engaged and committed."

The key is to find employees who can embrace FINLEY's blend of bridge design engineering and construction engineering. It's a blend of art and science that requires more than the tactics of how to build a bridge.

MORE ON FINLEY

For information on other project work by FINLEY Engineering Group, see the articles in ASPIRE *magazine on the Lee Roy Selmon Crosstown Expressway (Fall 2007), South Fork Eel River Bridges (Confusion Hill Bridges) (Summer 2008), the Kanawha River Bridge (Winter 2009), and the 4th Street Bridge (Fall 2009). Issue archives can be found at www.aspirebridge.org.*

FINLEY is providing construction engineering for the 4th Street Bridge in Pueblo, Colo., which is being built over 28 active railroad tracks.
Photo: Robert Heavilin, Flatiron Constructors Inc.