



# Dressed as a tunnel

FLL project features big, complex and routine tasks

By **Bill Wilson**  
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**T**he creaks of a typical freight train—some 80 cars long—slowly merge with the screech of brakes not too far from jet-powered takeoffs.

After a relatively short journey from north Miami Dade County, the locomotive grinds to a halt.

A small regiment of excavators is ready for the taking, and each one carefully maneuvers onto steel tracks and powers forward before easing into a stop position of their own. With the operator looking down at what the next few minutes or so has to offer, he shoves his excavator arm down the belly of the rail car. Over and over, he unloads a bucket of gravel into a dump truck. The job is not complex—just painstaking.

It's just one of the many faces of the Fort Lauderdale-Hollywood International Airport

(FLL) runway construction project, which began January 2012 and will be complete in September 2015. In one area you can see a line of machines happily going about their job of scooping and dumping, while in another part an engineer is straining an eye looking at data that will determine when the soft, intolerable soil will be settled enough for runway paving construction.

"It's a fairly complex project . . . although it is fairly simple," Ron Murtha, program director with Parsons Transportation Group, told *ROADS & BRIDGES*. "It's just a lot of certain things."

Make that tons of certain things. The FLL runway construction project, which calls for an elevated 8,000-ft-long air strip alongside a full-length parallel taxiway, will need 6 million cu yd of embankment material, more than 323,00 sq ft of mechanically stabilized earth walls, 2,661 concrete piles, almost 70,000 cu yd of concrete pavement and 857 prestressed I-beams before all is said and done.

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## FACT FINDER

The new runway on the FLL project is level at the start, but gradually climbs to a height of 60 ft.

Despite the nagging of a learning curve or two, the project will hit the final stretch late this summer when paving crews will arrive at the scene to lay down the new runway.

"The average [flight] delay here is equal to and often exceeds acceptable standards, which drove the need for the runway many, many years ago," said Murtha.

### Surcharged and shook

Initial planning of the new runway is more than a quarter-century old. Prior to the start of this project, the layout of the Fort Lauderdale-Hollywood International Airport consisted of one 9,000-ft-long runway, a 5,300-ft crosswind runway used primarily during peak travel times, and a general-aviation runway.

Archer Western Contractors will essentially be building the new takeoff and landing platform on top of the general-aviation runway and over U.S. Rte. 1. The crosswind runway will be permanently shut down.

When it comes to uniqueness, work done at Atlanta's Hartsfield-Jackson Airport is the only thing that comes close. Murtha, however, said what separates the two is the Fort Lauderdale job involves crossing over a major roadway and railroad. Accessibility also comes with a twist in Florida. Crews used a conveyor belt to launch material up to the embankment site in Atlanta. In Fort Lauderdale, the contractor has to grind it out through 20-hour days to unload 40% of the aggregate material from the rail cars, and before that could happen a rail spur had to be constructed on the west side of U.S. 1. It still requires trucks to ship the stone a half-mile to the work site, but it beats the alternative—a 40- to 50-mile round-trip.

The ground that the east portion of the embankment—which calls for 4 million cu yd of material and is located on the east side of U.S. 1—sits on is basically a wetland, and the soil conditions are extremely soft. "It's being constructed basically on muck," Murtha interjected.

Because of the close proximity to the Atlantic Ocean, coarse aggregate was installed to get out of the water before the crushed limestone from north Dade County was shipped in and placed. However, due to the weak soil, Murtha said it had to be surcharged, a process that calls for stacking extra soil in an effort to press out all of the settlement ahead of time. Settlement plates are in place and data is being pulled weekly. The contract states that no movement of more than  $\frac{1}{8}$  in. can occur for a month before the area is cleared for paving.

Ground conditions for the smaller embankment (2 million cu yd) on the west side of U.S. 1 were slightly better, but still have to be dealt with. The typical limestone formations had some fracturing underneath the footprint of the runway. Since the rock was not uniform, Murtha said dynamic compaction is being conducted to fracture the rock and make it a smoother surface.

Traditionally, crews have used what Murtha called the "Fred Flintstone Method," which simply consists of dropping a large weight to fracture the rock. For the Fort Lauderdale job, a mammoth vibratory tamper (MVT) was brought in to do the work of the large weight. The MVT is a giant plate tamper that vibrates the ground for a certain period of time, usually 90 seconds. However, the device did not come without a learning curve, one that required additional attempts to achieve acceptable performance results.

"It took a little bit longer to get to the goal line than we would have liked, but we have gotten there now and the game is moving on," said Murtha.

The crosswind runway was officially closed the week of May 6 so work on the west embankment could begin.

### Hitting it hard

The game being played out is a little unorthodox. Because the runway will be supported by the embankment and 3-ft-thick cast-in-place concrete walls—with the bridge deck (runway) serving as the roof, it is classified as a tunnel system, so life safety systems need to be installed.



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The taxiway, however, will be mainly supported by cast-in-place, 3-ft x 10-ft piers—about 90 in all. Due to the sandy soil conditions the concrete piles are being driven down to varying depths (60-70 ft) once the contractor can reach a hard layer.

“There are hard layers within the sand,” HNTB Corp’s Scott Dean told ROADS & BRIDGES. “What we try to do is target the piles to stop in one of those hard layers so we can pick up on the extra capacity of the hard layer at the end of the pile. Sometimes we don’t get enough capacity and it punches through and we have to go down to the next hard layer.”

Precast concrete Florida I-beams will sit on the piers. The beams are 6 ft deep with a 4-ft 2-in.-wide top flange and 3-ft 4-in.-wide bottom flange. Eleven-in. webs are on the 8,000-ft, 150-ft-wide runway portion and 9-in. webs on the taxiway. The runway is level at the start, but gradually climbs to a height of 60 ft.

“The most complex part of the job is dealing with the skewed geometry,” said Dean. “It’s skewed at almost a 45° angle. So dealing with that skew in conjunction with the very heavy aircraft loads are probably the biggest challenges of the project. Everything is so robust.”

The pavement—or bridge deck—will be anywhere from 15½ to 14½ in. thick. According to Dean, the runway in Atlanta suffered extensive cracking in the pavement portion of the project, so crews will do additional post-tensioning, and the designer has looked at ways to modify the bearing layouts to try and relieve the stresses that cause the extensive cracking.

## A little dust is fine

Extensive effort also has been made to protect the surrounding community.



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— Ron Murtha



In late May, about 80%—or approximately 70—of the piers were up, and two-thirds of the embankment work was complete. Over 2,200 of the 2,661 piles were in the ground.

Despite a few complaints on the vibrations generated by the MVT, Murtha said noise-level and vibration readings are coming in far below what is allowed by permit and ordinance. Portable speed-limit signs also have been placed in an attempt to slow down the haul truckers, which generate 2,000 trips a day.

Dust also has been a concern, but one business prefers it over the muck and mud. To accommodate the request, the contractor waters a haul route overnight and uses a pressurized wash to get dirt and dust off the pavement. Another two rounds of watering occur in the early morning hours before it is left alone for much of the day.

“They were happier with a little bit of

dust than a lot of splatter on their cars,” said Murtha.

## Prepping to pave

At press time, about 80%—or about 70—of the piers were up, and two-thirds of the embankment work was complete. According to Murtha, 2,229 of the 2,661 piles were in the ground.

Over the next couple of months, crews will wrestle with the major embankment on the west side of U.S. 1. With the crosswind runway closed, the paving contractor will begin work in the third quarter. The first assignment will be to lay down a big holding pad and the easternmost new cross-field taxiway.

Another portion of the project was to pave Northeast 10th Street, which provides access to businesses east of U.S. 1. That work is now complete.

While the deck is being cast the elements of the tunnel life safety system, including a deluge foam fire suppression system and huge fans for ventilation, will be installed. **R&B**

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