

Airport Improvement™



Minneapolis-St. Paul Int'l Focuses on Equitable Access for All



Clinton Nat'l Focuses on Passenger Comfort in Latest Round of Terminal Improvements

Greenville-Spartanburg Int'l Dovetails Ramp Replacement With Terminal Rehab



AIRPORT STORIES INSIDE: ABE | BWI | COI | EFD | GSP | HOU | IAH | JFK | LAX | LIT | MSP | ORD | PHL | XNA



O'Hare Int'l Adds Landside Cargo Warehouse



Merritt Island Airport Builds Seagrass Island, Restores Saltwater Marsh to Add New Runway Safety Area



Greenville-Spartanburg Int'l Dovetails Ramp Replacement With Terminal Rehab BY MIKE SCHWANZ



FACTS & FIGURES

Project: Apron & Trench Drain Reconstruction
Location: Greenville-Spartanburg (SC) Int'l Airport
Cost: \$15 million
Construction: 2014-2017
Engineering: AVCON
Concrete Slab Mfg: Tindall Corp.
Trench Drain Installation: Hi-Way Paving
Apron Reconstruction: GLF Construction Corp.
Key Benefits: Reconstructed apron enhances operational efficiency; fewer water-related pavement issues due to new trench drain & underdrain systems
Of Note: Engineers replaced traditional metal trench drain with concrete drain for improved long-term performance; most of apron work occurred simultaneously with terminal renovations

Completely rebuilding a terminal is a massive undertaking in and of itself. But Greenville-Spartanburg International Airport (GSP) recently doubled down when it replaced the adjoining airside apron and trench drain system during its comprehensive five-year terminal renovation.

"The new terminal, which was opened this past spring, was desperately needed," explains Kevin Howell, the airport's vice president and chief operating officer. "It had not changed much since 1962, when the airport opened. Our apron and trench drain were just as old, and they were deteriorating. So for us, it just made sense to undertake both projects at the same time."



KEVIN HOWELL

Ultimately, the strategy proved to be highly efficient for the South Carolina airport. During most of the apron construction, GSP shut down one gate at a time and coordinated schedules so work occurred simultaneously on both projects. One crew

performed terminal renovations inside while another replaced the apron outside, near the same gate. "It took lots of communication between airlines, contractors and airport management," says Howell.

Fortunately, the five airlines that serve GSP were willing and able to move from gate to gate as both projects progressed. "Most of the aircraft that land here are narrow-body planes and regional jets, including 737s and Airbus 320s," he explains. "All could fit comfortably into each gate, and the bridges could accommodate all of them."

In 2017, GSP enplaned about 1.1 million passengers and averaged 50 nonstop departures per day. Cargo operations include flights for the on-airport FedEx facility and several other freight carriers.

The airport selected AVCON to design and manage construction of its apron project, which it completed in three phases. Phase 1—replacing the trench drain—was started and finished in 2014; Phases 2 and 3—the complete reconstruction of GSP's concrete apron, lasted from 2015 through most of 2017.

Total cost for the airside improvements (not including the terminal) was about \$15 million, including consulting and engineering fees. FAA funded 90% of the project, and GSP paid for the rest out of its capital improvement budget. "We are very pleased we did not have to borrow any money to do these projects," says Howell.

Concrete vs. Steel

According to Howell, the first phase was the most complicated. During Phase 1, contractors removed more than 1,700 feet of existing cast-iron trench drain and replaced it with a new concrete drain. "The original trench drain contained metal grates over a concrete trench. The expansion and contraction of the grate on the concrete edges caused the drain to fail," he explains.

The airport had tried adding new metal grates in the 1980s, but they eventually eroded like their predecessors. Howell consequently turned to AVCON for an alternative solution. "While the metal grates were obviously failing and showing cracks, they did stay in place," says Robert Hambrecht, P.E., the firm's senior project manager. "The good news was that the trench *below* the drain was structurally adequate."



ROBERT HAMBRECHT

AVCON consequently recommended a different type of drain. Originally, engineers planned to use a large poured-in-place concrete slab with slots cut in the top—a design that has been

successful on a previous project. Instead, they improved on the design by specifying precast concrete panels that were custom-designed and manufactured to match the existing concrete apron joint pattern.

Tindall, a company in nearby Spartanburg, manufactured the precast panels, labeled the position of each one, and delivered them to the jobsite in sequence. Hi-Way Construction installed a total of 144 panels on the prepared surface.

Apron Reconstruction

During Phases 2 and 3, crews replaced the apron's entire Portland Cement Concrete pavement, base and sub-base course. "We deepened the pavement section and added more concrete," says Howell.

The airport also opted to widen the apron by 9,000 square yards to allow more space between the two entrances for taxiing planes and ground service equipment. "This wider apron will be especially helpful during our busy times, and will ease congestion a bit," he says.

Phase 2, completed in 2016, included nearly 25,000 square yards of 17-inch P-501 Portland Cement Concrete pavement. Phase 3, completed in October 2017, included 29,000 square yards of 17-inch Portland Cement Concrete P-501 pavement.

Howell emphasizes that it was imperative for airport officials to communicate closely with the airlines about the construction schedule for each gate. "If the apron around Gate 1 was being



Manhole access points were installed every 300 feet to facilitate maintenance.

torn up, it was a tight fit for planes using Gate 2 for arrivals and departures,” he says. “We wanted to ensure both the pilots and construction crews looked out for each other.”

GLF Construction used a rock crusher to convert the concrete removed from the old apron into material suitable for use in the base layers of the new apron. “It saved us money,” Howell

comments. “We did everything on airport property, on a remote piece of land. Old concrete was removed, placed on a flatbed truck and taken to the crushing site, where the crusher truck smashed the old concrete. Eventually, it was trucked back to the construction site to be used as the base for the new surface.”

Crews took extra care not to negatively impact the concurrent terminal renovations. “We cut the old concrete pavement into 20-foot-by-25-foot panels,” Howell says. “No jackhammers were used, to avoid noise and dust getting into the newly constructed terminal building.”

The airport’s high water table presented another challenge. “The soil underneath the apron pavement does not drain well,” Hambrecht explains. “When you introduce water to this particular soil for long periods of time, it makes the soil lose bearing capacity. When the soil is less supportive, the pavement above is subject to increased stress and premature failure.”

To counteract the challenging soil conditions, AVCON engineers designed a drain system under the pavement to prevent water from being trapped under the pavement. “The underdrain system is a network of 4-inch perforated PVC drainpipes located in the soil underneath the base course,” says Hambrecht. “This network of pipes constantly drains the water out of the soil and outfalls into the storm water system.”

New Paint

After the apron pavement cured properly, crews painted it based on the results of a gate utilization analysis. New aircraft lead-in lines include a variety of nose wheel markings to maximize the utility of each gate for various aircraft. Updated markings include ground service equipment hazard lines and engine ingestion zone markings for the 737-8s that a few airlines are beginning to use at GSP.

To date, the overall project has received accolades from airport staff and airline employees. “We are very pleased with the final product, and are confident our new apron and trench drain will hold up for many years to come,” Howell concludes. ✈️

**Transforming
Ideas Today's
into
Tomorrow's
Reality**

More Than a Consultant...
...a Trusted Partner Experienced in
Planning, Design, Permitting, and Full
Construction Phase Services

WWW.AVCONINC.COM