

2009 FICE Engineering Excellence Award Winners

The FICE Public Relations Committee is pleased to announce the winners of the 2009 Engineering Excellence Award Competition. The judging was held on November 19, 2008 in Jacksonville. The esteemed jury (representing government, education, media, transportation, the Florida Department of Transportation, and American Institute of Architects) awarded one grand conceptor, nine grand, and two honor awards.

The grand award winners are eligible to participate in the national Engineering Excellence Award competition sponsored by the American Council of Engineering Companies (ACEC). The FICE Grand Conceptor Award winner will be announced at the FICE Banquet on Friday, August 7, 2009 at The Breakers Resort in Palm Beach. The banquet is held in conjunction with the FES/FICE 93rd Annual Summer Conference and Exposition.

The FICE Public Relations Committee would like to thank the panel of judges for their time and commitment to the 2009 competition. The 2009 engineering excellence award judges are: John D. Booth, PE, Owner, John D. Booth, PE Engineering LLC; Neal S. Coulter, PhD, Dean, College of Computing, Engineering and Construction, University of North Florida; Tom Hurst, AIA, LEED AP, Principal, Rink Design Partnership Inc.; Walter V. Kloss, PE, Director of Transportation, Ghyabi & Associates Inc.; David Sillick, Publisher, Jacksonville Business Journal; and Nicholas Tsengas, Director of Transportation Operations, FDOT District II. A special thank you to the FICE Public Relations Chair, Terri Bowman, MACTEC Engineering and Consulting, Erin Browning, Public Involvement Director, HNTB; and the entire public relations committee for their professional administration of the program.



Pictured left to right: David Sillick, Publisher, Jacksonville Business Journal; Neal S. Coulter, PhD, Dean, College of Computing, Engineering & Construction, University of North Florida; Erin Browning, Public Involvement Director, HNTB; Tom Hurst, AIA, LEED AP, Principal, Rink Design Partnership Inc.; John D. Booth, PE, Owner, John D. Booth, PE Engineering, LLC.; Walter V. Kloss, PE, Director of Transportation, Ghyabi & Associates Inc.; Terri Bowman, MACTEC Engineering and Consulting; and Nicholas Tsengas, Director of Transportation Operations, FDOT D2.

2009 Grand Award Winners

Bermello Ajamil & Partners Inc. (B&A), Miami The World, UAE Dubai

Located 4 kilometers off the coast of Dubai, The World archipelago represents one of the most innovative and ambitious land reclamation and development projects ever attempted. Conceived by HH Sheikh Mohammed bin Rashid Al Maktoum, Ruler of Dubai, the project has gained worldwide recognition as one of the greatest engineering marvels of the 21st Century.

B&A was appointed master planner for The World, which was designed as a group of independent islands that approximate the shape of a Mercator projection of the world map. Rising out of the Arabian Gulf, The World spans an area of 50 square kilometers and while the project's scale creates significant opportunities for development, its size and location pose many engineering challenges. Constructing The World in an area cut off from the coast and in water depth exceeding 10 meters, with no roads or bridges available to transport equipment and supplies, was no easy feat. Planning the development of a completely navigational community comprised of an intricate network of channels that will support a population of approximately 250,000 represented another significant challenge when considering the logistical aspects. The scope of work focused on land reclamation, land use, transportation planning, navigation systems design and infrastructure planning. Today The World stands as an iconic emblem of visionary brilliance coupled with modern ingenuity. Total land reclamation was completed in the summer of 2008.



Camp Dresser & McKee Inc. (CDM), West Palm Beach Lantana Road Landfill/Park Ridge Golf Course, Lantana

The Palm Beach County Parks and Recreation Department (PRD) was being pressured by the public to build more parks, especially golf courses, due to the growing popularity of the sport amongst youngsters. But property values in central Palm Beach County had skyrocketed during the past few years and the cost of acquiring land was prohibitive. Consequently, PRD contacted the Solid Waste Authority of Palm Beach County (SWA) for assistance. SWA owns the 231-acre Lantana Road Landfill, which was closed in 1988. SWA and PRD teamed up with CDM to design and construct a par-72, 18-hole, championship golf course atop the closed landfill.

CDM encountered several challenges that included decommissioning the landfill gas collection system, building the course without damaging the geomembrane cap of the landfill, grading and installing erosion control features, obtaining sufficient irrigation water from the existing supply wells and adjacent lakes without exceeding water management district drawdown criteria, and maintaining soils and establishing turf grass. This project required an innovative design to address unique conditions, including floating slabs for structure foundations, shallow rooted plants and trees for landscaping, additional membrane liners beneath the tee boxes and greens, importation of fill material, use of flexible piping for the irrigation system, and a lined irrigation pond to store surplus water. SWA and PRD, with assistance from CDM overcame all of the permitting and construction challenges and now have a public golf course with topography that is truly unique



to South Florida. Yardage, sand bunkers, water hazards, and wind factors deliver a links-style golfing experience. The facility boasts TifEagle greens, extensive practice facilities, and a full-service golf shop and snack bar. The residents of Palm Beach County now have a championship golf course where they can enjoy an affordable round of golf all year long. The Park Ridge Golf Course opened to the public in March 2007, and currently averages 170 golfers each day, generating approximately \$6,000 in revenue per day for Palm Beach County.

Erdman Anthony, Royal Palm Beach
SR A1A Ocean Boulevard Turtle Lighting Project, Boca Raton

Roadway lighting, in addition to other sources of artificial lighting in coastal areas, interferes with the nesting of female turtles and disorients young hatchlings causing them to travel towards lights instead of towards the sea. As Erdman Anthony provided 3R (restoration, rehabilitation and resurfacing) services to the FDOT, District 4 on SR A1A/Ocean Boulevard (from the Palm Beach County line to SR 800/Spanish River Boulevard), they developed a turtle-friendly lighting solution. Erdman Anthony's traffic/transportation expert, Nisar Khan, PhD, PE, PTOE, worked closely with the FDOT and the city of Boca Raton to develop this solution.



The objective was to minimize the negative impact of roadway lighting on turtle nesting and hatchling activities while ensuring the safety of the traveling public. Pole mounted roadway lights are known to discourage turtle nesting and cause disorientation for hatchlings. Embedded Pavement Lights (LED pavement markers) were installed as opposed to overhead lighting to avoid this problem. The success of this project resulted in an FDOT decision to select Erdman Anthony as the consultant to develop alternative roadway lighting design standards for environmentally-sensitive coastal areas in Florida.



Jones Edmunds & Associates Inc., Gainesville
The H. Clay "Junk" Whaley, Sr. Memorial Water Plant, St. Cloud

For years the residents of St. Cloud, Florida listed poor water quality among their biggest complaints. dissolved organic carbon (DOC) caused a greenish-brown color, and it often had an objectionable smell because of hydrogen sulfide. To make their water potable, the city had to rely on high levels of disinfectant dosing, leading to the creation of disinfection byproducts (DBPs). Further problems followed when the city fell out of compliance with the EPA's Stage I Disinfectant By-Product Rule because of elevated levels of Total Trihalomethanes (TTHMs) and Haloacetic Acids (HAAs). This legally required the city to send notices of non-compliance along with information about potential health concerns to its customers.



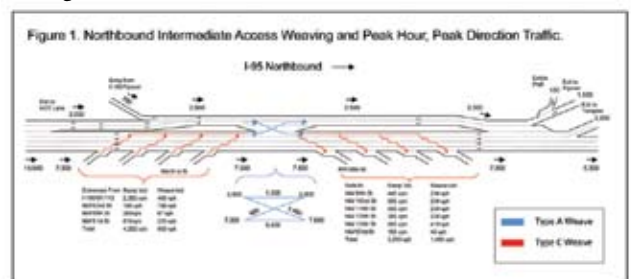
Jones Edmunds & Associates worked with the city to create a unique solution: the largest operating magnetic ion exchange (MIEX[®]) treatment plant in the United States. Within three days of the plant's coming online, concentrations of TTHMs and HAAs dropped below EPA's maximum contaminant levels. Also reduced were hydrogen sulfide concentrations and color, dramatically improving the water's taste and odor and significantly reducing the chlorine demand. This facility now produces over 90% of the water delivered to St. Cloud residents, with a current water service area population of approximately 35,000. Beyond vastly improving water quality, the St. Cloud plant is also the first full-scale facility to use sodium bicarbonate as a resin regenerate, an environmentally-friendly solution that eliminates the corrosive waste produced when using the traditional resin regenerate sodium chloride.



Reynolds Smith & Hills Inc. (RS&H), Jacksonville
95 Express Micro-Simulation, Broward and Miami-Dade Counties

As increases in population continue to strain our nation's infrastructure systems, many cities and regions are successfully relieving traffic congestion through travel demand management rather than increasing capacity. One such example is the 95 Express lanes project in South Florida, which involved converting the existing high-occupancy vehicle (HOV) lanes of I-95 and one additional lane in each direction to high-occupancy toll (HOT) lanes with variable tolls based on congestion and vehicle occupancy. The addition of HOT lanes to the inside, or left-side, of a freeway system requires the assessment of complex Type C weaving maneuvers that drivers are required to execute across the freeway lanes to ensure that the addition of the managed lanes does not degrade overall freeway system performance and safety. The weaving movements and peak hour, peak direction volumes are illustrated in Figure 1.

Traditional highway capacity manual analysis methods cannot evaluate complex maneuvers or the impacts of upstream or downstream freeway congestion, so RS&H used corridor simulation (CORSIM) software, which not only provided the information needed to evaluate complex operational maneuvers, but also provided the ability to "fine-tune" the design of the HOT lanes. RS&H used the simulation's operational measures of effectiveness (MOE) to assess HOT lane and general-purpose lane operations, intermediate access and terminal access designs. Speed differential and queuing assessed the operational safety of the HOT lane intermediate access and terminal access designs. This innovative application of micro-simulation modeling provided a complete picture of the impacts of operations from the proposed HOT lanes on the overall freeway system. It also revealed the high level of congestion that currently exists within the project limits, verifying the need for the HOT lanes project. The analysis provided new operational information



that enabled RS&H to make several design recommendations, including the need to redesign the intermediate access points to avoid significant operational and safety problems, as well as modifications to lane continuity at the managed lane terminal points to remove congestion and improve traffic flow. The design changes, shown in Figure 2, included: 1) NW 81st Street Intermediate Access redesign; 2) northbound Golden Glades Intermediate Access changed to egress only; 3) southbound Golden Glades Intermediate Access changed to ingress only; 4) northbound HOT lane access to Florida's Turnpike required weaving modifications; and 5) I-195 westbound to I-95 southbound ramp required a lane addition. This project was the first application of micro-simulation to a HOT lanes project in Florida and the first project to integrate the design and micro-simulation operational assessment phases of a project. This methodology can be applied to all HOT lane projects and has the added benefit of justifying design and project benefits to funding and reviewing agencies.

Reynolds Smith & Hills Inc. (RS&H), Jacksonville Mathews Bridge Deck Replacement, Jacksonville

The city of Jacksonville is home to Florida's first high-level cantilever truss bridge, the Mathews Bridge, which opened in 1953 to carry traffic along State Road 10A over the St. Johns River. Its original open deck steel grating system was replaced in 1997 with an in-kind system, but the original steel stringers supporting the grating remained in place and produced a slight negative camber. With public sentiment and local political pressure mounting against the open deck, the Florida Department of Transportation decided to replace the grating with a solid deck system that would provide a proven and durable wearing surface with improved rideability, skid resistance and corrosion protection of the steel members below. The RS&H Team explored three solid deck alternatives: 1) a reinforced concrete deck; 2) an epoxy-filled steel grating; and 3) an exodermic deck, which is an innovative, unfilled steel grid deck composite with reinforced concrete slab. Maintaining load-carrying capacity of truss primary chord members and increasing load-carrying capacity of the floor beams were major challenges to address, while considering the additional weight associated with the new deck system. The entire truss was load-rated dozens of times for each alternative to determine which elements would require strengthening. The exodermic deck provided a cost-effective system, requiring the strengthening of only four truss members. In addition, the floor beams were riveted, built-up members, which added to the complexity of the team's analysis. A composite floor beam was chosen for its effectiveness over adding post-tensioning or additional steel to the floor beams.



The RS&H Team ultimately recommended the exodermic deck system due to its cost-effectiveness and lighter weight while it provided the same level of durability of the other alternatives. In addition, it eliminated the wearing surface life-cycle cost of other decks, such as the epoxy-filled grating. To minimize construction impacts, half of the bridge was taken out of service at a time to complete the construction. The new deck was installed in an aggressive 90-day schedule with all four lanes opening before the National Football League's Jacksonville Jaguars first regular season game. For Florida, the project was by far the largest application of an exodermic deck system, and it is the first use on a steel through truss bridge. Its application will benefit other projects involving the rehabilitation/restoration of similar aging bridges in Florida and throughout the U.S.

Stanley Consultants Inc., Bonita Springs Golden Gate Parkway Overpass, Collier County

Golden Gate Parkway, a major east-west arterial that extends from US 41 (Tamiami Trail) to CR951 (Collier Boulevard) in north-central Collier County had reached its capacity limits. A grade separated overpass (GSO) was needed to meet future traffic demands, but the public was adamantly opposed. It took a creative design and a major public relations effort to educate and convince residents that the intersection could be functional, efficient and attractive. Now Naples boasts the county's first GSO in the form of a single point urban interchange. Coined "The Gateway to Naples," the GSO is receiving rave reviews.



The GSO has vastly improved safety, reduced traffic congestion, offers easier access to adjacent properties via ramps and Texas U-turns, and provides an essential link between I-75 and commercial, residential and industrial properties. Because aesthetics were imperative, it is outfitted with stone veneer and inlay, abutment towers, decorative lighting, and light pole, and end bent pilasters. Stanley Consultants, in conjunction with RWA, designed the project. "The consultant was faced with winning over public support while designing a high-capacity intersection into a unique surrounding," said Collier County Principal Project Manager Gary Putaansuu. "I believe the end product speaks for itself."



Taylor Engineering Inc., Jacksonville S-65E Emergency Tailwater Structure, Okeechobee

Low downstream (tailwater) elevations in Lake Okeechobee resulted in increased upstream hydrostatic forces and risk of scour to S-65E, the water control structure located at the southern end of the Kissimmee River. Discharging flows under such a condition could undermine the structure, cause structural failure, and trigger severe flooding to upstream and downstream residential and agricultural properties.



In response to these public concerns, the owner and operator of the S-65E structure—the South Florida Water Management District (SFWMD)—contracted Taylor Engineering to develop an emergency solution. Taylor Engineering,

their subconsultant Hartman Engineering, the SFWMD, and the U.S. Army Corps of Engineers worked in concert to conceive a downstream structure—a low-elevation sheet pile weir—to reduce the Kissimmee River’s channel width from 450+ feet to 200 feet and allow S-65E to discharge flows as designed. An aggressive design, hydraulic and structural analysis, construction document preparation, and bidding schedule allowed only two and a half months from Taylor Engineering’s notice to proceed to the start of construction and four months for construction completion—a seemingly impossible task.



URS Corporation, Orlando

I-4/SR 408 Interim Interchange Design, Orlando

URS Corporation as the lead in a joint venture with HNTB, served as consultant for a partnership between the Orlando-Orange County Expressway Authority and Florida Department of Transportation to provide design and post-design services for the I-4/SR 408 Interim Interchange Improvements. The I-4/SR 408 Interchange required innovative design solutions and unique applications of material use to achieve the desired goals of improved traffic mobility and minimal intrusion on the downtown community. The design required interim improvements that would be compatible with a future four-level ultimate interchange while minimizing construction material waste when implementing the ultimate phase of the interchange. Efficiently phasing traffic operations for both the interim and the ultimate improvements while minimizing costs was paramount at I-4’s busiest interchange and the centerpiece of the Central Florida region in a thriving downtown Orlando. With more than 300,000 vehicles per day traveling through the I-4/SR 408 Interchange, safety, both during construction and throughout the life of the interchange, required extraordinary design attention. Additional highlights of the project included: demolition of a the downtown OUC parking garage, coordination with utility owners of major facilities and an active rail line, design of a fire suppression system, constant public awareness and communications, significant aesthetic treatments, structural design of multiple bridge types, as well as retaining walls and signing structures. The project was completed on schedule and within the client’s prescribed budget.



2008 Honor Award Winners

Ardaman & Associates Inc., Orlando

Phosphogypsum Stack Closure, Polk County

The closed phosphogypsum stack is located at CF Industries Inc.’s Bartow Phosphate Complex in Polk County, Florida. As much as 140-foot high unlined stack had been used for over 30 years to accept phosphogypsum, a byproduct of the fertilizer production process. The stack system, comprising about 900 acres, included a series of process acid water ponds at-grade and on top of the stacked phosphogypsum, and these ponds comprised a large portion of the process system watershed. In order to reduce the source of potential surface and ground water contaminants from the stack, and to reduce the process system watershed on the site, CF Industries Inc. implemented a closure plan for the stack system. Ardaman & Associates assisted CF throughout the permitting process, providing recommendations for various environmental solutions and design. They designed the closure plan and assisted CF’s staff in developing a comprehensive and creative process water management plan as well as innovative phased construction management and scheduling for the stack/pond system. They also provided QA/QC testing and inspection of all the project elements during construction.



As a result of the closure to-date, the contaminated stack watershed was eliminated (about 670 acres) and the acidic process water inventory was reduced by 88%, which included 98% reduction of ponded process water (about 1.9 billion gallons) and 72% reduction in water within the pores of the gypsum (about 900 million gallons). Further, the pollutant discharges from the site were all reduced dramatically as the closure progressed. This project is possibly the largest phosphogypsum stack closure in the world.

Camp Dresser & McKee Inc. (CDM), Jacksonville

Upper Deer Creek Regional Stormwater Treatment Facility, Jacksonville

The city of Jacksonville had identified a suitable site for a large regional stormwater facility to provide flood control and retrofit water quality treatment for an urban area near downtown Jacksonville. Adjacent to the site was an existing brownfields site with legacy groundwater pollution. The challenge was to construct the stormwater management facility without affecting the local groundwater gradient and initiating movement of contaminated groundwater from the adjacent site toward the facility. Lowering normal water for the stormwater pond would draw the contaminated groundwater toward to the pond, and ultimately discharge that water to the St. Johns River. The option to install a physical cut-off wall to provide a barrier was unavailable due to geologic constraints. Project implementation on this challenging site was accomplished with the innovative design feature of a hydraulic barrier to isolate the adjacent groundwater plume. The hydraulic barrier consists of a ten-foot-wide trench on elevated grade surrounding 60 percent of the pond. Water from the pond is pumped into the trench to maintain a target water level and provide a column of continually infiltrating water between the contamination and the stormwater facility. The innovative, pump-controlled hydraulic barrier preserves the existing groundwater gradient and blocks migration of contaminated water, with redundancy built into the design. This is the first permanent application of such a barrier in Florida. ■

