An innovative progressive span-by-span viaduct construction method was used to meet the project's constructability challenges. Using this method, the concrete segments were erected with self-launching underslung erection girders supported by temporary towers in the median. Photo: Kiewit.

provide for proper left-turn sight distance at all intersections and median openings. Spans over intersections are generally 230 ft, with the longest spanning 260 ft. Spans over left-turn movements into driveways are between 200 and 220 ft. The 59-ft 2-in.-wide viaduct overhangs most of the four lanes of Gandy Boulevard below. THEA required that the boulevard remain open during construction, with only single-lane overnight closures and rolling stops permitted.

Given the potential for restrictive impacts to the businesses, residents, and commuters during construction, the request for proposal stipulated the use of top-down construction techniques, an aggressive 1000-day design and construction schedule, and redundant support of the erection equipment and concrete segments during construction for the entire 7060-ft-long structure. There were also significant penalties written into the contract if all lanes along Gandy Boulevard were not open by 6:00 a.m. each day. THEA proactively managed constructability and redundancy concerns by requiring the submittal of an erection plan and protection plan for overhead construction detailing each design-builder's approach to construction before bid, which was included in the "best value" scoring.

Conventional Approaches Proved Inefficient

The conventional design for a viaduct with 230- to 260-ft spans requires a top-down construction method with a precast concrete segmental box girder built using the balanced-cantilever method with an overhead gantry. Using this method, one segment is set at a time on alternating ends of the cantilever, and the segment hangs from the gantry until post-tensioned to the cantilever. The gantry, in turn, is supported by the cantilever and temporary shoring may be required to stabilize the cantilever, especially for redundancy. The design-build team determined that this method of construction was not practical because it would require two headings, each having its own overhead gantry to complete erection within THEA's required time frame. In addition, for this project with this construction method, the overhead gantries would need to be supported on the final foundations, and that would often control the permanent substructure and foundation design. The resulting heavily loaded eccentric columns and foundations would not fit in the narrow median without long-term lane closures. Lastly, this gantry style does not afford a redundant means of supporting segments; thus, traffic would not be allowed to travel beneath construction the next morning if post-tensioning operations were not complete.

AESTHETICS **COMMENTARY**

by Frederick Gottemoeller

The design decisions that were most important in making this bridge beautiful were not made for aesthetic reasons—they were made for engineering or urban impact reasons. Many were made by the owner before design even started. Limiting the width of the substructure to the width of the median, requiring adequate left-turn sight distance at all intersections, and, related to both, requiring that the superstructure be a single box girder with wide overhangs, were all decisions made for the safety and convenience of the users of Gandy Boulevard. Setting the vertical clearance under the bridge at 30 ft, roughly twice the legal minimum, was done to maintain the viability of the Gandy Boulevard businesses. Taken together, these technical decisions produced the bright, open spaces under the bridge that make it so attractive.

The designers responded to the project's challenges with engineering decisions that both met the constructability requirements and improved the bridge's appearance. The finback design solved the constructability challenges and also lengthened the spans, reduced the depth of the girder, and gave travelers on the viaduct visual features to enjoy. Post-tensioning the piers improved the performance of the piers and reduced their thickness and visual mass.

Then there are the decisions that were made for solely aesthetic reasons. The vertical blue stripes on the columns and on the sides of the finback towers and the diagonal blue stripes on the fins themselves divide these massive forms longitudinally and make them appear thinner, as does the blue "racing stripe" on the face of the parapet. The "estuary" motif on the piers and towers works well in this landscaped commercial environment. Overall, these visual features perfectly complement the aesthetic qualities of the structural elements.

So, let's sum it up. Users of Gandy Boulevard can see along and through the structure from all angles. The signs and frontages of adjoining businesses are fully visible. Daylight penetrates across the whole width under the bridge, making the space bright and inviting. The aesthetic motifs complement the structural elements and the neighborhood. There is no dark forest of massive columns here, nor any pigeons lurking overhead in the shadowy spaces between I-girders. Compare the attractiveness and usability of the space under this viaduct to the spaces under any viaduct in your town. Where would you prefer to be?