Spotlight on Georgia's Concrete Bridges

by Paul Liles, Georgia Department of Transportation

Georgia is a mid-level state when it comes to bridge inventory, with 14,661 structures presently listed on the National Bridge Inventory system. Of these structures, approximately 9040 are bridges, with the rest being culverts or other miscellaneous structures. As such, Georgia has a long history in the use of concrete for bridges, with special emphasis taking place over the last 20 to 30 years.

Early Bridges

Georgia's early concrete bridges consisted of reinforced concrete structures and are usually of the T-beam or concrete-arch type of construction. Over 300 of these structures are still in existence dating from the 1900s to the start of World War II. A fine example of an arch bridge from this period is the Dillingham Street Bridge in Columbus, Ga., that dates to 1912 (Fig. 1). This bridge is a Melan Arch that uses small, curved built-up I sections for the arch reinforcement that is embedded in the concrete. All of the pre-World War II structures, listed in the National Bridge Inventory, are still in service and continue to carry traffic daily.

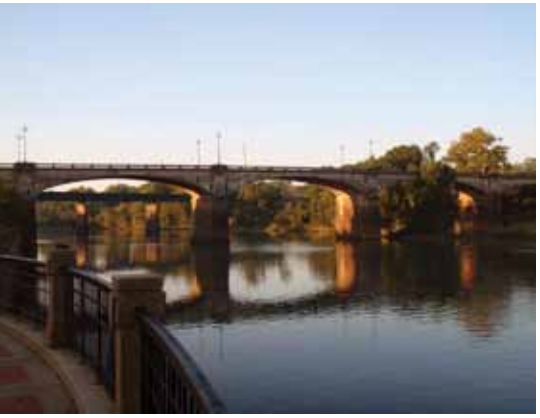

Figure 1. The Dillingham Street Bridge is a Melan Arch, which dates back to 1912. All photos: Georgia Department of Transportation.

Figure 2. The Jonesboro Road Bridge was Georgia's first high-performance concrete bridge.

In the 1950s, Georgia experimented with prestressed concrete when the then-Georgia state bridge engineer helped develop the original AASHTO prestressed concrete beam shapes. These beams were used around the state primarily over the interstate highways. Many of them were removed with interstate widening projects, but approximately 75 still exist in Georgia and carry traffic today.

Beginning in the mid-1970s, Georgia made a concerted effort toward using longer prestressed concrete beam spans along with the use of long-span, post-tensioned concrete box girders. Coupled with extensive research and interaction with the Federal Highway Administration and the concrete industry, this trend continues.

Researching Innovation

Beginning in the mid-1990s, the Georgia Department of Transportation (GDOT) began an extensive bridge research program with the Georgia Institute of Technology (Georgia Tech) to further enhance its bridge and structural program. Beginning with research into high-performance concrete, specifically with the use of Georgia aggregates. Figure 2 shows Georgia's first high-performance concrete bridge built in 2002. This bridge utilized a high-performance concrete superstructure with Type IV AASHTO beams having a span length of 127 ft and a specified concrete strength of 10 ksi.

Georgia Tech's research showed that Georgia aggregates allow high-performance concrete strengths to reach an upper length of around 14 ksi. High-performance concrete is now routinely used for long-span beams for high strength and for coastal prestressed concrete piling to limit chloride intrusion into the concrete.

Research continues in such areas as high-performance lightweight concrete, self-consolidating concrete, and ultra-high-performance concrete. Figure 3 shows Georgia's recent high-performance lightweight concrete bridge built over I-85 south of Atlanta. This bridge used lightweight concrete BT-54 beams with a density of 120 lb/ft^3 and a specified concrete compressive strength of 10 ksi.

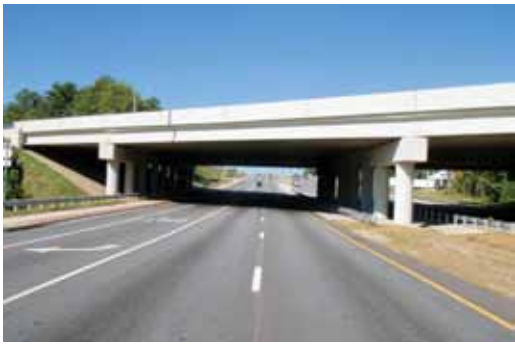

Figure 3. The I-85 Ramp over Georgia State Route 54 used prestressed concrete beams with a density of 120 lb/ft^3 and a specified concrete compressive strength of 10.0 ksi.

Current research with Georgia Tech involves investigations into using stainless steel prestressing strand for construction of prestressed concrete piles. These are being developed with the idea of developing a corrosion-free pile for use in Georgia's coastal bridges where the piles are exposed in salt water.

Some other significant Georgia projects involved innovative construction techniques such as precast concrete elements for design-build construction. Georgia's Highways for Life (HfL) project on I-85 near LaGrange used precast concrete bents that were assembled on site (Fig. 4). A major design-build project was the Fifth Street Pedestrian Plaza Bridge over I-75/I-85 in Atlanta (Fig. 5). The Fifth Street Plaza Bridge was previously described in the Winter 2008 issue of *ASPIRE*™ magazine.

Georgia also has two major cable-stayed bridges along the Georgia Coast. These bridges are the Talmadge Memorial Bridge located in Savannah, Ga., and the Sidney Lanier Bridge in Brunswick, Ga. (Fig. 6). Both bridges are cast-in-place, concrete segmental bridges that serve as the gateways to Georgia's two port cities. These structures allow commercial ocean-going ships to enter the ports and provide 185 ft vertical clearance above the waterway with main spans of 1100 ft for Savannah and 1250 ft for Brunswick.

Figure 4. Precast concrete bents were used in Georgia's Highways for Life program.

Figure 5. Fifth Street Bridge over I-75/I-85 provides a user-friendly environment.

Figure 6. The Sidney Lanier Bridge has a main span of 1250 ft.

Summary

This article summarizes some of the trends and highlights Georgia's concrete bridges. Developments over the past 20 years greatly influenced the design of concrete bridges in the state. The use of high-performance concrete, with increases in concrete strength and concrete durability, increased beam lengths by almost 100%. Backed by research, we expect this trend to continue into the future.

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For more information about Georgia's bridges visit www.dot.state.ga.us/doingbusiness/PoliciesManuals/bridge/