

The Virginia Dare Bridge • Croatan Sound, NC

PROJECT

The Virginia Dare Bridge

LOCATION

Between Manns Harbor and Roanoke Island over the Croatan Sound in N.E. North Carolina

OWNER

State of North Carolina

ENGINEER

Wilbur Smith Engineers
Raleigh, NC

CONTRACTOR

Balfour Beatty
Atlanta, GA

LIGHTWEIGHT EXPANDED SLATE AGGREGATE PRODUCER

Carolina Stalite
Salisbury, NC

BRIDGE STATISTICS

- Piling: 2,368
- Concrete: 43,830 yds³
- Roadway: 42 acres
- Lanes: 4
- Stalite Lightweight Aggregate: 30,000 tons**

LIGHTWEIGHT CONCRETE

- 4,500 psi at 28 days
- Max. Fresh
Unit Weight: 120 lb/ft³
- Max. Equilibrium
Unit Weight: 115 lb/ft³

(See page 3 for additional information)

STALITE PROVIDES LIGHTWEIGHT AGGREGATE FOR NORTH CAROLINA'S LONGEST BRIDGE



The Virginia Dare Bridge spans the Croatan Sound from Manns Harbor to Roanoke Island, North Carolina

HISTORY-MAKING BRIDGE COMPLETED IN N.C. Longest Bridge in the State • 100-Year Design Life

History was made in North Carolina on August 16, 2002 when a new bridge opened. **The Virginia Dare Bridge is the longest bridge in the Carolinas; at 5.2 miles, it is 2 miles longer than any bridge in the Carolinas, and one of the longest concrete bridges on the East Coast. This bridge is designed to last a century, twice as long as the preceding generation of bridges.**

In the summer of 1996 the State of North Carolina and the Department of Transportation determined that a new bridge was

required to replace the present William B. Umstead Bridge connecting the Dare County mainland with the hurricane-prone East Coast. A new bridge was deemed necessary because of findings made in a 1996 study of traffic flow through Manteo, NC to Manns Harbor, NC. This traffic volume is expected to more than double by 2020. The present bridge, opened to traffic in April 1957 and nearly 43 years old, is unable to handle that amount of traffic and already causes congestion for vacationers. It also increases the risks associated with evacuation in the event of a hurricane.

Early in 1997, Wilbur Smith Associates of Raleigh, NC was given the responsibility of designing the new "100 year" bridge. In April, 1998, Balfour Beatty Construction, Inc. of Atlanta, GA was awarded the contract for constructing the bridge. At a cost of \$91 Million Dollars, construction took a little more than 3.5 years and was completed in the summer of 2002.

The 4-lane Virginia Dare Bridge, U.S. 64/U.S. 264 (Manteo By-Pass), connects Manns Harbor and Roanoke Island over Croatan Sound. (It replaces an aging two-lane bridge located farther north; however, there are no current plans to dismantle this bridge.)

The Virginia Dare Bridge was a bargain at \$91 million, especially as compared to the \$531 million Cooper River Bridge replacement in Charleston, SC.

DURABLE LIGHTWEIGHT CONCRETE DECK PROVIDES SAFER, LONGER-LASTING RIDING SURFACE

This is a pre-cast, pre-stressed concrete beam bridge with a cast-in-place lightweight concrete deck (riding surface). The design is simple - each beam rests on top of two piers or columns. When a vehicle passes, the beam carries and redistributes the load to the piers and foundations. The logistics were challenging - each component had to be made on site or brought in by water or specially designed rail. Two concrete batch plants were needed - one was built in Manns Harbor, the other was built on a floating platform.

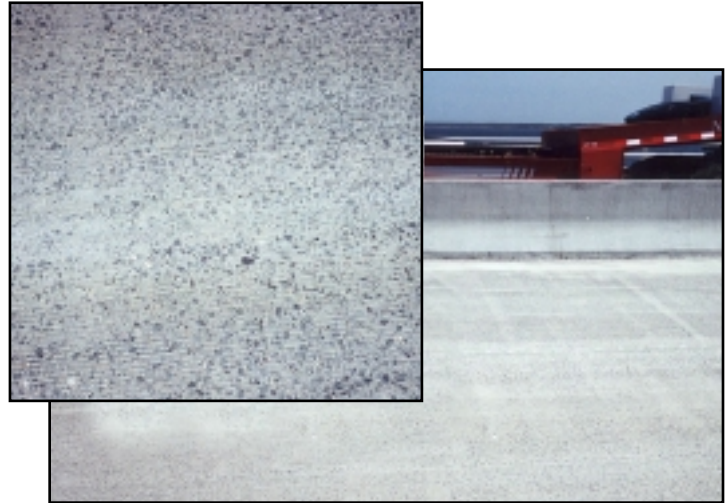
Everything else, including the massive cranes, came by barge or on an elevated railroad built to haul supplies without damaging the surrounding wetlands. At the peak of construction, 50 boats were counted in the construction flotilla.

Contractors crafted giant concrete piling, carried them by barge to the middle of Croatan



At 5.2 miles, the Virginia Dare Bridge is North Carolina's longest bridge, and one of the longest bridges on the East Coast.

Sound, then drove them as much as 100 feet into the sea bed. Concrete pile caps went on top of the piles and concrete beams rest on these to support the roadway. The design gets complicated at the 65-foot high main span. This allows ships to pass under the bridge safely. At this point the pre-stressed girders are spliced together by post-tensioned high tensile strength steel cables.



“Grooved” deck exposes durable Stalite Lightweight Aggregate in lightweight concrete riding surface.

VIRGINIA DARE BRIDGE PROVIDES SECURITY TO RESIDENTS AND EASIER COASTAL ACCESS FOR TOURISTS

The bridge, named for Virginia Dare, who in 1587 was the first English child born in the New World, will relieve traffic congestion for local citizens and it will be a key evacuation route off the beaches and out of the county when offshore storms threaten. Tourism officials hope that the new span will lure people from the Triangle, Piedmont, and Western North Carolina areas. Traditionally, many people favor the central and southern coastal areas because these areas are perceived to be closer to major population centers. The new bridge will provide another option.

Proportions – For Lightweight Concrete, the North Carolina DOT uses a cement content of 715 lbs. per cubic yard with a 20% replacement rate of cement for class F flyash using 1.2 lbs of flyash to replace 1.0 lbs of cement. The mix was as follows:

- 572 lbs cement
- 172 lbs flyash
- Approx. 825 lbs of 3/4" Stalite
- 6% entrained air

Strength: 4500 psi at 28 days

Maximum plastic unit weight = 120 lbs/ft³

Maximum equilibrium unit weight = 115 lbs/ft³

For Additional Information About Structural Lightweight Concrete and Other Advantages of ESCS

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