High-Performance Concrete Bridges- Georgia
Bridge Over Interstate 75, Henry County
Tentative Site

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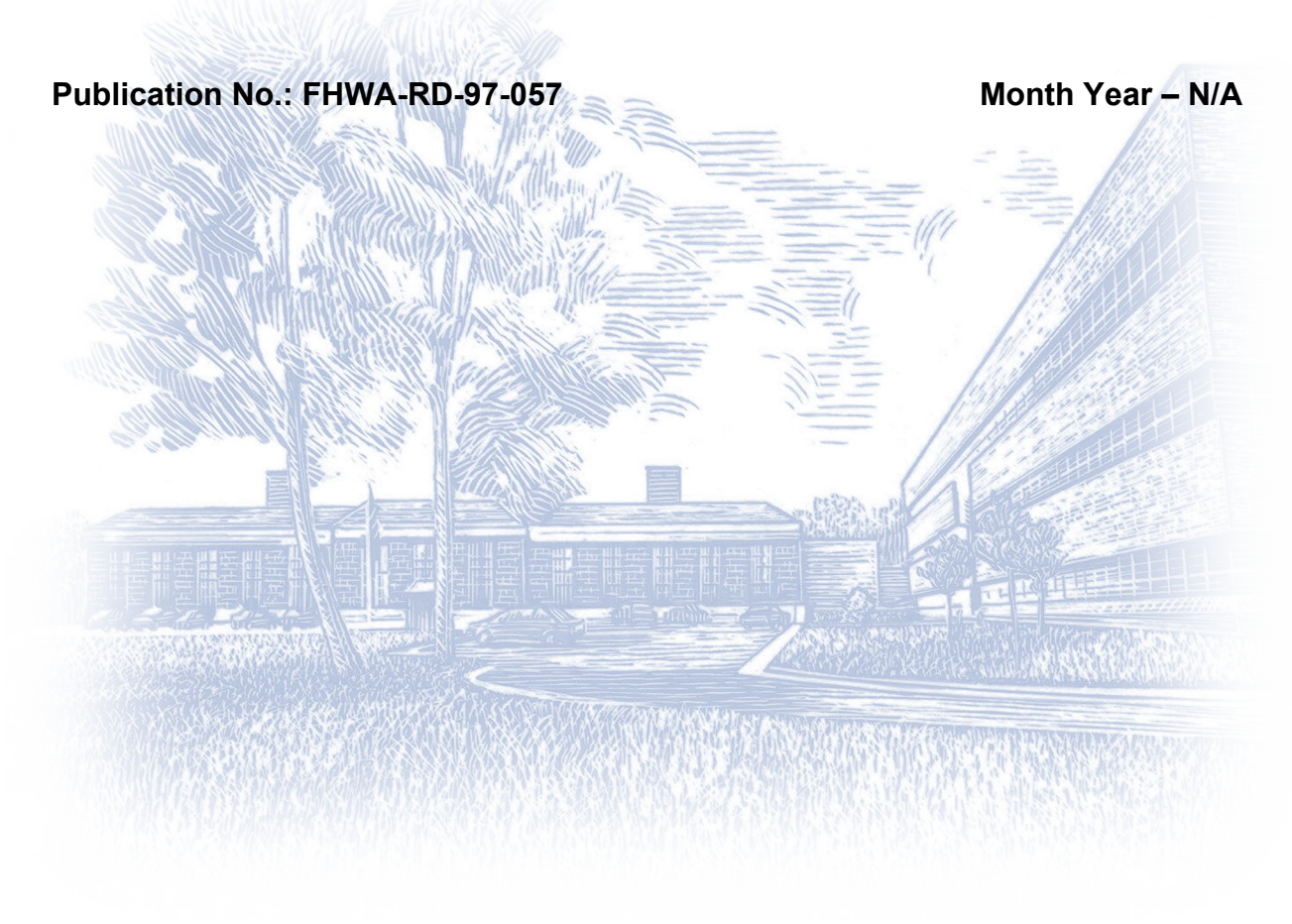

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Foreword

High-Performance Concrete - Concrete with enhanced durability and strength characteristics. Under the Strategic Highway Research Program (SHRP), more than 40 concrete and structure products were developed. To implement the new technology of using High Performance Concrete (HPC), the Federal Highway Administration (FHWA) has a program underway to showcase bridges constructed with HPC. The objective is to advance the use of HPC to achieve economy of construction and long-term performance.

General Description

This HPC bridge project is being conducted by the Georgia Department of Transportation (GADOT). Funding for this project comes from GADOT, FHWA, and 10 states that pooled their research funds. The project is being conducted in cooperation with the Georgia Institute of Technology. The objective is to design, construct, test and evaluate a highway bridge in the Atlanta area utilizing HPC AASHTO prestressed concrete beam shapes and an HPC composite deck.

Outline of HPC Features

The prestressed concrete girders will require FHWA Grade 2 HPC with a strength of 62 MPa (9,000 psi) and a 56-day rapid chloride permeability of less than 3,000 coulombs. The deck will require an FHWA Grade 1 HPC with a strength of 48 MPa (7,000 psi) with a 56-day rapid chloride permeability of less than 2,000 coulombs. Air content of both the girders and deck will be between 5 and 8 percent.

Research/Testing

Prior to construction of the bridge, extensive research is being conducted to accomplish the follwoing: (1) determine the "best" mixes for FHWA Grades 1,2, and 4 HPC using Georgia coarse and fine aggregates that will produce HPC in the 48- to 97-MPa (7,000- to 14,000-psi) range; (2) determine compressive strength, modulus of elasticity, creep, shrinkage, and permeability properties; (3) evaluate the local HPC production capabiltiy and conduct a round-robin evaluation of local ready-mix and pre-cast girder producers; and (4) evaluate the bond of 15.2 mm (0.6 in) prestressing strand using direct pull-out and beam tests. For the constructed bridge, the concrete properties studied above will also be evaluated.

Instrumentation

Both the girders and deck of the constructed bridge will be instrumented. Thermocouples and vibrating wire strain will be embedded in the concrete; surface strain will be measured with mechanical gauges. Girder camber, overall length change, and inital force in prestressing strands will be measured. Natural frequency of the girders and of the completed bridge will be determined using accelerometers.

Benefits

The research project is expected to demonstrate that HPC girders provide greater economy in highway bridge construction by permitting smaller depth girders to be used for longer spans while also allowing wider girder spacing. Furthermore, the HPC deck will provide greater durability with reduced long-term maintenance.

Current Status

- The Georgia DOT bridge design programs have been checked and verified using HPC parameters.
- Trial mix designs using both silica fume and fly ash have been developed and tested.
- Georgia granite and granite gneiss aggregate have been determined to be satisfactory in producing 97 MPa (14,000 psi) HPC.
- A round-robin team of ready-mix and precast girder producers has been formed to test mix designs in a production mode.
- An HPC bridge has been tentatively selected for design. This bridge is located over I-75 in Henry County, just south of Atlanta. The bridge's preliminary layout is being developed at this time. Construction is scheduled to begin in late 1997 or early 1998.

Additional Research

Computer studies will investigate the advantages of using HPC bridge girders and will analyze effects of concrete strength, strand size and strength, girder spacing, deflection limits, stress limits, and cross-section on maximum span length. A laboratory study will investigate the ultimate strength of AASHTO Type II test girders with composite deck sections made using Grade 2 and Grade 4 HPC.

For further information on High Performance Concrete or this project, contact:

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