Florida Department of Transportation Research

Development of Tiered Aggregate Specifications for FDOT Use
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Limestone in Florida's peninsula plays a major role in transportation. As a road surface, a base layer, or as aggregate in asphalt and cement concretes, most road building projects require large quantities of limestone. Millions of tons of Florida limestone produced annually go into transportation projects.

However, limestone properties can vary considerably. Therefore, the Florida Department of Transportation (FDOT) has established minimum durability requirements for limestone aggregate, which all limestone used in FDOT projects must meet. Limestone meeting these requirements comes from only a few regional locations, notably west Miami-Dade, Lee, and Taylor counties, and the supply is finite. The desire to conserve existing reserves as long as possible prompted the question of whether top quality limestone should be required for all transportation purposes.

In this project, researchers from the University of Florida's Department of Civil and Coastal Engineering addressed this question by examining the possibility of tiered specifications that would match limestone quality more closely to its use and allow transportation projects to draw on a wider range of products and suppliers.

Several states already have tiered aggregate specifications, and with the assistance of FDOT, the researchers sent surveys to all fifty state departments of transportation concerning their practices regarding aggregates. Many states responded, eighteen reporting use of tiered aggregates, including Indiana, California, Georgia, and Kentucky.

A laboratory testing program was then conducted to evaluate properties of two control concretes made with FDOT-approved aggregates and compare them to eight concretes made with non-specification aggregates. Florida sources were used for all aggregates in the study. Tests included compressive strength, splitting tensile strength, flexural strength, modulus of elasticity and Poisson's ratio, coefficient of thermal expansion, and concrete absorption. Additional tests examined the relationships between these properties. Concrete properties were then correlated with aggregate properties.

Concrete samples using a variety of aggregates are prepared for compression testing on the vibrating table.

Based on these studies, researchers selected the compressive strength of concrete samples as a basis for a tiered aggregate specification. Key aggregate properties used in the tiered specification were No. 200 sieve, LA abrasion loss, MD abrasion loss, soundness loss and shell content. The relationship between these key properties and the compressive strength of concrete had been established by the laboratory testing program. The proposed tiered specification allows three categories of limestone. The top tier matches the current FDOT specification.

Project Manager: John Shoucair, FDOT Materials Office
Principal Investigator: Mang Tia, University of Florida
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