Beneficial Use Case Study

Davis Wade Stadium Renovation

Coal Combustion Product Type
Class C Fly Ash

Project Name
Davis Wade Stadium Renovation

Project Location
Starkville, Mississippi

Project Participants
Holcim US, MMC Materials, MSU Construction and Materials Research Center, Roy Anderson Corp. Contractors, LPK Architects, Walter P. Moore, 360 Architecture

Project Completion Date
2014

Project Summary
Built in 1914, Mississippi State University's Davis Wade Stadium is the sixth-oldest Division 1 college football ground. To celebrate its centennial, the university in 2012 initiated a $75 million renovation and expansion involving the replacement of its north end zone bleachers, reconstruction of the west side main concourse, and the addition of new elevator towers, concessions, restrooms, and more than 6,000 seats. Home to the Construction and Materials Research Center (CMRC), the university's officials prioritized the center's involvement in the project to research and test an array of construction materials.

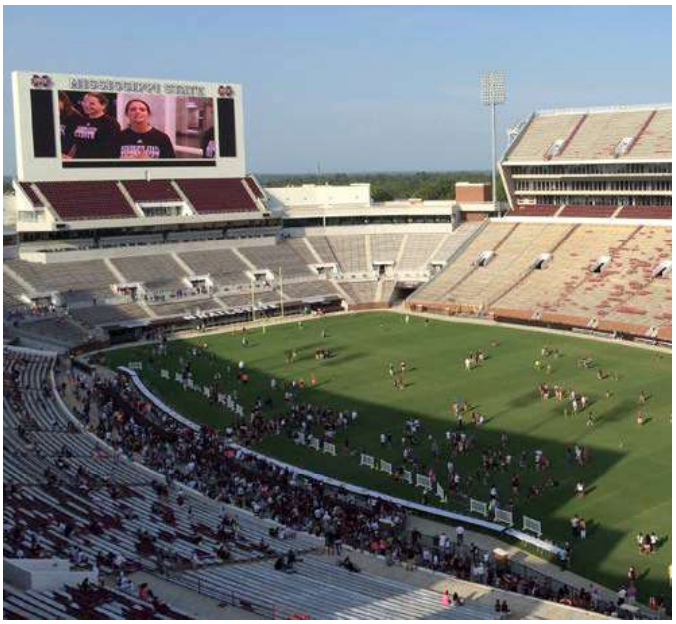
Project Description
As is often the case in stadium construction projects, concrete was to be the primary building material; in the end over 23,000 cubic yards would be used in the renovation. With sustainability, budget, performance, and durability all priorities, CMRC investigated the use of a number of potential concrete mixes incorporating high levels of supplementary cementitious materials (SCMs).

Coincidentally, the stadium renovation dovetailed with CMRC research investigating the substitution of ordinary portland cement (OPC) with portland limestone cement (PLC) with the objective of maximizing the SCM replacement rate. PLC offers environmental benefits over OPC stemming from its lower clinker content. SCMs, meanwhile, can yield both sustainability benefits—because many, such as fly ash, bottom ash, etc., are recycled products—and performance improvements resulting from their specific chemistries.

Holcim US, Separation Technologies LLC, Lehigh Cement Company (now part of Heidelberg Materials) and Headwaters Inc. (now part of Eco Material Technologies) all provided CMRC with cementitious materials as part of the research. In all, over 200 concrete mixtures, as well as hundreds of paste and mortar mixtures, were analyzed and tested. Ultimately, concrete mixes incorporating PLC and 50 percent SCM substitution—including 20 percent Class C fly ash—were incorporated into most concrete elements of the project. However, a smaller portion of the renovation that used OPC served as the basis for a comparative analysis.

Among the conclusions of the analysis were that: (1) without SCMs, PLC mixes were merely equivalent in strength performance to OPC mixes; (2) in combination with Class C fly ash, PLC concrete mixes exceeded all OPC performance; (3) setting times were shorter for all PLC mixtures, but especially with Class F fly ash (alone) and with Class C fly ash mixed with slag; and (4) SCM replacement levels above 50 percent that use Class C fly ash and slag may be possible that yield additional setting benefits while maintaining the same performance advantage.

The Davis Wade renovation has been widely lauded for its execution, including being named runner-up in the World of Concrete's Triad Award for innovation, sustainability, and leadership.



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