사단법인 한국콘크리트학회 Korea Concrete Institute

The KCI Presidential Lecture Series

May 18, 2022 (1:00 to 2:00 pm, Wednesday)

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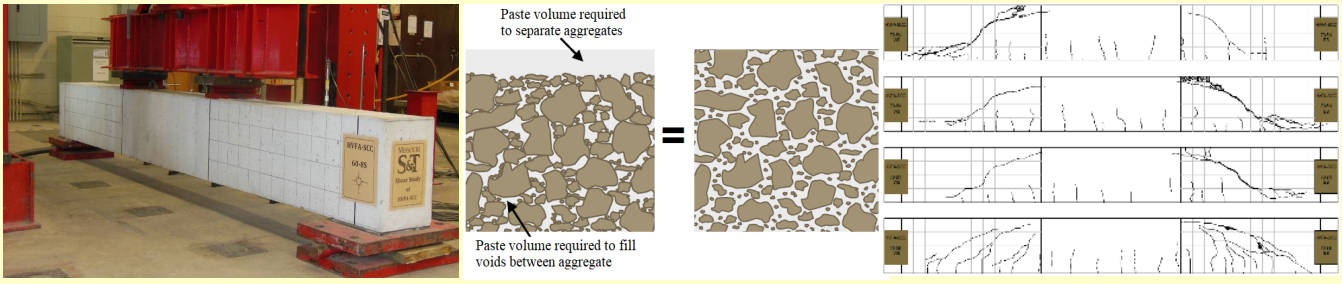
Zoom Link <https://us02web.zoom.us/j/5685985100?pwd=c2wzdjQ0VGthRzF4MXBRQXF1bkJ4dz09>

Temporal-Based Effects and Structural Behavior of Sustainable Self-Consolidating Concrete in Bridge Structures



Welcome to the KCI Presidential Lecture Series

The Presidential Lecture Series is a technical event of the Korea Concrete Institute (KCI) to disseminate the state-of-the-art knowledge of concrete materials and structures for the benefit of engineering students, research professionals, and practicing engineers.

Invited Speaker

John J. Myers, Ph.D., P.E., F.ACI, F.ASCE, F.IAAM, F.IIFC, F.TMS, F.VEST
Professor, Civil, Architectural and Environmental Engineering
Deputy Director, Missouri Center for Transportation Innovation (MCTI)
Missouri University of Science and Technology, MO, USA

Moderator

Yail Jimmy Kim, Ph.D. P.Eng., F.ACI
University of Colorado Denver, CO, USA

Abstract: The main objective of this study was to investigate the performance of sustainable self-consolidating concrete (SCC) for highway bridge structures. Two types of concrete were utilized in this study: high volume fly ash-self consolidating concrete (HVFA-SCC) and high strength-self consolidating concrete (HS-SCC). This research program consisted of two major parts: a laboratory study developing and investigating the overall performance of HVFA-SCC and a field study of time-dependent field-based behavior of HS-SCC in Bridge A7957 MO, USA. In the first part, an experimental program was conducted to develop a new class of SCC incorporating up to 70% cement replacement with fly ash. Three replacement levels (50%, 60%, and 70%) by weight were selected to quantify the effect of cement replacement on the structural performance of HVFA-SCC. Shear behavior and bond performance of HVFA-SCC were investigated in the laboratory. The shear behavior program consisted of twelve full-scale beams, and the bond performance program consisted of twelve full-scale splice test specimens. Analysis of the HVFA-SCC data indicated that concrete with up to 70% cement replacement can be considered for the production of sustainable SCC. The second part of this dissertation presents the total prestress losses and thermal behavior of Bridge A7957 constructed with HS-SCC. A structural health monitoring system was established on this bridge to monitor the time-dependent behavior of bridge girders using VWSGs and a data acquisition system. HS-SCC girders were monitored for more than two years' worth of field-based data. Both measured prestress losses and thermal data (uniform temperature and thermal gradients) were compared to the current design specifications. Results showed that the investigated specifications require some modifications to accommodate the material composition of HS-SCC.

Speaker: Dr. John J. Myers, P.E., Professor of Civil, Architectural, and Environmental Engineering, joined Missouri University of Science and Technology (Missouri S&T) under the University's Infrastructure Mission Enhancement Program in March 1999. Dr. Myers has been actively involved in high performance materials from a research standpoint for the past twenty-eight years. In particular, his focus has concentrated on the development of advanced materials for application in structural engineering primarily focusing on advanced composites materials and sustainable advanced concretes. These have included research efforts on fiber reinforced cementitious matrix (FRCM), fiber reinforced polymer (FRP), steel reinforced polymer (SRP) and steel reinforced grout (SRG) technologies for repair and new construction in civil infrastructure. His efforts in the development of environmentally sensitive advanced concrete construction materials have focused on the development and application of high-strength/high performance concrete (HS/HPC), high strength self-consolidated concrete (HS-SCC), high volume fly ash self-consolidating concrete (HVFA-SCC) behavior and durability performance. His efforts have contributed to the code & standardization of these materials and led to the deployment of these systems into field application with in-situ studies into structural health monitoring (SHM), non-destructive evaluation (NDE) and load testing of these technologies for bridges. Dr. Myers has published more than 275 technical journal and conference publications along with 90 technical research reports. Professionally, he is very active in ACI, ASCE, ASEE, IAAM, IIFC, PCI, TMS, and TRB and serves as an active committee member in numerous technical and educational committees within these organizations. He is a registered Professional Engineer (P.E.) in and has over 11 years of professional consulting experience. He is a Fellow of ACI, ASCE, IAAM, IIFC, TMS and VEST.