

Implementation of Self-Consolidating Concrete for Prestressed Concrete Girders

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Synopsis: This paper describes the first experience of using self-consolidating concrete for prestressed concrete bridge girders in North Carolina. Under construction in eastern North Carolina is a multi-span bridge which will use one hundred thirty AASHTO Type III girders, each 54.8 ft (16.7 m) long. To demonstrate the full-scale field production of self-consolidating concrete, and for comparative purposes, three girders from one production line of five girders were selected for the experimentation. Two of the girders were cast with self-consolidating concrete and one with normal concrete as control.

The plastic and hardened properties of both the self-consolidating concrete and the normal concrete were monitored and measured. The plastic properties of self-consolidating concrete included unit weight, air content, slump flow, visual stability index (VSI), and passing ability measured by J-ring and L-box. Hardened properties of the two concretes included temperature development during curing, compressive strength, elastic modulus, and flexural tensile strength. The prestressing force was monitored by load cells. The transfer lengths of prestressing strands were determined by embedded strain gauges, and from the measured strand end-slips. Finally, the three girders were tested in flexure up to the design service load to determine and compare their load-deformation characteristics.

Keywords: bridge beam; flexural modulus; girder; modulus of elasticity; prestressing; pretension; self-consolidating concrete; strength