SIKA AT WORK
ST. CROIX CROSSING 4 LANE BRIDGE PROJECT

HIGH PERFORMANCE ADMIXTURES FOR HIGH PERFORMANCE CONCRETE

BUILDING TRUST

ST. CROIX CROSSING
OAK PARK HEIGHTS, MN AND ST. JOSEPH, WI

PROJECT: St. Croix Crossing
OWNER: Minnesota and Wisconsin DOT's
CONCRETE PRODUCER: Aggregate Industries US
GENERAL CONTRACTOR: Lunda Construction & Ames Construction JV
YEAR: 2013 – 2017

PROJECT DETAILS

The St. Croix Crossing 4 lane bridge project connects Oak Park Heights, MN and St. Joseph, WI. The extradosed bridge system, a hybrid combining concrete box girder and cable-stayed bridge designs, is only the second extradosed bridge constructed in the United States.

This major project will reduce severe traffic congestion by diverting traffic from the historical Stillwater Lift Bridge constructed in 1931 to a four-lane bridge that will connect expressways on both sides of the St. Croix River.

At over 5000 feet in length, the bridge consists of approx. 60,000 cubic yards of concrete for the 650 precast main bridge girder segments. In total there are approximately 1000 precast concrete segments. This case study is written for the 650 precast segments (average size 48' wide x 18' deep x 10' long; 180 tons) for the main bridge and awarded to Aggregate Industries. Sika® admixtures were used for these bridge girders. The precast girders were shipped 33 miles by barge to the project site.

THE CHALLENGE

- High early strength requirements to strip forms and stress tendons
- Adequate workability to flow around the congested reinforcing steel and throughout the uniquely shaped form work while remaining cohesive.
- Special considerations for cold weather and hot weather placement as the segments were cast continuously over an approximate 2 year period.

THE SOLUTION

Sika® and Aggregate Industries decided on a mix design utilizing, Sika® ViscoCrete®-2100 (High Range Water Reducer), SikaTard® 440 (Hydration Stabilizer) and Sika® Air-260 (Air Entrainer) to meet the challenging mix design requirements.

CONCRETE SPECIFICATION

	Specification Requirement	Average Results
Slump	4 – 9"	8.5"
Air content	5 – 8%	6.5%
Early age strength	4,000 psi	6,000 psi
28 days strength	9,000 psi	9,600 psi

MIX DETAILS

Water Cementitious Ratio	0.30

Sika® Air-260	0.10 – 0.15 floz/cwt*
Sika® ViscoCrete®-2100	4.0 – 4.5 floz/cwt*
SikaTard® 440	3.5 – 4.0 floz/cwt*

* Admixture dosages were adjusted as necessary at the time of batching to maintain the designed slump, w/c, and air content.

BENEFITS UTILIZING SIKA ADMIXTURES & SERVICES

- The high early strength allowed forms to be stripped and production of the girders to stay on track, while consistently meeting the long term strength requirements.
- The finished concrete segments met all performance requirements without a single segment rejected.

OTHER SIKA PRODUCTS INVOLVED

Product	Application
Sikadur® 31 SBA	Segmental Bridge Adhesive
Sikadur® 42 Grout Pak PT	Epoxy Grouting System
Sikagrout® 328	Cementitious Precision Grout
Sika FTP Primer/ Sikalastic® 735	Polyurethane Waterproofing Membrane System
Sikadur® 22 FS LoMod	Epoxy Chip Seal (Bridge Deck Overlay)
Sikadur® 35, Sikadur® 32	Epoxy Resin Adhesive
Sikaquick® 2500	Rapid Hardening, Patching Material for Concrete

SIKA CORPORATION
201 Polito Avenue
Lyndhurst, NJ 07071
Phone: 201-933-8800
Fax: 201-933-6225

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