

# EUCON LiNX

## Emergency Bridge Repair Platte-Winner Bridge, South Dakota



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accomplish two important benefits: first, it will prevent ASR in the new concrete and grout despite the known reactivity of the locally available aggregates. And, according to Johnston, some of the lithium will migrate into the existing concrete to retard the ASR already occurring in the pile cap. Along with ASR resistance, the projects' 4000 psi concrete mixture had to be highly pumpable and compatible with underwater placement techniques.

HDR Engineering, Inc., Omaha, NE developed the plan to encapsulate each damaged pile cap in a new 12' 6" high

reinforced concrete beam measuring 47 feet long by 16 feet wide. The new concrete was placed in two

While the Platte-Winner Bridge, built in 1966, did not show advanced deterioration due to Alkali Silica Reactivity (ASR), petrographic examination of cores taken from the structure indicated that ASR was occurring. However, the severe winter storm in 1997 caused extensive damage and repairs were mandated.

South Dakota has experienced serious ASR bridge and roadway failures in the past and was committed to using the best ASR mitigation techniques available for the bridge repair work. The State has been participating in a FHWA Lead States program to demonstrate the effectiveness of lithium

***"No problems were encountered in the use of lithium-based admixtures for new concrete construction."***

***SD-DOT's ASR Report***

***"The failure of the pile caps was due primarily to the ice flow but was exacerbated by the presence of alkali silica reactivity in the concrete."***

***Dan Johnston, Project Engineer, SD-DOT***

admixtures to suppress ASR. Coincidentally, South Dakota Department of Transportation (SD-DOT's) ASR Report was issued in the same month that the emergency repair work began on the Platte-Winner Bridge.

Armed with this knowledge, SD-DOT specified the addition of lithium nitrate to the concrete and grout to



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stages according to SD-DOT bridge construction engineer Greg Fuller. The first placement, encapsulating the bottom of the existing pile caps, was placed underwater with a tremie. For the second pour, encapsulating the sides and top of the pile

***“Lithium didn’t seem to make any difference in the workability of the concrete and was compatible with the other admixtures.”***  
***Rich Laber, General Manager,  
Rosebud Concrete***

caps, water was pumped out of the formwork so that concrete could be placed in the dry. Fuller felt the lithium-modified concrete had good flow and workability properties, even when placed underwater. The lithium nitrate admixture incorporated Lifetime<sup>®</sup> Admixture Technology from FMC Corp.

Grout tubes were then drilled approximately 36 inches on center through the existing pile caps so that grout could be placed under pressure to fill internal cracks in the damaged pile caps and any voids left by the underwater pour. The close spacing of the grout tubes also enables lithium in the grout to help ameliorate ASR occurring in the existing concrete.

Complicating the repair work was the fact that concrete mixers and pumps could not be placed on the damaged spans. This required concrete to be pumped over 2000 feet horizontally and then down thirty feet from the bridge deck to the elevation of the pile caps.

The lithium represented only a small fraction of the total project cost, yet provided extra assurance that the bridge would remain functional throughout its intended service life.



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## MATERIAL DETAILS

Cement	TYPE I-II	Low Alkali
Fly Ash	Class F	Intermediate CaO
Rock	Quartzite	Slowly Reactive
Sand		Highly Reactive
ASR Admixture	Lifetime <sup>®</sup>	1.5 gal/yd <sup>3</sup>

NOTE: The Euclid Chemical Company acquired the Chemical Admixture and Fiber Division of Boral Materials Technologies, Inc. July 1, 2003.



**The Euclid Chemical Company**

19218 Redwood Road • Cleveland, OH 44110  
Toll-free: (800) 321-7628 • Fax: (216) 531-9596

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