Evaluation of "FIBERMESH" Synthetic Fibers in P.C. Concrete Bridge Barrier Rail

Final Report for MLR-88-17

November 1988

Highway Division

Iowa Department of Transportation

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Final Report for
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DISCLAIMER

ABSTRACT:

Ten bridges were chosen to have their concrete barrier rails constructed with one rail having "Fibermesh" synthetic fibers added and the other rail without the fibers. The rails were constructed in 1985, 1986, or 1987. All the bridges were inspected in 1988 and no consistent reduction in cracking was achieved using Fibermesh fibers in the p.c. concrete bridge barrier rails.

INTRODUCTION:

Cracks that develop in P.C. concrete bridge barrier rails soon after construction are a concern. The Fibermesh Company of Chattanooga, Tennessee markets a fiber reinforcing material for P.C. concrete. The company claims the following benefits:

Inhibits Cracking

Increases Impact Capacity

Reduces Permeability

Adds Shatter Resistance

Reduces Construction Time

To determine if the addition of "Fibermesh" synthetic fibers to concrete bridge barriers would be effective at controlling cracking, ten bridge projects were constructed with fibers in the rails. Each bridge was to have one rail with fibermesh and one without fibermesh.

PROJECT DESCRIPTION:

In 1985, one barrier for one bridge was constructed with 2" long fibermesh fiber added at the rate of 1-1/2 lbs. per cubic yard of concrete.

In 1986, one barrier for one bridge was constructed with 3/4" long fibermesh fiber added at the rate of 1-1/2 lbs. per cubic yard of concrete.

In 1987, the barriers for the remaining eight bridges were constructed, one with 3/4" long fibermesh fibers and the remainder with 2" long fibermesh fibers at 1-1/2 lbs. per cubic yard of concrete. One of these bridges had fiber incorporated in both rails by mistake.

EVALUATION:

In October 1988, all ten bridges were inspected. All visible cracks were located and their positions recorded. No differences in surface conditions or crack widths were found. The results of the inspection are in Table I and Table II.

TABLE I

Location	County	Project	Length	Type	Fiber Rail	Plain Rail	Fiber Size	Date Placed (Mo., Year)
149 over N. English River	Iowa	BRF-149-2(23)	278'	PCC*	West 33	East 45	2"	May 1987
149 over Middle English River	Iowa	BRF-149-2(23)	143'	PCC	West 24 East 20		2"	May 1987
20 E.B. over North Fork	Dubuque	F-20-9(56)	498'	CWPG**	South 109	North 101	3/4"	Oct. 1986
22 over Cedar River	Muscatine	BRF-22-4(30)	963'-6	PPC	South 163	North 224	2"	Apr. 1987
14 S.B. N. of Marshalltown	Marshall	BRF-14-5(38)	473'	CWPG	East 100	West 93	2"	June 1987
117 1.5 Mi. N. of Prairie City	Jasper	BRF-117-1(11)	95'	PPC	West 2	East 7	2"	Oct. 1987
Local over 20 S. of Earlville	Delaware	F-20-8(24)	244'-6	PPC	East 67	West 37	3/4"	Apr. 1987
218 over Ditch N. of Plainsville	Bremer	BRF-218-8(13)	93'	PPC	East 5	West 14	2"	Sep. 1985
149 1.2 Mi. N. of S. English	Keokuk	BRF-149-1(26)	218'	PPC	East 57	West 45	2"	Aug. 1987
149 over So. Skunk River	Keokuk	BRF-149-1(28)	512'-6	PPC	West 90	East 99	2"	May 1987

* PPC Prestressed, Pretension Concrete Beam Bridge

** CWPG Continuous Welded Plate Girder Bridge.

TABLE II Crack Summary

	Number of Cracks in Rail	
	Side with Fibers	Side without Fibers
Bridges with 3/4" fibers	176	138
Bridges with 2" fibers *	450	527
All bridges *	626	665

* Does not include project BRF-149-2(23), Iowa County, over Middle English River.

On the two bridges with 3/4-inch fibers, more cracks appeared on the fiber reinforced rail than the plain rail. Five of the seven bridges with the 2-inch fibers did show fewer cracks on the fiber reinforced rail than the plain rail. The result is 28 percent more cracks with 3/4-inch fibers and 15 percent fewer cracks with 2-inch fibers overall than without fibers.

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COST:

The total cost of adding fiber reinforcing averaged $1.22/lineal foot of rail. The lowest rate was $1.02/lin. ft. and the highest was $2.19/lin. ft.

CONCLUSIONS:

No consistent reduction in cracking was achieved using Fibermesh fibers in p.c. concrete bridge barrier rail.

RECOMMENDATIONS:

Fibermesh fibers should not be used to control cracking on p.c. concrete bridge barrier rails.