

POLYMER IMPREGNATED BRIDGE SLABS

Interim Report —

Condition of Slabs After Three Years of Service Life

by

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Research Scientist

(The opinions, findings, and conclusions expressed in this report are those of the author and not necessarily those of the sponsoring agencies.)

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SUMMARY

The condition of six concrete bridge slabs that had been in service for three years was evaluated. The top 2 in. of the four slabs that had been impregnated to a depth of about 1 in. with a methyl methacrylate and trimethylolpropane trimethacrylate monomer, and that were subsequently polymerized, was found to exhibit an average permeability to chloride ion which was 18% of that exhibited by the top 2 in. of the two control slabs that had not been impregnated. Electrical half-cell and resistance measurements were the same for the impregnated and control slabs.

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INTRODUCTION

This report on HPR project 1897-204 summarizes the condition of four polymer impregnated bridge slabs after three years of service life. The evaluation of the condition is based on electrical half-cell potentials (ASTM C876-77), electrical resistance measurements (ASTM D3633), and chloride ion permeability measurements.⁽¹⁾ The four polymer impregnated slabs (A, B, C, and E) and two control slabs (D and F) were placed to widen a bridge on Rte. 42 in Rockbridge County. They were placed in December 1979 after having been fabricated and impregnated in October and November 1978.⁽²⁾ Electrical half-cell and resistance measurements were made on October 26, 1982. One 4-in. diameter core was removed from each of the six slabs on October 28, 1982, and taken to the laboratory for the chloride permeability test.

RESULTS

All half-cell measurements made on five of the six slabs (A, B, D, E, F) were less negative than -0.20 volt, which implies that for these slabs there is a 90% probability that no corrosion is occurring. Twenty-five percent of the measurements on Slab C were less than -0.20, and 75% were in the range of -0.20 to -0.35, a range for which no conclusion can be drawn. Therefore, it can be concluded that after three years of service life there is no difference between the polymer impregnated and control slabs from the standpoint of corrosion of the steel. No delamination was detected.

All electrical resistance measurements made on all six slabs were less than 10,000 ohms/ft.², which is typical of concrete not having a protective membrane. Therefore, it can be concluded that the number of cracks through the polymer impregnated layer was great enough to cause the readings to be low.

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Permeability tests conducted on the top 2 in. of the cores removed from the six slabs provided values of 292, 455, 305, and 303 Coulombs for the polymer impregnated slabs A, B, C and E, respectively, and 1502 and 2387 Coulombs for the control slabs D and F, respectively. It can be concluded that, on the average, after three years of service life the polymer impregnated slabs exhibit a permeability to chloride ion which is 18% of that of the control slabs, which were not impregnated.

Of the three tests used to evaluate the condition of the slabs after three years of service life, only the permeability test suggests that the polymer impregnation provides an increase in protection against corrosion of the reinforcing steel.

REFERENCES

1. Whiting, D., "Rapid Determination of the Chloride Permeability of Concrete", FHWA-RD-81/119, August 1981.
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