

STATE OF VERMONT  
AGENCY OF TRANSPORTATION  
MATERIALS & RESEARCH DIVISION

PRELIMINARY FINDINGS ON  
PROJECT NO. VT-MD-R&D -2-76

LABORATORY PERFORMANCE OF GALVANIZED COATING FOR REBARS

Information package includes:

1. Specific objectives and results to date
2. Sample construction method and evaluation procedure
3. Graph of voltage potential readings
4. Photographs
5. Original Research Project Statement of 2/28/77

Reviewed by:

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Date: *Nos. 17, 1981*

SPECIFIC OBJECTIVES

- A. Determine average age when potentials reach corrosion threshold on galvanized rebars.
- B. Determine what potential level is indicative of corrosion on galvanized rebars.
- C. Determine the average age when electrical potential levels reach the corrosion threshold (0.35 volts) on black steel rebars.
- D. Determine the average age when corrosion on both galvanized and untreated reinforced concrete cylinders is sufficient to cause visual cracking.
- E. Determine the average time span between initial corrosion and visual cracking.
- F. Determine the average age when corrosion is sufficient to cause concrete delamination.
- G. Compare the performance of the galvanized specimens with that of the unprotected reinforced concrete cylinders.

RESULTS TO DATE

Assuming corrosion was initiated at 0.35 volts, average age of cylinders was 431 days.

0.35 volts assumed. Note steady climb in voltage potentials from 0.25± volts at 365± days to 0.70± volts at 1000 days.

Average age of black steel cylinders was 780 days.

Additional time required for completion.

Additional time required for completion.

Additional time required for completion.

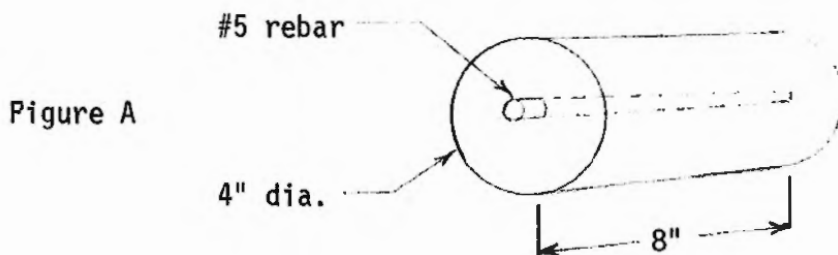
The galvanized steel cylinders have 11 times as much visible cracking as the black steel cylinders (33.8" vs 3")

The black steel cylinders have approximately 3 times as many rust spots (mainly 1/8" in diameter) on cylinder walls as the galvanized steel cylinders.

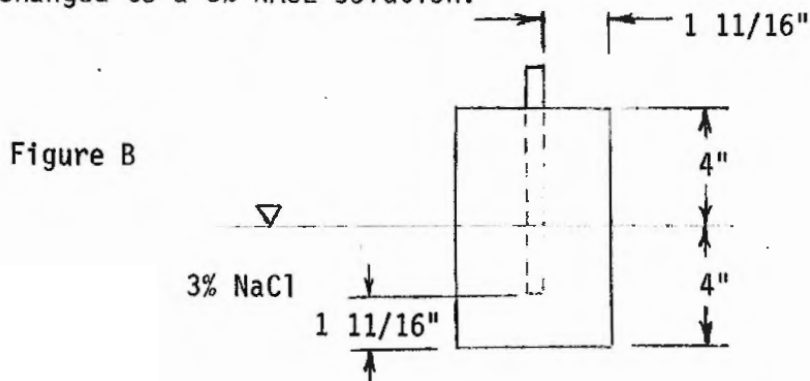
October 28, 1981

SAMPLE CONSTRUCTION METHOD AND EVALUATION PROCEDURE

20 - 4" by 8" cylinders were constructed on February 23, 1976. These cylinders were made with Class AA concrete with a 2 1/2" slump and 6 1/2% air content. Strengths at 14 and 28 day breaks were 2747 and 2550 psi. respectively. Ten cylinders were constructed with galvanized rebars and 10 with black steel rebars.

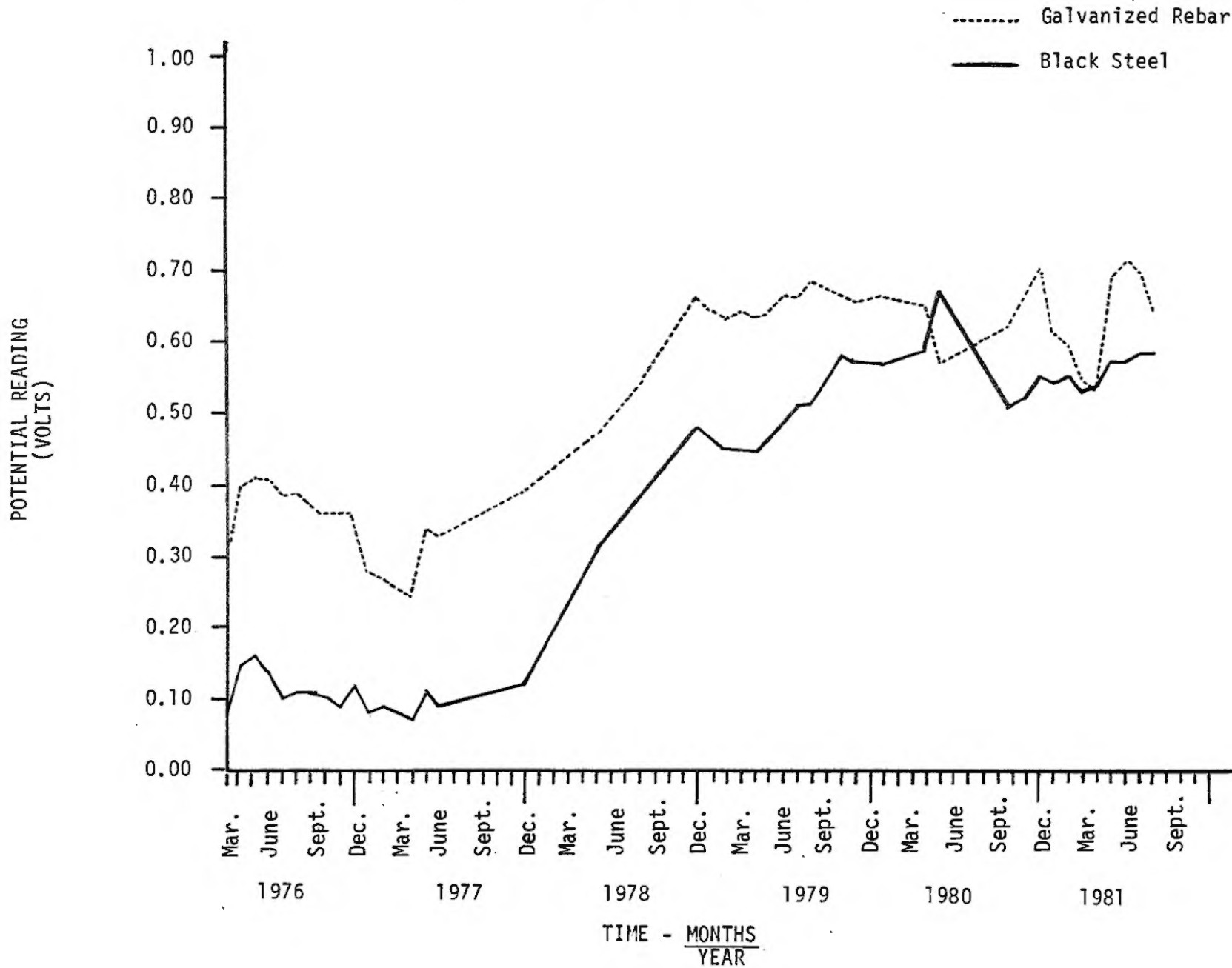


All samples were fog room cured from February 23, 1976 to March 10, 1976. The samples were then immersed in four inches of water from March 10, 1976 to April 9, 1976 during which time initial potential readings were taken. On April 9, 1976 the water was changed to a 3% NaCl solution.



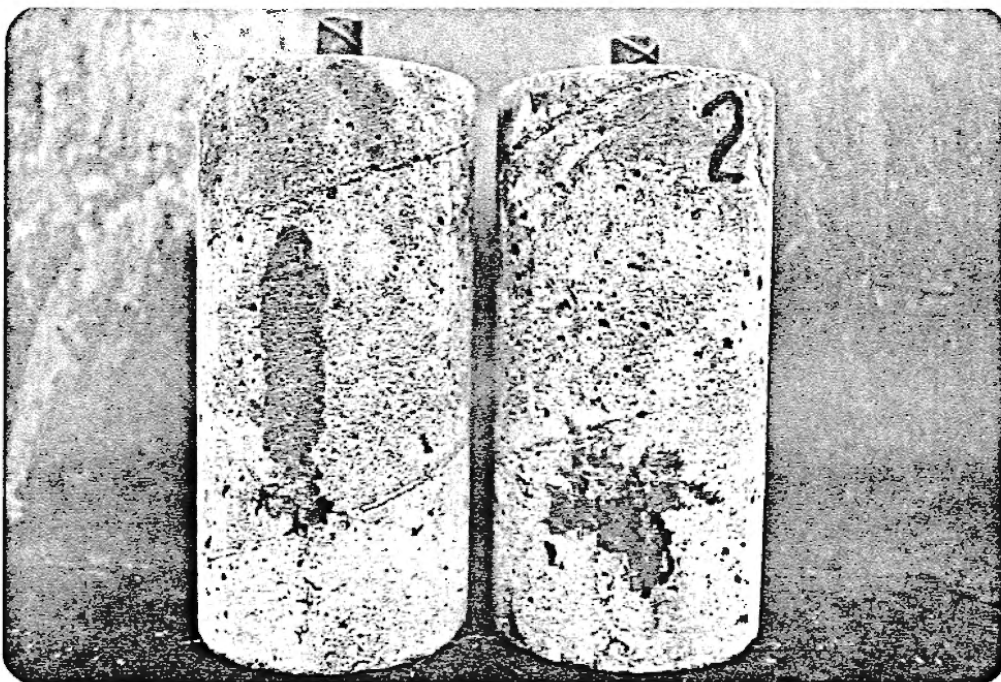
Since April 9, 1976 steel potential readings have been taken approximately every two weeks. See sheet 6 for a graph of these readings.

PERFORMANCE OF GALVANIZED COATING FOR REBARS  
(AVERAGE OF TEN SAMPLES EACH)





Cracks in cylinders with galvanized rebars (9/81)



Corrosion product on cylinders with black steel rebars (9/81)

VERMONT DEPARTMENT OF HIGHWAYS  
MATERIALS DIVISION - RESEARCH & DEVELOPMENT SUBDIVISION

RESEARCH PROJECT STATEMENT

Project No.: VT-MD-R&D-2-76

Research Project Title:

Performance of Galvanized Coating for Rebars

General Problem Area:

Bridge Decks

Research Problem Statement:

The use of a zinc coating (hot dip galvanized) has been specified as a means of increasing the maintenance-free life of reinforcing steel placed in bridge decks which will be subjected to deicing chemical applications. Although a number of bridges utilizing galvanized rebars have been in service for up to five years, field evaluations have not clearly defined the value of the zinc coating. In addition, laboratory evaluations of galvanized reinforcing steel have produced varying results with at least one case reporting a higher percent of concrete failures with treated bars than with regular steel.

Objective:

The objective of this research is to establish a laboratory evaluation program to determine the value of a hot dip galvanized coating on reinforcing steel.

Specific objectives include the following:

- A. Determine the average age when electrical potential levels reach the corrosion threshold on galvanized reinforced concrete cylinders.
- B. Determine what potential level is indicative of corrosion on galvanized reinforcing steel.
- C. Determine the average age when electrical potential levels reach the corrosion threshold (0.35 volts) on reinforced concrete cylinders.
- D. Determine the average age when corrosion on both galvanized and untreated reinforced concrete cylinders is sufficient to cause visual cracking.
- E. Determine the average time span between initial corrosion and visual cracking.

- F. Determine the average age when corrosion is sufficient to cause concrete delamination.
- G. Compare the performance of the galvanized specimens with that of the unprotected reinforced concrete cylinders.