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LETTER REPORT

Supplement to Technical Note N-1032, July 1969

EFFECTIVENESS OF ZINC COATING ON REINFORCING STEEL IN CONCRETE EXPOSED TO A MARINE ENVIRONMENT

By

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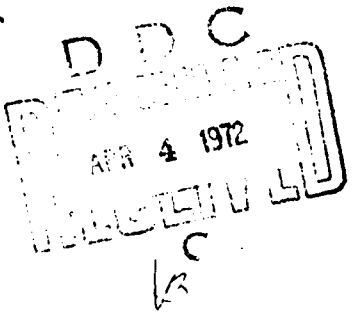
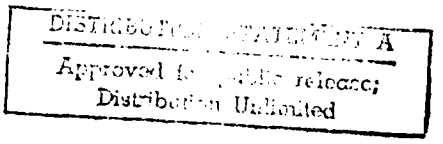
June 1970





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Base - AD-739271
Supp 2 - AD-737545

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Letter Report - Supplement to Technical Note N-1032

The following information covers the period between June 1969 and June 1970.

Note: See attached Table 2, Variables for Walls, taken from TN-1032.

Wall 101 destroyed 11 Dec 1968 - See TN-1032

Wall 103 destroyed 20 Jan 1969 - See TN-1032

Wall 104 destroyed 20 Jan 1969 - See TN-1032

Wall 109 destroyed 16 Jan 1970 with the following observations:

Corrosion - All bars had white zinc corrosion products plus red rust which was scattered over the length of each bar in addition to areas of steel corrosion concentration.

Horizontal bars - Top bar was least corroded with each successive lower bar showing increasing amounts of corrosion.

Vertical bars - All bars showed corrosion products of zinc as well as steel. The two inner bars were least corroded with the outer bars (two on each side) showing progressively greater amounts of corrosion.

Joints - The joint areas were severely corroded especially at joints of the 4 outer vertical bars; however, the weld metal showed no corrosion.

Cracking - See Figures 1, 2, and 3. Cracks generally are opposite steel bars.

Wall 111 destroyed 16 Jan 1970 with the following observations:

Corrosion - All bars had white zinc corrosion products plus red rust which was scattered over the length of each bar in addition to areas of steel corrosion concentration. Red rust did not appear to be as extensive as for Wall 109.

Horizontal bars - The turned down portions of the bars showed the worst corrosion with the west end being slightly more corroded than the east end. The lower bar had the most corrosion while the upper 4 bars were about equally corroded.

Vertical bars - The two outer bars showed the most corrosion; the 4 inner bars were about equally corroded.

Cracking - See Figures 4, 5, and 6. Cracks generally are opposite steel bars.

Wall 106 - Table 6 of Technical Note 1032 indicates a crack 1.8 in. long on one face near the bottom. Subsequent observations reveal this is not a crack but a small spall about 2 in. long. No rust stains have developed here.

In the upper left hand quarter of the land side face of the wall there is a brownish-red stain about 2 in. in diameter presumed to be iron oxide leaching out of the concrete.

As of June 1970 the following walls were existent and crack free:

102	106	108
105	107	110

Conclusions

Conclusions as stated in TN-1032 remain unchanged.

Table 2. Variables for Walls (Source: Technical Note 1032)

Wall No.	Concrete[a]		Date Cast 1966	Reinforcing Steel			
	No AEA	With AEA		Zn Coated	Sand Blasted	Welded	Tied Insul.
101	X		11 Apr	X[b]		X	
109	X		18 May	X[c]		X	
102*		X	13 Apr	X[b]		X	
110*		X	18 May	X[c]		X	
103	X		12 Apr	X[b]			X
111	X		18 May	X[c]			X
104	X		11 Apr		X	X	
105*		X	13 Apr		X	X	
106*	X		12 Apr		X		X
107*	X		12 Apr		NO STEEL		
108*		X	13 Apr		NO STEEL		

*Existent as of June 1970 and crack free.

[a] AEA means air-entraining agent.

[b] Each bend and weld and bar ends were touched up with zinc-enriched paint employing a silicious vehicle.

[c] No touch up with zinc-enriched paint employing a silicious vehicle.

Note: Walls were transferred from fog room to field site 28 days after casting. For walls cast in April, sea spray was begun 16 May 66; for walls cast in May, sea water spray was begun 20 June 66.

Figure 1. Sea side (South face) of wall No. 109.

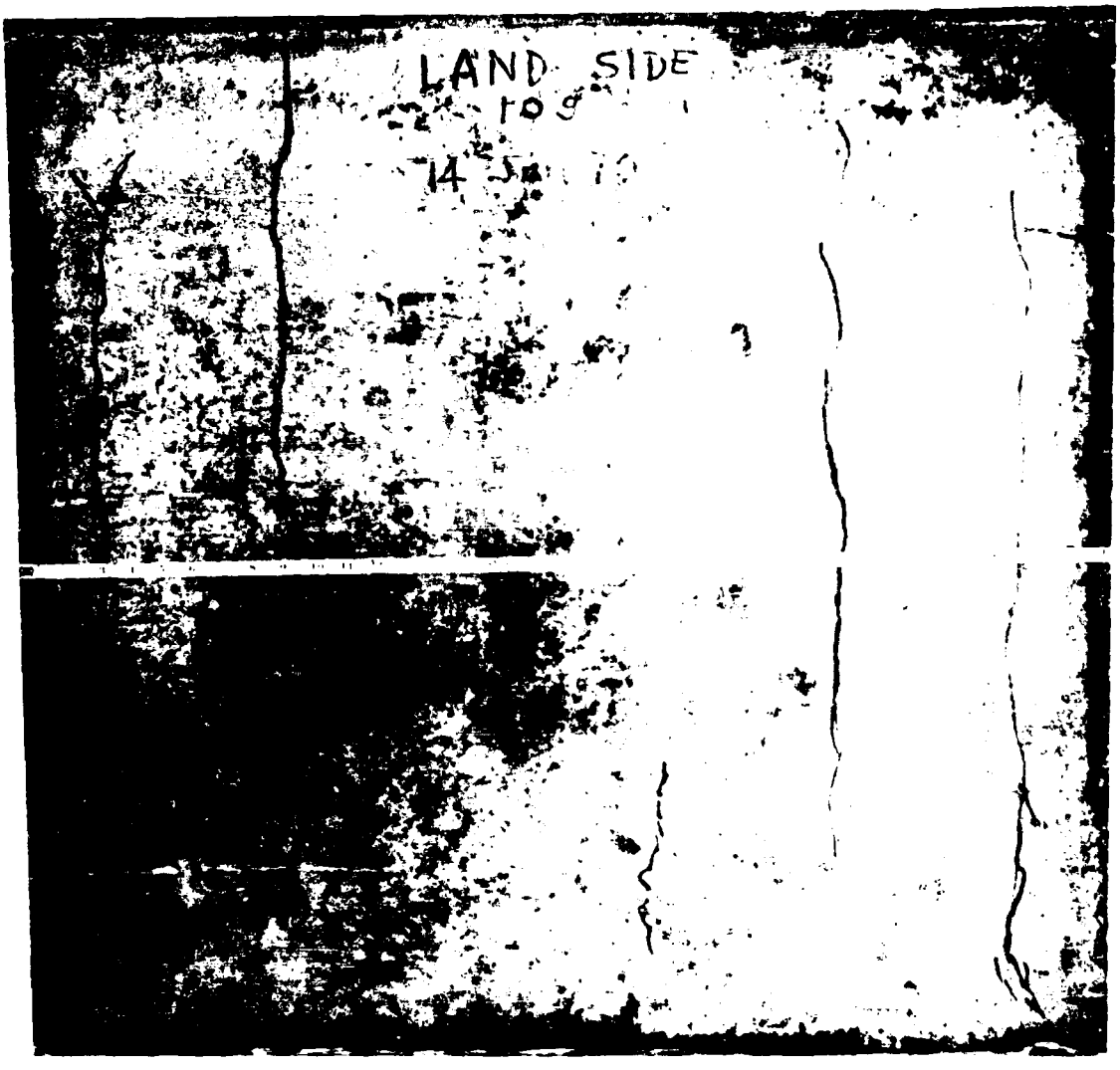

Figure 2. Land side (North face) of wall No. 109.

Figure 3. End faces of wall No. 109.

a. East face

b. West face

Figure 4. Sea side (South side) of wall No. 111.

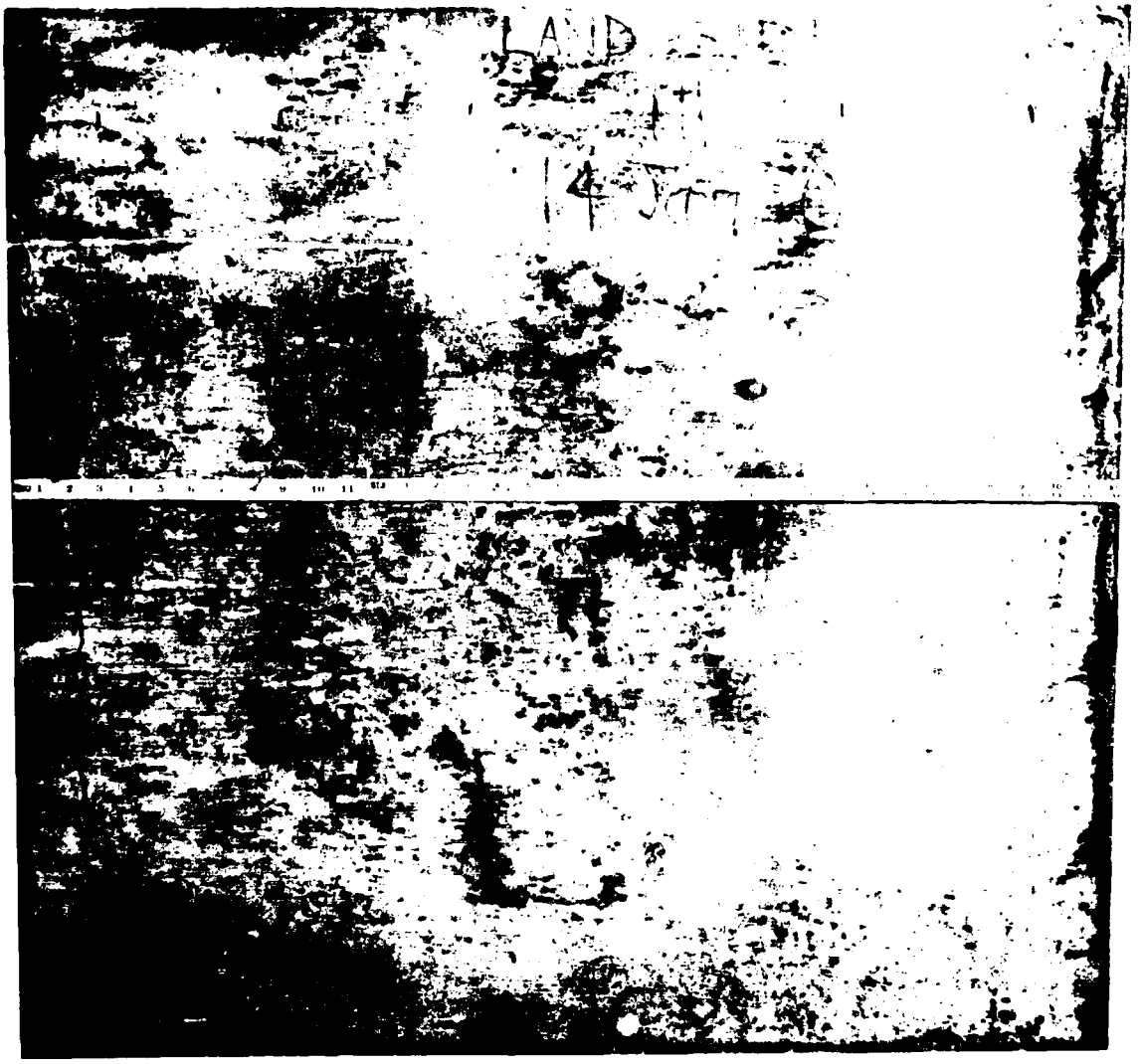

Figure 5. Land side (North side) of wall No. 111.

Figure 6. East face of wall No. 111.