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2006/11/1:

2008/3/6:

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(1500, 1000, 750)

Cathodic Protection of Steel Reinforcement in Concrete

Abstract:

The present research has been investigated the relation between the induced level of polarization and the area of the embedded steel, area of the anode, the concrete resistance and the level of applied external voltage. During exposure period, the specimens were polarized using three different levels of external voltages (750, 1000, 1500) mV. Various electrochemical and electrical measurements were made, these include half cell potential, degree of polarization, flowing current and the actually applied voltage as compared with the external one.

The results indicate differential moisture content in each specimen has produced different potentials along the steel bars. Greater polarization has always been associated with the submerged portion of the specimen where the concrete resistance is at its minimum. whereas the degree of polarization is directly proportional to the level of external voltage. The results also illustrate that, for a given level of externally applied voltage, the degree of polarization is dependent on the area of protected steel and the area of the anode. Thus the polarization

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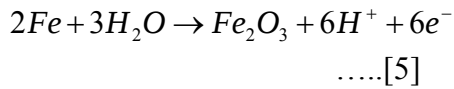
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increases with the decrease in the protected steel area and the increase of the area of the anode.

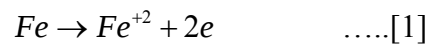
: .1



Fe₂O₃)

(Fe₃O₄

:



/ (1- 0.1)

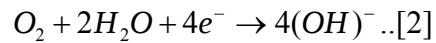
-700 +200

.(SCE)

-200 +100

(SCE)

:

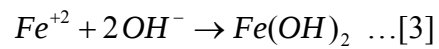


-1100 -800

.(SCE)

:

:_____



:

.

.[2, 1]

()

.(SCE)

-500 -200

:_____

:

:_____

pH

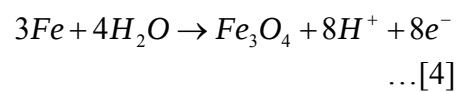
(pH =13)

.(SCE)

- 600 -450

.(5) (4)

:_____



[6] [4, 3].(SCE) -1200

2
:

()
()

[7] [5] (1)

3

[9,8]

-1

- 720

Ag / AgCl / KCl

.

- 2

- 600

Ag / AgCl / KCl

.

- 3

100

4

.

) ()
()

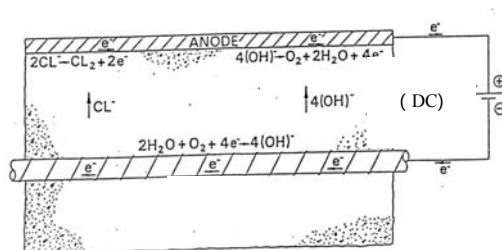
- 4

.

24

.

120



(1)

[5]

: .4

8

33

 4.1

² 400

: **F**

(G)

33

: **A**

: .5

: 1.5

: **B**

12

(1)

8

23

: **C**

(1)

(B)

23

12	
² 112	
² / 459	
² / 670	
% 24.1	

: 4.2

² 250

: 2.5

: **D**

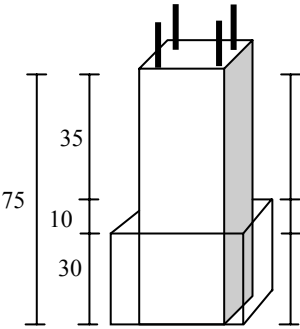
(A)

(2)

: **E**

.() (2)

	%									
	Zn	Fe	Si	Mn	As	Al	Ni	Sb	S	Cu
	30	.007	.0043	.0088	.005	.012	.0004	.0084	.0025	Rem.



(2)

: .6

2 / 35
4 () 28
(: :) : 2 : 1
/ 3 / 345
(0.6)
(150 - 130)

: .7

(1500, 1000, 750)

(2)

: .8

1.8

: _____

(4) (3)

(D,A)

(10)

.(Dry Zone)

(A)

. (11350,430,357)
(D)
. (11330,457,340)

.
(5)
:

..[6] $\frac{\Delta E_1}{R_1} + \frac{\Delta E_2}{R_2} + \frac{\Delta E_n}{R_n}$ T. C. =
:
:
:() : n
:() : ΔE
:() : R

(3)

(1500,1000,750)

.
(F , E ,C , B)
(D,A)
(3)

.
2.8
:

(45±)

(3)

: .9
.1

A)
(C B
(A)
(C , B)

(B)

. 2

(C)

.(F E D)

3.8

.3

:

(4)

B A)
(C

.4

(6)
750

(F E D)

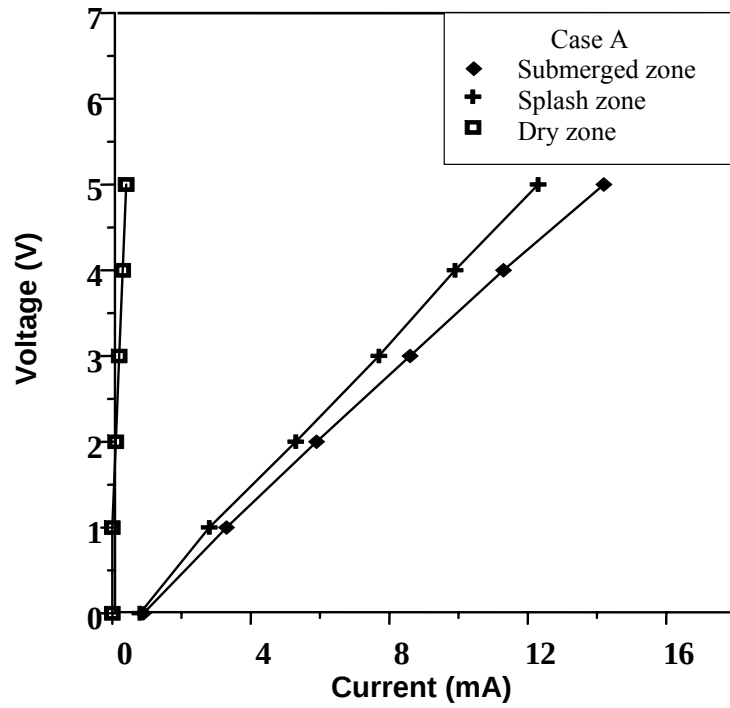
(D) (A)
75
1500
194

.5

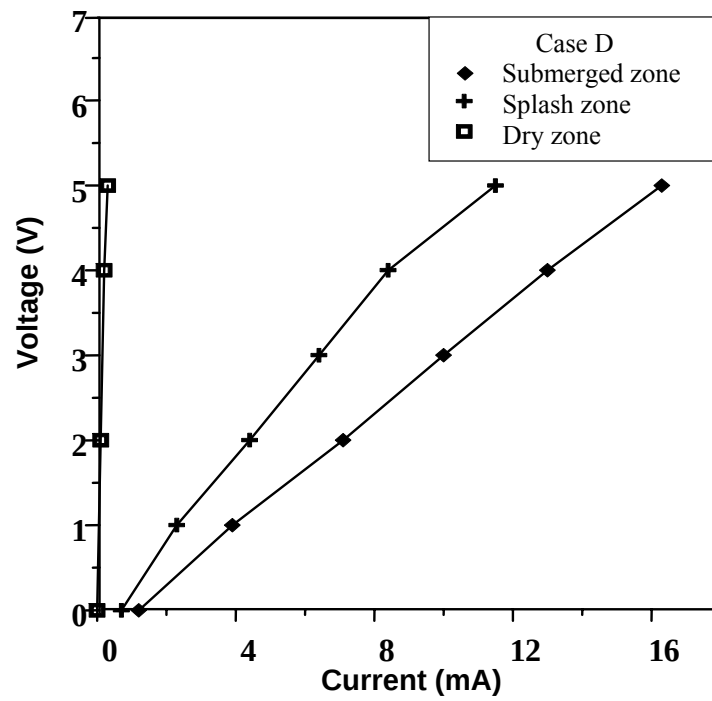
(A)
.(D)

.6

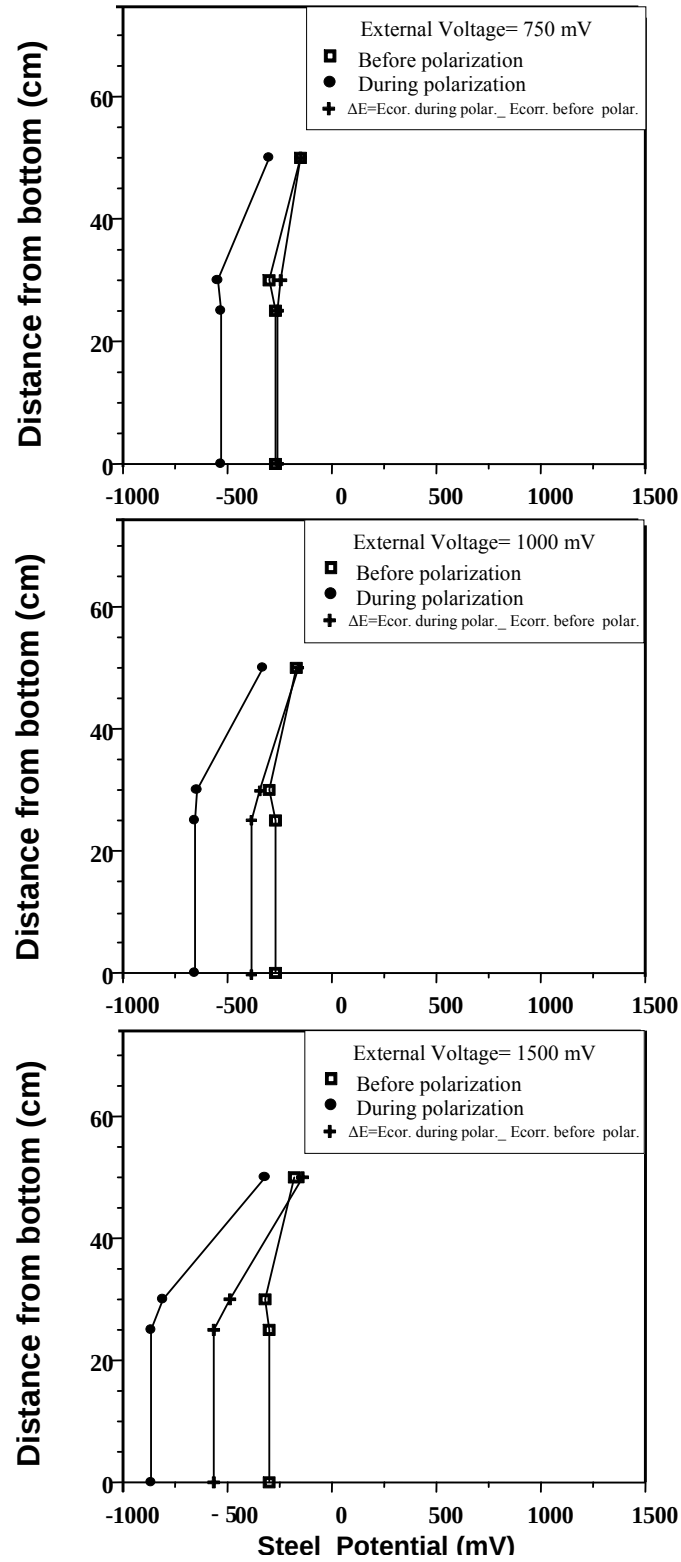
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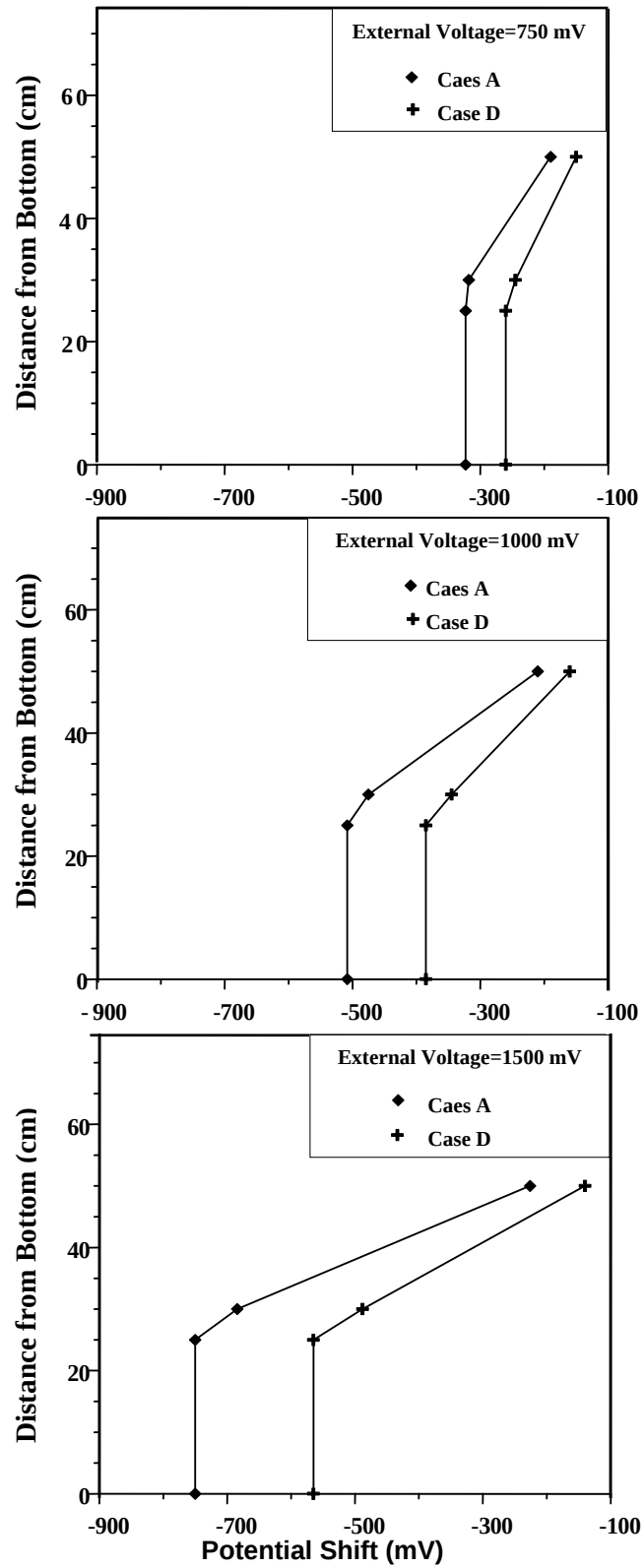
(3)



(4)



(5)



1500						750						()	
F	E	D	C	B	A	F	E	D	C	B	A		
713	744	572	892	914	761	311	317	265	369	382	334		()
567	656	493	815	843	678	282	263	252	354	367	326		
243	386	144	344	416	269	131	162	213	141	163	198		
1. 83	2. 18	1. 83	2. 12	2. 47	2. 18	0. 83	0. 99	1. 3	1. 2	1. 11	0. 89		()
0.95	1.27	1.14	1.68	1.95	0.68	0.47	0.54	0.58	0.81	0. 88	0.74		
0.02	0.04	0.02	0.03	0.04	0.03	0.02	0.02	0.03	0.02	0.02	0.02		
500	500	1000	500	500	1000	500	500	500	500	500	1000	(²)	
5.3	7.2	6.2	7.43	9.31	3.79	2.6	3.1	1.7	3.18	3.78	1.69	(² /)	

(6)

(3)

(4)

()						(²)	
1500		1000		750			
738	-756	497	-511	279	-327	400	A
933	-568	618	-391	341	-265	250	D
597	-904	398	-604	228	-379	400	B
767	-729	514	-488	294	-314	250	E
615	-887	412	-593	239	-369	400	C
796	-699	533	-471	297	-308	250	F