

U. S. DEPARTMENT OF COMMERCE  
NATIONAL BUREAU OF STANDARDS  
WASHINGTON 25, D. C.

Letter  
Circular  
LC984  
(Supersedes  
LC734)

April 26, 1950

UNDERGROUND CORROSION:

Publications of the National Bureau of Standards

This list covers published reports on two general projects: One is the investigation of corrosion of metals, especially pipe lines, in soils; the other, an earlier series of studies on electrolytic corrosion caused by stray electric currents.

Unless specifically indicated, papers are not obtainable from the National Bureau of Standards. When a price is stated, the publication can be purchased from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. The prices quoted are for delivery to addresses in the United States and its territories and possessions and in foreign countries which extend the franking privilege. For delivery in other countries, one-third the cost of the publication should be added to cover postage. Remittances should be made either by coupons (obtainable from the Superintendent of Documents in sets of 20 for \$1.00 and good until used), or by check or money order payable to the "Superintendent of Documents, Government Printing Office" and sent to him with order.

Publications marked "OP" are out of print, but, in general, may be consulted at technical libraries. Series letters with serial numbers are used to designate the Bureau publications:

T = "Technologic Paper". T1 to T370. This series was superseded by the "Bureau of Standards Journal of Research" in 1928.

RP = "Research Paper". These are reprints of articles appearing in the "Bureau of Standards Journal of Research" and the "Journal of Research of the National Bureau of Standards", the latter being the title of this periodical since July 1934 (volume 13, number 1).

C = "Circular".

Circular C24 which gives a complete list of the Bureau's publications from 1901 to 1941 may be obtained from the Superintendent of Documents for 50 cents per copy. A later supplement listing all papers published from 1942 to 1944, inclusive may be obtained for 20 cents per copy. Announcement of new publications is made each month in the Technical News Bulletin, which is obtainable by subscription at \$1.00 a year, (foreign \$1.35).

SOIL CORROSION

<u>Title</u>	<u>Series</u>	<u>Price</u>
Bureau of Standards soil-corrosion studies. I. Soils, materials, and results of early observations. K. H. Logan, S. P. Ewing, and C. D. Yeomans. Tech. Pap. BS <u>22</u> , 147 (1927-1928).	T368	OP
Soil-corrosion studies, 1927-28. K. H. Logan. BS J. Research <u>3</u> , 275 (1929).	RP95	OP
Pipe line currents and soil resistivity as in- dicators of local corrosive soil areas. E. R. Shepard. BS J. Research <u>6</u> , 683 (1931).	RP298	OP
Soil-corrosion studies, 1930. Rates of corrosion and pitting of bare ferrous specimens. K.H. Logan and V. A. Grodsky. BS J. Research <u>7</u> , 1 (1931).	RP329	OP
Soil-corrosion studies: Nonferrous metals and alloys, metallic coatings, and specially pre- pared ferrous pipes removed in 1930. K. H. Logan. BS J. Research <u>7</u> , 585 (1931).	RP359	OP
Correlation of certain soil characteristics with pipe line corrosion. I. A. Denison. BS J. Research <u>7</u> , 631 (1931).	RP363	OP
Methods for determining the total acidity of soils. I. A. Denison. BS J. Research <u>10</u> , 413 (1933).	RP539	OP
Soil-corrosion studies, 1932. Rates of loss of weight and pitting of ferrous and non-ferrous specimens and metallic protective coatings. K. H. Logan and R. H. Taylor. BS J. Research <u>12</u> , 119 (1934).	RP638	OP
Corrosion of ferrous metals in acid soils. I. A. Denison and R. B. Hobbs. J. Research NBS <u>13</u> , 125 (1934).	RP696	OP
Soil-corrosion studies, 1934. Rates of loss of weight and pitting of ferrous specimens. K. H. Logan. J. Research NBS <u>16</u> 431 (1936)	RP883	.05
Electrolytic measurements of the corrosiveness of soils. I. A. Denison. J. Research NBS <u>17</u> , 363 (1936).	RP918	OP

<u>Title</u>	<u>Series</u>	<u>Price</u>
Soil-corrosion studies, 1934. Rates of loss of weight and penetration of nonferrous materials. K. H. Logan. J. Research NBS <u>17</u> , 781 (1936).	RF945	OP
Soil-corrosion studies, 1934. Field tests of non-bituminous coatings for underground use. K. H. Logan and Scott P. Ewing. J. Research NBS <u>18</u> , 361 (1937).	RF982	OP
Soil-corrosion studies, 1934. Bituminous coatings for underground service. K. H. Logan. J. Research NBS <u>19</u> , 695 (1937).	RF1058	OP
Correlation of an electrolytic corrosion test with the actual corrosiveness of soils. I. A. Denison and R. B. Darnielle. J. Research NBS <u>21</u> , 819 (1938).	RF1157	.05
Engineering significance of National Bureau of Standards soil-corrosion data. K. H. Logan, J. Research NBS <u>22</u> , 109 (1939).	RF1171	OP
Soil-corrosion studies, 1937. Corrosion-resistant materials and special tests. K. H. Logan. J. Research NBS <u>23</u> , 515 (1939).	RF1250	.10
Measurement of electrode potentials and polarization in soil-corrosion cells. R. B. Darnielle. J. Research NBS <u>25</u> , 421 (1940).	RF1336	.05
Soil-corrosion studies, 1939. Coatings for the protection of metals underground. K. H. Logan. J. Research NBS <u>28</u> , 57 (1942).	RF1446	OP
Soil-corrosion studies, 1939: Ferrous and non-ferrous corrosion-resistant materials. K. H. Logan. J. Research NBS <u>28</u> , 379 (1942).	RF1460	OP
Soil-corrosion studies, 1941: Ferrous and non-ferrous corrosion-resistant materials and <b>non-bituminous</b> coatings. K. H. Logan and M. Romanoff. J. Research NBS <u>33</u> , 145 (1944).	RF1602	OP
Effect of aeration on hydrogen-ion concentration of soils in relation to identification of corrosive soils. Melvin Romanoff. J. Research NBS <u>34</u> , 227 (1945).	RF1639	.05

<u>Title</u>	<u>Series</u>	<u>Price</u>
Underground Corrosion. K. H. Logan. Circular of the Bureau of Standards.	C450	1.25
Behavior of experimental zinc-steel couples underground. Irving A. Denison and Melvin Romanoff. J. Research NBS <u>40</u> , 301 (1948).	RP1876	.15
Soil-corrosion studies, 1946: Ferrous metals and alloys. Irving A. Denison and Melvin Romanoff. J. Research NBS <u>44</u> , 47 (1950).	RP2057	.15
Soil-Corrosion studies, 1948: Copper and Copper Alloys, Lead and Zinc. Irving A. Denison and Melvin Romanoff. J. Research NBS <u>44</u> , 259 (1950).	RP2077	.20

The following letter circulars and preprints may be secured by writing to the National Bureau of Standards.

#### Letter Circulars

Corrosion and protection of underground tank and grave vaults.	LC521
Materials in the National Bureau of Standards soil-corrosion tests.	LC646
Cathodic protection of underground structures.	LC821

#### Preprints

The effect of protective coatings on the rate of pitting of pipe lines. K. H. Logan. (1941).	
The status of cathodic protection of pipe lines in 1941. K. H. Logan. (Proc. Second Annual Water Conference, Eng. Soc. of Western Pennsylvania, Civil Eng. Sec. Page 21, 1941).	
The determination of the current required for cathodic protection. K. H. Logan. (Pet. Eng. <u>14</u> , No. 10, 168, 1943).	

#### ELECTROLYSIS BY STRAY CURRENTS

The series of Technologic Papers listed below presented results of a very extensive study of damage by electrolysis and means of preventing it. All except the last **two** are out of print, and since they were issued only as separate pamphlets they may not be readily available in reference libraries.

In order to keep the essential general results of the work available the Bureau issued in 1933 its Circular C401, "Abstracts and summaries of the Bureau of Standards publications on stray-current electrolysis", prepared by E. R. Shepard. At the present time (April, 1950) this Circular is out of print.

The Bureau's work on this subject was carried out in collaboration with the American Committee on Electrolysis, which included representatives of nine national organizations. The Committee published in 1921 a report giving such information and conclusions as could be agreed upon unanimously. Copies of this report can still be obtained from the American Institute of Electrical Engineers, 33 West 39th Street, New York 18, New York, at \$1 per copy.

#### Technologic Papers

(All out of print except T351 and T355, which can be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C., at the prices indicated.)

Surface insulation of pipes as a means of preventing electrolysis.

Berton McCollum and O. S. Peters. T15 (January 5, 1914).

Electrolysis in concrete. E. B. Rosa, Burton McCollum, and O. S. Peters.

T18 (March 19, 1913) (2d ed. Aug. 1, 1919).

Electrolytic corrosion of iron in soils. Burton McCollum and K. H. Logan.

T25 (June 12, 1913).

Earth resistance and its relation to electrolysis of underground structures.

Burton McCollum and K. H. Logan. T26 (December 20, 1915).

Special studies in electrolysis mitigation. I. A preliminary study of conditions in Springfield, Ohio, with recommendations for mitigation.

E. B. Rosa and Burton McCollum. T27 (June 19, 1913).

Methods of making electrolysis surveys. Burton McCollum and G. H. Ahlborn.

T28 (August 26, 1916) (Superseded by T355).

Special studies in electrolysis mitigation. II. Electrolysis from electric railway currents and its prevention - An experimental test on a system of insulated negative feeders in St. Louis. E. B. Rosa, Burton McCollum, and K. H. Logan. T32 (December 27, 1913).

Electrolysis and its mitigation. E. B. Rosa and Burton McCollum. T52,

2d ed. (November 25, 1918).

Special studies in electrolysis mitigation. III. A report on conditions in Springfield, Ohio, with insulated feeder system installed. Burton McCollum and George A. Ahlborn. T54 (February 5, 1916).

Special studies in electrolysis mitigation. IV. A preliminary report on electrolysis mitigation in Elyria, Ohio, with recommendations for mitigation. Burton McCollum and K. H. Logan. T55 (January 22, 1916).

Modern practice in the construction and maintenance of rail joints and bonds in electric railways. E. R. Shepard. T62, 2d ed. (February 9, 1920).

Leakage of currents from electric railways. Burton McCollum and K. H. Logan. T63 (March 14, 1916).

Influence of frequency of alternating or infrequently reversed current on electrolytic corrosion. Burton McCollum and G. H. Ahlborn. T72 (August 15, 1916).

Data on electric railway track leakage. G. H. Ahlborn. T75 (August 22, 1916).

Leakage resistance of street railway roadbeds and its relation to electrolysis of underground structures. E. R. Shepard. T127 (October 6, 1919).

Practical application of the earth-current meter. Burton McCollum and K. H. Logan. Tech. Pap. BS 21, 683 (1926-27): T351. .20

Electrolysis testing. Burton McCollum and K. H. Logan. Tech. Pap. BS 22, 15 (1927-28): T355. .30