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A BIBLIOGRAPHY RELATING TO SOIL ALKALIES

Compiled with Special Reference to the Deleterious Action of Soil Alkalies, and Various Other Chemical Agents on Cement and Concrete

Compiled under the direction of

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WORD AND PHRASE ABBREVIATIONS

| Abs | Abstract. |
| Ag | Agriculture. |
| An | Annual. |
| Ass'n | Association. |
| Bd | Board. |
| Bul | Bulletin. |
| Col | Column. |
| Concl | Conclusions. |
| Disc | Discussions. |
| Ed. Comment | Editorial Comment. |
| Eng | Engineer, Engineering. |
| Exten. Abs | Extensive Abstract. |
| Exc | Excerpts. |
| Inst | Institute. |
| Int | International. |
| Jour | Journal. |
| Min | Minutes. |
| Munic | Municipal. |
| Proc | Proceedings. |
| Pt | Port. |
| Rpt | Report. |
| Sect | Section. |
| Ser | Series. |
| Soc | Society. |
| Suppl | Supplement. |
| Tech | Technical. |
| Trans | Transactions. |

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ABBREVIATIONS FOR NAMES OF PERIODICALS CITED

Am. Contr.................................... American Contractor.
A. S. C. E. Trans............................ American Society of Civil Engineers. Transactions.
A. S. M. E. Jour.............................. American Society of Mechanical Engineers Journal.
Bet. u. Eis.................................... Beton und Eisen.
Can. Eng..................................... Canadian Engineer.
Cement....................................... Cement.
Cem. Age..................................... Cement Age.
Cem. Era.................................... Cement Era.
Chem. Abs.................................... Chemical Abstracts.
Chem. Eng.................................... Chemical Engineer.
Ciment........................................ Ciment.
Colo. Sta. Bul................................ Colorado Agricultural Experiment Station Bulletin.
Concrete...................................... Concrete.
Conc. Cem. Age.............................. Concrete-Cement Age.
Conc. & Const. Eng.......................... Concrete and Constructional Engineering.
Conc. Eng.................................... Concrete Engineering.
Contract Rec................................ Contract Record.
Dom. Eng..................................... Domestic Engineering.
Engineer..................................... Engineer.
Engineering.................................. Engineering.
Eng. & Contr................................ Engineering and Contracting.
Eng. N. Rec.................................. Engineering News Record.
Eng. Rec..................................... Engineering Record.
Exper. Sta. Rec............................. Experiment Station Record (U. S. D. A.).
Gesundheits-Ingenieur...................... Gesundheits-Ingenieur.
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<tr>
<td>Off Rpts.</td>
<td>Official reports.</td>
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<tr>
<td>Int. Marine Eng.</td>
<td>International Marine Engineering. (Now Marine Engineering and Shipping Age.)</td>
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<tr>
<td>Ohio Sta. M. Bul.</td>
<td>Ohio Agricultural Experiment Station Monthly Bulletin.</td>
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<tr>
<td>Prof. Mem.</td>
<td>Professional Memoirs. (United States Army.)</td>
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<td>Rcl. Rec.</td>
<td>Reclamation Record.</td>
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<td>Ry. Age Gaz.</td>
<td>Railway Age Gazette.</td>
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<tr>
<td>Stadt. Tiefb.</td>
<td>Der Stadtische Tiefbau.</td>
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<tr>
<td>Surveyor.</td>
<td>Surveyor and Municipal and County Engineer.</td>
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The references contained in this bulletin were compiled in connection with an investigation by the Bureau of Public Roads of the effect of soil alkalies on concrete drain tile. The bibliography is believed to be fairly complete in respect to articles published prior to 1924. The importance of the problem presented by the use of concrete structures in sea water and in soils containing various acids and alkalies has long been recognized. To one engaged in the study of any phase of the problem the literature extant is indispensable. Such a compilation necessarily requires considerable time and labor, and in order that the results of this search may be made accessible to as many as possible the bibliography is published as a bulletin.

EXPLANATORY NOTES

The references are arranged alphabetically by authors under each of the six headings. Each article is placed under the heading which most nearly describes its main content and those which fall under more than one heading are cross-indexed. The Roman numerals used in connection with authors' names indicate the headings under which the cross-indexed references appear. Plural authorship is cross-indexed in a like manner. At the end of the groups are lists of references, arranged alphabetically by titles, referring to articles the authorship of which is not indicated. These are also cross-indexed by Roman numerals. The abstract in each case refers to the first reference given under the title. The other references under a given title may or may not be of the same title, but are concerned with the same subject matter. Inclusive paging is not always given for these supplementary references.
I. SOIL ALKALINITY

ORIGIN, DISTRIBUTION, PHYSICAL AND CHEMICAL PROPERTIES AND TREATMENT

ALDJEM, R. Decomposition of Nitrates as a Possible Cause of Formation of Sodium Carbonates in Egyptian Soils. Cairo Scientific Jour., v. 6 (1912), p. 301-302. Outline of tests to determine effect of continuous waterlogged condition upon nitrification of soils.


BROWASH, A. H. See SHUTT, F. T., and A. H. BROWASH, I.


BROWN, P. E. See STEVENSON, W. H., and P. E. BROWN, I.


BUTT, N. I. See HARRIS, F. S., and N. I. BUTT.


DEAKIN, A. Irrigated India. (London, 1893), 322 p. Narrative account of India: Its people, their activities, and in particular, the irrigation systems.

Review of literature and summary of information to date on origin, nature, distribution, and treatment of soil alkali. Maps and tabular data.

Describes alkali conditions and methods of reclamation. Tabular data. Illustrated.

Origin, accumulation, and effects of soil alkali. Prevention of accumulation and, physical and chemical methods of reclamation. Illustrated.

Describes alkali conditions and methods of reclamation.

Study of contents and value of irrigating waters. Diagrammatic and tabular data. Illustrated.

Reports investigation of soil and waters with respect to alkali conditions. Diagrammatic and tabular data. Illustrated.

GAUDECHON, H. See MUNTZ, A., and H. GAUDECHON, I.

Study of colloidal substances and soluble salts in soils.

GREENE, J. E. See STEWART, R., and J. E. GREENE, I.

A study of salts found in waters of Utah with suggestions as to irrigation methods. Diagrams and tabular data. Illustrated.

Discusses alkali accumulations as due to movement of salts in solution; evils of over-irrigation. Tabular data. Diagrams.

General treatise on origin, distribution, effects and treatment of alkali soils. Discusses physical, chemical and biological aspects, reclamation and cropping. Tabular data. Illustrated.


Experimental investigations and results, with bibliography. Tables and diagrams.

Discusses need and benefits of draining irrigated lands. Describes methods of design and installation.

Discusses need, methods, design, construction, maintenance and cost.

See also BROWN, C. F., and R. A. HART, I.

Formation, nature, effects, and differences of "white" and "black" alkalis and nitrates.

Discusses effects on agriculture of detrimental amounts of "black alkali" in San Luis Valley, Colo. Suggests gypsum treatment of soil as remedy.

Extensive investigations and analyses of ground and surface waters. Much tabular data.

Discusses the formation, nature and effects of nitrate, often mistaken for "black alkali."

Colorado soil study. Special reference to soluble salts.

Physical and chemical aspects of ground water in Colorado. Alkali effects discussed. Tabular data.

Study of salt content.

Discusses allowable concentration of soluble salts and precautions in use for irrigation. Concerns effects on vegetation only.

Soils. (New York, 1911), 593 p.
General treatise on soils; their origin, nature, properties and relations to physical laws and life.

See also SNOW, F. J., HILGARD, E. W., and G. W. SHAW, I.

Discusses nature, formation, transportation, and effect of various alkali salts in soils and waters as affected by natural forces, and agricultural methods. Many diagrams and tables. Results of field investigations.


A study of California soils as to kinds and concentration of salts. Redaction by gypsum discussed. Tabular data. Illustrated.


Describes chemical analyses. Tabular results.

HIRST, C. T. See GREAVES, J. E., and C. T. HIRST, I.


Results of laboratory experiments with various solutions.


Discussion and conclusions of investigation of (1) Effects of manure soil dressing on crop yield and soluble salt content; (2) Movements of soluble salts in soils; and (3) Absorption of soluble salts by soil types. Tabular and diagrammatic data. Illustrated.

---


Discussion of ground-water movement in its various physical aspects with results and conclusions of extensive laboratory and field experimental investigations. Diagrammatic and tabular data. Illustrated.


Short discussion of sources and nature of various salts.


KOSSOVICH, P. See TULAYKOV, N., and P. KOSSOVICH, I.


Laboratory experiments determine movement as affected by various conditions.


An investigation of soil and waters with respect to origin, accumulations and movement of alkali salts. Conclusions regarding effects of irrigation and methods of reclamation. Tabular and diagrammatic data. Illustrated.


Preliminary report on laboratory experiments with various chemical treatments. Tabular data. Illustrated.

LOUGHRIDGE, R. H. See HILGARD, E. W., and R. H. LOUGH-RIDGE, I.


Describes experiments at Tulare Station. Tabular data.


Discusses source, distribution, kinds and concentration of salts, the cropping and reclamation of the lands. Special reference to drainage. Tabular data.


Occurrence and movement of soluble salts as affected by natural forces. Diagrammatic and tabular data.

McCOWEN, P. Brak Land in Relation to Irrigation and Drainage. Agricultural Journal (Cape of Good Hope) v. 22 (1903), p. 573–81.

Discusses alkali lands of South Africa and chemical treatment, drainage and reduction of evaporation as corrective measures. Tabular data.


Description of electrical soil bridge and its use.

---


Rather detailed description of Egyptian reclamation work as adapted to similar work in United States of America. Tabular and diagrammatic data. Illustrated.

See also WHITNEY, M., and T. H. MEANS, I.
MILLAR, C. E. See McCool, M. M., and C. E. MILLAR, I.


This report deals with the practical phases of the problem of reclaiming lands that have become nonproductive due to alkali.


Observations of diffusion under various conditions described. Conclusions and diagrammatic and tabular data. Illustrated.


Describes laboratory experiments on cause of soil acidity. Considerable technical detail. Tabular and diagrammatic data.


Part of a detailed report on the investigation of 97 soils of the Pas-de-Calais.

PATTEN, H. E. See CAMERON, F. K. and H. E. PATTEN, I.


Describes the accumulation of salts due to irrigation and the reclamation of the land by drainage and leaching.

PETTERSON, W. See STEWART, R., and W. PETTERSON, I.


Laboratory tests of percolation and capillary movement with soils and waters of known composition. Tabular data.

ROBINSON, J. S. See HARRIS, F. S., and J. S. ROBINSON, I.


Discusses removal of sodium chloride by flooding and drainage and by cropping with grain.


Describes reclamation of barren niter-affected land in Colorado by flooding and by furrow irrigation.


Describes reclamation of "black alkali" lands by use of gypsum. Diagrams.

See also LOUGHRIDGE, R. H., and C. H. SHINN, I.


Percentages of various salts in loam soils are stated.


Mathematical consideration of the physical aspect of ground-water movement. Diagrammatic and tabular data. Bibliography. Illustrated.

SLOSSON, E. C. See KNIGHT, W. C., and E. C. SLOSSON, I.

SMITH, E. A. See SHutt, F. T., and E. A. SMITH, I.


Study of the soil, water, and vegetation with respect to alkali.

Development and methods of application of "alkali coefficient"—an index of salt concentration in water.


Desorbs experiments and discusses organic and metallic acids, and adsorption by colloids as causes of acid activity in soils. Tabular data.


Study of the nature of these soils. Drainage and certain farming methods as corrective measures. Diagrammatic and tabular data. Illustrated.

STEWART, J. See GARDNER, F. D., and J. STEWART, I.


Study of nitrates in soil. Tabular data.


Considers the origin, distribution, evidences and effects of nitrate in the soil, rock and water of western United States. Tabular data. Illustrated.


Results of investigations in western United States of soluble salts in the various geological formations. Bibliography, diagrams, and tables.


Discusses origin as concentrations of salt leached from country rock rather than bacterial fixation. Tabular data.


SYMMONDS, R. S. Experiments with Nitric Acid in Alkaline Soils. Agricultural Gazette (N. S. Wales), v. 21 (1910), p. 257–266.

Description and results of field tests in reclamation of "black alkali" lands. Illustrated.


Laboratory experiments on wheat grown in flower pots. Illustrated.

TAMHANE, V. A. See MANN, H. H., and V. A. TAMHANE, I.


Design, installation, and operation of flooding and drainage systems discussed. Diagrammatic and tabular data.


Study of conditions and methods of correction. Tabular data.


Origin and composition discussed.


Investigation of relation of capillarity to soil alkali of the Muganj Steppe. Three figures.


Study of these soils with respect to composition and origin of salts present.


Detailed report of Russian Government investigation of irrigation by flooding as a cause of alkali lands and preventative measures. Tabular and diagrammatic data. Illustrated.


Study and classification of soils with respect to composition and concentration of salt content.


Lectures on physical properties and relations of soil. Special reference to alkali soils and their treatment. Tabular and diagrammatic data.


Discusses leaching, cropping, and manuring as causes. Lime as a remedy.

Description of design, construction, operation, and results of test on reclaiming a quarter section of land reclaimed with alkali through irrigation. San Joaquin Valley, Calif. Illustrations, tables, and diagrams.


II. ALKALI SOIL SALTS

EFFECTS ON MORTAR AND CONCRETE AND MEASURES FOR PREVENTION


Describes deterioration of Winnipeg aqueduct inspection of same, and of concrete sewers in Winnipeg and plans for organized field investigation. General discussion of alkali action on concrete in western Canada. Bibliography.

AMERICAN RAILWAY ENGINEERING ASSOCIATION. See III.


Describes tests on solubility of cement tile in water. Tabular data.


General discussion of ill effects of various salts, acids, and gases upon concrete, the causes and possible remedies. Discussions by Rudolph Hering, Richard L. Humphrey, and others. Considerable technical detail. Numerous accounts of tests, inspections, and specific cases in practice.


General discussion of irrigation. Includes descriptions of concrete structures and alkali effects in western United States.

BARNETT, M. R. See IV.

BARTHOLOMEW, T. See III.


Three classes of conditions listed, one of which treats of products subject to a solution of salts, especially sulfates.


Full report on laboratory experiments and field tests (in sea water) covering 3 ½ years. Physical and chemical tests on mortar specimens and fresh cements. Tabular and diagrammatic data. Illustrated.

BAUCHERE, A. See III.


Reviews Government investigation (see Wig and others—"Durability of Cement Drain Tile and Concrete in Alkali Soils"), and discusses generally the results observed, 1917-1921. Illustrated.

BIEB, J. See III.

BISHOP, W. See IV.


Comparison of results and conclusions of investigations by United States Bureau of Standards, the Wyoming University, and city of Winnipeg on action of alkali on concrete. Tabular data.


Effects of salts on cements. Discusses addition of puzolana as protection against sea water and notes results of experiments with acids on puzolana cement.

BLOUNT, B. See III.


General discussion.


Origin, nature, and concentration of soluble salts investigated. Over-irrigation discussed as a cause and underdrainage as remedy. Tabular and diagrammatic data. Illustrated.


Gives area in California affected by alkali.

BURCHARTZ. See IV.

BURCHARTZ, H., and J. V. WROCHEM. See VI.


BURKE, E. See TANNATT, E. T. and E. BURKE. II.


EnDell. Lectures on Recent Cement investigations. Zement, (1921), No. 42, p. 527-530; No. 43, p. 542; No. 45, p. 571-572; No. 47, p. 598-599; No. 48, p. 640-641; No. 49, p. 621-625; No. 50, p. 635-638; No. 51, p. 650-651; No. 52, p. 654-660; (1922), No. 1, p. 3-6.

Endell, K. See IV.

Evers, Erdahl, Furlong, Golrich.

New Weapon to Fight Alkali.

Concrete, v. 19 (1921), p. 181.

Discusses a patented soluble compound for preventing alkali action on concrete.


Experiences and opinions of users pro and con.


Ferguson, L. R. See Wise, R. J., and L. R. Ferguson. III.


Observations on concrete structures near Winnipeg and results of laboratory tests.


Describes limited tests at Wisconsin University laboratory on effect of mixing and curing mortar specimens with alkali water.

Fortier, S. Concrete Lining as Applied to Irrigation Canals. U. S. D. A. Bul. 126 (1914), 86 p.


Illustrated.

Freeman, J. E. See Abrams, D. A., and J. E. Freeman, II.

Furlong, I. Alkali Attack on Concrete Roads and Building Brick.


Contribution from United States Bureau of Standards relating to tests in Glenn County, Calif.

Gary, M. See IV.

Goffette, J. L. See III.


Joint Committee (Eng. Societies). See III.


Cites cases of successful use of cement tile in alkali soils of Utah.


Further results of observations on concrete tile in alkaline soil in Utah.

LE CHATELIER, H. See III.


Discusses manufacture and requirements of cement tile, alkali effects, and use of cement tile in drainage. Discussed by several authorities. Diagram.

LIPFINCOT, J. B. See VI.


Letter written from Basrah, Mesopotamia, giving opinion based on observations.


Reviews known facts and theories as to disintegration and its prevention. Outlines field and laboratory tests carried out by the Eng. Inst. of Canada.


Report of special committee of Engineering Institute of Canada.


MARKUS, O. See IV.


Discusses action on concrete of various soluble salts in soil water. Suggests preventative measures. Tabular data. Illustrated.


Contains recommendations as to aggregates, proportioning, and placing concrete to minimize harmful effects of alkali.


Discusses deterioration of plain and reinforced concrete foundations and sewers in alkali soils of Winnipeg district. Chemical analyses of soils and waters.

MCVAY, C. B. Portland Cement Drain tile and Their Importance in Reclamation Work. Concrete, v. 8 (1908), No. 4, p. 24-25.

Discusses efficiency, cost, and durability.


Account of tests made on mortar briquettes in various salt solutions. Tabular data and results. Discussions.


Results of experiments at Minnesota laboratory with test cylinders.


Contains precautions to designing engineers in laying concrete in alkali soil.


Describes field investigations and tests of tile failures in alkali soil. Water and soil analyses. Tabular data, conclusions. Illustrated.


Progress report of experiments at laboratory of Minnesota Experiment Station in cooperation with United States Department of Agriculture on action of alkali salt on Portland cement mortars. Contains analyses of tile after exposure to alkali soil, danger limit of sulphates. Tabular data.


Discusses action of alkali on cement drain tile in Minnesota.

MORRISON, H. C. See NEWBERRY, S. B., and A. C., and H. C. MORRISON, II.

MUSSELMAN, H. H. See WINTER, O. B., and H. H. MUSSELMAN, II.


Discusses action of ground water.

Describes tests showing injury to concrete by continuous percolation.


Discusses relative merits of surface and integral waterproofing and their action. Notes tests of a commercial integral waterproof compound.


Technical discussion of action and preventative measures.


Opinions pro and con, concerning efficiency of concrete pipe for sewers and drains. Concrete versus clay. Mainly a defense of concrete.

Petry, W. See IV.


Discusses action and describes a new low-lime-high-silica “alkali-proof” cement manufactured in Colorado. Tabular data of composition, strength, tests, etc. Illustrated.

Pinckney, R. M. See Burke, E. and R. M. Pinckney, II. Burke, E., R. M. Pinckney, and E. T. Tannatt, II.


Describes failure due to alkali of wood-stave conduit.

Potter, C. J. See VI.

Pulver, H. E. See IV.


Suggestions as to manufacture and use. Cement against clay tile discussed briefly.

Rebuffat. See III.

Reyes, F. D. See Witt, J. C., and F. D. Reyes, IV.

Richardson, R. D. See IV.

Rodt, V. See IV.


Discusses action, and trass admixture as preventative.


Discusses merits of this commercial product as a protection against solutions, acids, etc.

See also IV.


Discusses action of soluble sulphates.

Schiffner. See IV.


Schott. See IV.

Sewell, J. S. See Humphrey, R. L. and J. S. Sewell, III.


Full description of manufacture, installation, and disintegration of 22-inch drain in Iowa, and chemical investigation of conditions. Tabular data.


Describes peculiar failure of 20-inch concrete pipe in Arizona and discusses tests indicating the cause to be differential expansion due to absorption. Diagrammatic data. Illustrated.


Discusses action of salt waters and the causes and prevention. Special reference to lime content.


Summary of results of several years' study at the Wyoming station.


Laboratory tests on cement and mortar specimens in salt solutions. Discussion of tests and deductions. Diagrams and tables. Illustrated.


Clay versus cement tile.

STUTZER. See IV.


Short discussion of action of alkali on mass concrete. Illustrated.

See also BURKE, E. R. M. PINCKNEY, and E. T. TANNATT II.


Describes inspections, tests and conclusions regarding deterioration of concrete and cement-motor brick sewers in alkali soil.


Brief outline of the chemical changes occurring during the manufacture of cement and the manner in which alkali salts disintegrate concrete.


Discusses acids and salts which may prove injurious. Suggests method for analyzing swamp water.

TILLMANS, J., and O. HEUBLER. See IV.

TOCH, M. See IV.


Experiences and opinions of engineers and manufacturers as to action. Introduction and summary of Bureau of Standards, Technological Paper No. 12.

See BATES, P. H., and others, II.


Describes installation of irrigating system and precautions to prevent deterioration.


Describes behavior of pure iron and concrete subjected to alkali action in Colorado.


Rich mixtures and linseed-oil coating discussed. Includes results of some experiments and observations. Illustrated.


Discusses concrete failures in alkali soils at Saskatoon, Canada. General conclusions.

WHITE. See IV.

WIG, R. J., and L. R. FERGUSON, See III.


Review of past experiments with summary. Discussion by E. E. Butterfield and R. J. Wig.

Disintegration of Concrete in Alkali Soils. Contract Rec., v. 35 (1921), p. 805 (7 col.).

General discussion of nature of action. A review and summary of results and conclusions by American investigators. General conclusions by the author.


Third progress report of cooperative experiments.


Outline of investigations in progress in field and laboratory.


Report to Engineering Institute of Canada outlining investigations.


Describes failures in Michigan soils. Laboratory experiments on effects of various solutions seeping through the walls. Impermeability tests on mortars of certain proportions. Tabular results with discussion. Illustrated.

Witt, J. C. Effect of Calcium Sulphate on Cement. Concrete, v. 16 (1920), Mill Sect., p. 32-35.

Laboratory tests of time of setting, soundness and normal consistency with various percentages of the sulphate. Tabular data.


Setting time and tensile strength tests on specimens gauged with sodium sulphide solution. Results checked with hydrogen sulphide solutions. Special references to iron content of the cement. Conclusions as to chemical and physical action. Tabular data. Illustration.


Tests for effects on tensile strength and initial set of gauging with solutions of various salts. Includes a bibliography with short abstracts. Tabular data.


Second progress report on effect of 11 salts on setting time and strength of cements.


Ninety-day laboratory tests for effects of gypsum and plaster of Paris on tensile strength and time of setting. Also of carbon dioxide and sodium carbonate which may be formed during storage. Tabular data.


Short discussion of action and preventative measures. Cases cited.

Alkali from Plaster as a Danger to Concrete. See IV.


Concrete, v. 19 (1921), p. 205. Describes method for subdraining an 8-foot alkali-affected reinforced concrete aqueduct by ungoverning and underfilling with gravel in which are placed tile drains.


Editorial comment on conditions in western United States.


Discusses formation, action and means of preventing destructive effects.
A BIBLIOGRAPHY RELATING TO SOIL ALKALIES


Discusses nature of action and methods of preventing.

—. Destructive Agents and Protective Treatments. Concrete, v. 22 (1922), p. 73, 74.

Report of committee E-6 of American Concrete Institute Convention at Cincinnati, Jan. 22 to 25, 1923.

—. Drainite in Alkali Soils: Discussion. A. P. C. M. Min., June, 1908, p. 16.


Report of observations of test tile placed in alkali soil in 1913.


Summary and conclusions of results of investigations in Minnesota in 1919-20 with concrete drain tile.

III. SEA WATER

EFFECTS ON MORTAR AND CONCRETE AND MEASURES FOR PREVENTION; SEA-WATER STRUCTURES OF CONCRETE.


One, four, and eleven year results of continuous tests on 24 piers of reinforced concrete of various proportions and cements, conducted at United States navy yard, Charlestown, Mass., to determine chemical and mechanical effects of sea water upon concrete. Detailed report on chemical and physical tests of concrete materials, methods of manufacture and curing specimens, operation of tests and results to date. Excellent illustrated tabular description of manufacture and behavior of each specimen.


A mixture of limestone or lime and bauxite. Unaffected by sulphurous and sea waters.


Experiments on porosity and permeability of mortars of various composition. Results of seepage of soft and sea waters, and of long exposure to sea water in walls. Tabular data illustrated.

Allen, K. See Tuttle, A. S., K. Allen, and W. T. Carpenter. III.


Discusses action of sea and alkali waters and protection of reinforcing.


Report of committee on masonry. Conclusions and recommendations concerning the making and placing of plain and reinforced concrete sea-water structures.


Committee report. Presents opinions and experiences of various engineers and observations by the committee. Special reference to frost action and methods of placing concrete.


Bakenhus, R. E., et al. Tests of Concrete Specimens in Sea Water at Boston Navy Yard. A. S. C. E. Trans., v. 81 (1917), p. 645-708. A complete and detailed description of the tests up to January, 1916, on reinforced concrete piers in sea water made at Charleston (Mass.) Navy Yard by Aberthaw Construction Co. Includes, mostly in tabular form, all physical and chemical tests of concrete materials and sea water, all from account, with contract and specifications, of manufacture, curing and testing of specimens; detailed description of progressive results to date and classification of specimens with respect to durability as affected by the nature and proportions of ingredients. One illustration. Discussions by various engineers citing practical related experience and describing similar tests, with tabulations and illustrations. For 1920 results, see "Aberthaw Construction Company.

Barker, R. See VI.

Bartholomew, T. Destructio n of Concrete by Sea and Alkal Water. Mining Science, v. 62 (1910), p. 206. Puts together some current opinions and notes, some points to be observed in preventing action and examining damage.

Bates, P. H., and others. See II.


Laboratory tests on mortars of various composition in sea and sulphate waters. Tabular data. Results and conclusions.

Baykoff, A. See Czarnomski, W., and A. Baykoff, III.

Belloitte, Examination of Slag Cements for Sea Water Purposes. Ton. Zeit., v. 34, p. 64.


BLENINGER, A. V. See II.


Brown, H. P. See VI.

Burchartz, H. See VI.

Burchartz, H., and J. V. Wrochem. See VI.


- Materials Capable of Resisting Sea Water.

Paper delivered at meeting of the French and Belgian members of the International Association of the Materials of Construction April 25, 1903.

Carey, A. See Kyle, J., and A. Carey, VI.


Discusses tests on various cements in sea water by Vicat and Durand, Claye and Debray.

---

Strength of Briquettes when Made with Fresh and Salt Water.


Table showing comparative strengths in 7, 14, and 28-day tests.


Description of tests on briquettes. Diagrams of results. Discussion.

Chenoweth, A. C. See VI.


Tests on mortar briquette made with and immersed in salt and fresh waters.


Describes sea water tests on concrete blocks of various compositions. Results and conclusions.

Collier, B. C. See VI.

Crary, A. P. Some Experiences with Concrete in the Republic of Panama.


Describes construction and disintegration of concrete wharves at Panama City. Diagrams. Illustrated.


Chemical tests on fragments of masonry and concrete blocks after 8 to 14 years immersion. Tabular data. Illustrated.


Discussion of past and present design and methods of construction of quay walls, docks, etc. Numerous descriptions and diagrams of such works. Illustrated.

Debray, P. See Durand-Claye, L., and P. Debray. III.

Deforge. See Lombard and Deforge, III.


Discusses deterioration of concrete piers in sea water at Annapolis Royal, Nova Scotia, after 3½ and 5 years exposure. Illustrated.


General discussion and opinions of various engineers.

See also VI.


Results of analyses of mortars after action by sea water, and permeability tests of unexposed parts of docks. Also comparative tests of magnesium sulphates and chlorides acting on mortars. Tabular data.


Results of German tests. Tabular data.


Describes various structures in different parts of the world.

Endell, K. See IV.


Challenges claims of superiority for concrete ships and discusses comparative merits. Reference to deteriorating action of sea water.


Discusses damage to Aberdeen graving-dock and tests tending to show that properly mixed and set concrete is durable in sea water. Extensive discussion.

FERGUSSON, L. R. *See Wig, R. J., and L. R. Ferguison, III. Toch Bros., R. J. Wig, and L. R. Ferguison, III.*

FRAMM, F. *See VI.*  
FRASER, O. *See VI.*  
GARY, M. *See Poulsen, A., M. Gary, and C. Schneider, III. Gary, M., IV and VI.*  
GASSIER. *See VI.*  
GOFFETTE, J. L. *Formula for Making Lime Products. Cem. & Eng. N., v. 33 (1921), No. 12, p. 18.* Author desires to sell or lease formula for making cements proof against sea water alkali and atmospheric action.  
GREENMAN, R. S. *See IV.*  
HAMBLOCH, I. A. *See VI.*  

HIOI, I. *See VI.*  
 —. *Hydrated Lime not Fairly Treated in Boston Sea Water Tests. Eng. N. Rec., v. 80 (1918), p. 575.* Criticizes conclusions regarding hydrated lime in Aberthaw tests of concrete in sea water. See also Aberthaw Construction Company, III.
Howkins, J. D. Deterioration of Concrete. Inst. Civil Eng. (Lond.) Min. & Proc., v. 188 (1911–12), p. 416.

Discusses failure of concrete in British pier as due to submarine springs of gyspiferous water.


Discusses chemical action and methods of preventing disintegration. Notes various structures and failures. Describes various tests and conclusions.


Short review of tests on concrete exposed to sea water and alkali water and on waterproofing compounds. 1909–10.


General discussion of reinforced concrete as used in harbor and inland works in United States of America, including a study of destructive agencies. Illustrated.


General report on deterioration of structural materials in sea water. Numerous descriptions of concrete sea water works with discussion on effects of destructive agencies and remedial suggestions. Excellent diagrams and illustrations.

Institution of Civil Engineers (London).—Committee to Investigate the Deterioration of Structures of Timber, Metal, and Concrete Exposed to the Action of Sea Water. Second (Interim) Report, edited by P. M. Crosswaite and R. S. Redgrave (1922) 57 p.

Johnson, A. A. See Atwood, W. G., and A. A. Johnson, III.


Quotes old works on concrete which state some of conclusions of Wig and Ferguson in series of five articles on concrete in sea water. For author's reply see Wig, R. J., and L. R. Ferguson, III.


Includes recommendations concerning destructive agencies and materials, methods of mixing, placing and construction to insure durability.

Kasai, S. See VI.


Two papers with extensive discussion and correspondence. Discuss the construction, maintenance and behavior of these docks, with results of inspections, opinions, and experiences of many engineers with respect to durability of concrete structures in sea water.


Six papers on concrete harbor works in various parts of the world, with extensive discussion and correspondence concerning them. Includes much detail as to design and structural methods, with opinions, observations and experiences of many engineers. Tabular data of cement tests, etc.

Klaudy, J. See VI.

Kyle, J. See Kinipple, W. R., J. Kyle and others, III.

Kyle, J., and A. Carey. See VI.


Discusses chemical and physical aspects of decomposition. Special reference to porosity and the formation of impermeable coatings.


Study of the disintegrating actions of air, fresh water, and sea water.


Describes results of laboratory tests in various cements with calcium sulphate, magnesium sulphate, and artificial sea water.

Discussion from chemical viewpoint causes and nature of disintegration of concrete in sea water.


Ljamar. See VI.

Lombard and Deforge. Report on Tests at the tour St. Nicholas on Concrete in Sea Water. La Rochelle Laboratory (France), July 1, 1911.

Luiggi, L. See VI.


Describes action of sea water on concrete structures in Canada. Editorial comment.

Markus, O. See IV.


Discusses tests, results, and conclusions regarding action on neat cement and concrete of sea and fresh water when used in mixing and as a curing medium. Protective measures against destructive action of sea water. Opinions of authorities to date. Tabular data.


Design and construction of concrete sea wall and connected works. Describes compressive strength tests on concrete of various aggregates and on specimens mixed with sea water and exposed to air, tidal conditions, and immersion in sea water. Tabular data and diagrams.


Discussion of the committee report on this subject (see Institution of Civil Engineers (London), III), with critical suggestions and original conclusions.


Results and conclusions of long-time tests of blocks in sea. Extended tabular data.


Results of 2 1/2 year tests to determine effects of distilled and sea waters on cement.

See also VI.


Discusses alumina content of cement in relation to resistance to sea water.

See also II.


Discusses chemical action.


Technical discussion of the physical and chemical aspects. Recommendations as to composition and methods of making sea-resistant concrete. Tabular data.


See also VI.

Michaelis, W., Jr. See VI.


Thirteen-year tests on reinforced concrete, both precurved and produced in situ, exposed to tidal action. Results and conclusions.


Describes increase in size in sea-water dock during 22 years.


General discussion of sea-water action and the composition, making and placing of concrete to resist it. Reference to specific cases and tests.

Newberry, S. B. See VI.

Nitzsche, H. See II.


Pagon, W. W. See VI.


Pickwell, R. See Kelley, W. F., and R. Pickwell, III.


**Studies of the Chemical Influence of Sea Water upon Portland Cement.** Zentralblatt Hydraulische Zemente (translation from Ciment, 1910, Nos. 6 and 7). Abs., Chem. Abs., v. 5 (1911), p. 1328.

Pope, A. *Concrete Wharf Exposed to Sea Water and Wave Action at Fort Williams, Me.* Prof. Mem., v. 8 (1916), p. 676-682. Describes construction, exposure, disintegration, and repair of wharf.

Potter, C. J. See VI.

Poulsen, A. See VI.


Ravier, L. See VI.


Rhett, A. H. *Porosity the Vital Point to Consider.* Eng. N. Rec., v. 80 (1918), p. 265, 267. Questions importance attached to carbonate of lime skin and abrasion by Wig and Ferguson in second of articles on concrete in sea water. Suggests porosity as more important. Authors' reply.

(See Wig, R. J., and L. R. Ferguson, III.)


Rodt, V. See IV.

Sartori, A. See II.


Schneider, C. See Gary, M., and C. Schneider, III. Poulsen, A., M. Gary, and C. Schneider, III.


Schwartz. See VI.

Sewell, J. S. See Humphrey, R. L., and J. S. Sewell, III.

Shaw, A. L. See VI.

Dissolves disintegration of concrete sea structures in Maine and New York. Describes tests on laboratory specimens made to ascertain cause.


Description of investigation of concrete work at Aberdeen Harbor and general discussion of chemical deterioration of concrete in sea water. Discussion and correspondence by numerous engineers with accounts of many other tests and observations. Much technical detail. Tabulated data. Remedial measures.

Snow, W. A. Pronounced Reinforcement Corrosion Due to Sea Water or Electrolysis. Eng. N. Rec., v. 87 (1921), p. 528-529.


Discusses causes and nature of action and offers recommendations for preventing.


Discusses alumina cement as used in France. Much greater resistance to sea water. See also II.

Spregelburg. See II.


Questions certain of Wig and Ferguson's conclusions regarding failure of concrete in sea water. Discusses relative values of calcium carbonate skin and density as protection. Also causes of reinforcement corrosion.

(See Wig, R. J., and L. R. Ferguson, III.)


Tests covering one year with several brands of cement. Diagrams.


Review of foreign and American practice in reinforced concrete dock construction, failures and causes, opinions of experts and general conclusions. Considers initial cost and repairs. Discussions. See also VI.


Review of current opinions and experiences of various American and European engineers of note.

Toch, M. See IV.


Experiments taken to conclusions of Wig and Ferguson on effect of waterproofing compounds. Reply.


Summary of rules for securing durable work.


Reports conditions of Coney Island bathhouse. Experience, opinions, and suggestions of many engineers and concrete authorities on use of concrete in sea water. Chemical action discussed.


U. S. Navy (Joint experimenters with Aberthaw Construction Co.) See Aberthaw Construction Co., III.


Reports of observations of piers in Boston Harbor.


Questions conclusions in series of five articles by R. J. Wig and L. R. Ferguson on concrete in sea water. Author's reply. (See Wig, R. J. and L. R. Ferguson III.


Results of 20 years' experience and observation.
Wig, R. J., and L. R. Ferguson. 
Reinforced Concrete Failing. A. S. T. M. Proc., v. 17 (1917), part 1, p. 290-299.
Discusses causes and nature of failure in sea water and suggests preventative measures. Notes effect on concrete of acids and alkalies and difficulty of prevention.

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Series of five articles on 
Covers investigation which included personal examination of nearly every concrete structure in sea water in continental United States and many in Canada and Cuba, together with detailed information secured through American Consular officers regarding concrete structures in harbors in all parts of the world. Compare with articles by Harrison, J. L., III.

Introductory. Describes purpose, extent, and scope of investigation. Descriptive list of structures examined. Illustrations and map. Preceded by short editorial comment.

Discusses causes and nature of damage to plain concrete in sea water and precautions for preventing. Description of and comments on numerous observed failures. Well illustrated.

Discusses cause and nature of damage to reinforced concrete in sea water and preventative measures. Comments on specific observed cases. Illustrated.

Discusses effects of chemical constituents of cement, use of fresh and sea water, water-proofing compounds and various kinds of aggregate in making plain and reinforced concrete for sea-water structures. Numerous cases cited to verify conclusions. Illustrated.

Discusses necessity of reliable supervision and good workmanship in constructing sea-water concrete structures; proportioning of materials, quantity of water, care in mixing and placing concrete, construction joints, causes of failure, etc. General principles of successful construction. Includes verifying cases. Illustrated.

See also Toch Brothers, R. J. Wig, and L. R. Ferguson, III.

Wig, R. J., and others. See VI.

Williams, A. E. See VI.

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Describes making, placing, and theories of reinforced concrete piles and cylindrical supports and experience in their use in sea water.

Wood, F. J. See Owens, J. S., and F. J. Wood, III.

Wrochem, J. V. See Burchartz, H., and J. V. Wrochem, VI.


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EDITORIALS, ANONYMOUS ARTICLES, ETC.

Gives results of observations on piers immersed in sea water from 1909 to 1920.

Rich concrete mix specified as protection against deterioration from sea water.

Calcium - Aluminum - Sulphate as a Destroyer of Concrete. See II.
Calcium - Aluminum - Sulphate; Effect on Concrete. See II.

Concrete Encased Steel at Kowloon, China. Inst. Civil Eng. (Lond.) Min. & Proc., v. 199, p. 133.

Describes disintegration of docks at Charlestown (Mass.) Navy Yard. Illustrated.

Summary of second (interim) report of a committee of Institution of Civil Engineers in which is contained a general discussion of concrete in marine structures.

Editorial review of opinions and known facts, including 2/4 column quotation from R. Hering on action of sewage.

Describes occurrences and effect of a thick tar-like substance on concrete piers of Aberthaw Construction Co.'s test on concrete in sea water at Charlestown (Mass.) Navy Yard. Deposits originated from floating fuel oil.
Editorials, Anonymous Articles, Etc.—Continued.

Heath Clay for Cement in Sea Water. See VI.


Conclusions of three foreign engineers.


Los Angeles Engineers Approve Concrete Sewer Pipe in Sea Water. Eng. N. Rec., v. 90 (1923), p. 825. Results of inspection trip by Board of Public Works of Los Angeles.


IV. OTHER INJURIOUS AGENTS

EFFECTS OF SEWAGE, ACIDS, OILS AND VARIOUS CHEMICALS ON MORTAR AND CONCRETE; MEASURES FOR PREVENTION

Aberthaw Construction Co. See Stone and Webster, Aberthaw Construction Co., and others, IV.


Anderson, A. O. See II.

Anderson, G. G. See II.
Highly technical study of chemical reactions.

Bach, H. See Helbing, H., and H. Bach, IV.

Discusses the deterioration of an English aqueduct of limestone concrete and the repair of the same. Illustrated.

Describes investigation at four public institutions in Iowa, and conditions found. Discusses cause and effects of chemical action. Illustrations and tabular chemical data.

Chemical study of disintegrated cement sewer carrying waste from calcium chloride factory.

Discusses use of bituminous paints, enamels, and mastics.

Describes cement water mains in use for 38 years.

Blackwell, A. V. See II.

Blount, B. See III.


Disintegration of concrete in butter factory.

Discusses nature and causes of disintegration. Chemical data. Illustrated.

Buchanan, R. E. See Barr, W. M., and R. E. Buchanan, IV.


Chemical processes of decomposition.

Tests on cement containing various amounts of gypsum and calcium chloride. Tabular data of results.

Describes action of domestic sewage on concrete containers. Results and conclusions of inspection and tests of affected concrete. Tabular data. Discussion by various engineers.

Discusses "force of crystallization" as distinct from simple expansion. Discussions. Illustrated.

General discussion of causes and manner of attack. Electrolysis considered as cause. Illustrated.

Discusses solvation of water, salt solutions, and acids on fresh and set cement. Notes tests.

Day, W. H. See II.

Debray, P. See Durand-Claye, L., and P. Debray, IV.

Discusses experimental investigation of the use of lime sulphate to determine the percentage of lime aluminate in Portland cement.


D'HERICART. See Brard, modified by D'Hericart and Thury, IV.


Describes disintegration in concrete septic tank at Amherst, Ohio.


D'ROHAN. See II and III.


Observations and laboratory tests show damage. Action discussed.


Swelling and cracking in concrete bridges laid to high magnesia content of cement. Tests uphold this theory.

DYCKERHOFF, R. See III and VI.

EDDY. See METCALF and EDDY, IV.


Review of 10 years' German literature on cement and effects of chemical agents.


Table showing effects of various percentages of salts on time of setting and tensile strength.


Results of experiments on neat and mortar specimens to determine effect of magnesia in cement, both as an added constituent and as replacing part of the lime.


GADD, W. L. See V.

GAINES, R. H. See V.


Tests covering 14 months on 2,631 briquettes to determine the effect of salt water in mixing mortars.


Discusses internal and external chemical agencies; their causes and effects.


Requirements of linings for concrete oil tanks. Notes two methods of treating concrete surfaces to render oil-proof.


GOTTSCALK. Concrete with Mineral Oil. Bet. u. Eis., v. 12, p. 247.


Discussion of ingredients, workmanship, and external forces as factors in concrete failures. Discussions by various engineers.


HARTLEB, R. See STUTZER, A., and R. HARTLEB, IV.


HEUBLEIN, O. See TILLMANS, J., and O. HEUBLEIN, IV.

HEUCHLING, F. G. See WESTON, R. S., and F. G. HEUCHLING, IV.


HILDRETH, K. E. Acid-proofing Concrete, v. 12 (1918), p. 205. Brief discussion of the use of pitch, gilsonite, or unintiate (an asphalt), and miniture (a commercial asphalt product) as a protecting covering for concrete exposed to acids.


HOOL, G. A., and N. C. JOHNSON. See III.

HOUGH, N. G. See V.


HUMPHREY, R. L. See III.

HUMPHREY, R. L., and J. S. SEWELL. See III.


JOHNSON, N. C. See HOOL, G. A., and N. C. JOHNSON, III.


KUHL, H. Swelling Theory of Portland Cement. Ton. Zeit., v. 33, p. 556. See also ROHLAND, P., and H. KUHL, IV.


MICHAELIS, W. Der Cement-Bacillus. Berlin (1892).


Discusses "swelling" of cement upon agitation in water. Describes experiments and progressive observations.


Discusses cases of concrete sewer and tunnel failures and causes and nature of disintegration of underground concrete. Preventative measures suggested.


NEW YORK (CITY) BOARD OF WATER SUPPLY. See II.


OCHS, E. J. Action of Sulfuric Acid on Concrete. Concrete, v. 22 (1923), p. 56. Brief account of investigation showing harmful effects of sulphuric acid.


Describes plans for altering outfall sewer at Los Angeles. Report on disintegration of brick and mortar portions.

ORTON, E., Jr. and others. See II.


Discusses processes involved in setting and hardening of cement and effects of various ingredients and treatments. Laboratory experiments and results. Tabular data.

PAGE, L. W. See V.


Describes strength tests on mortar briquettes made with sugar admixtures. Tabular data.


Discusses acid action on concrete. Describes tests of protective coatings and results.


Results of laboratory strength tests on concrete cubes to which sodium chloride and calcium chloride were added in mixing water. Cured at high and low temperatures. Tabular and diagrammatic data.

REYES, F. D. See WITT, J. C., and F. D. REYES, IV.


Discusses laboratory tests to determine the extraction of lime from mortar by various salt solutions.


Discusses injurious action in railway tunnels.

Activity of Absorbed CO₂ ions.


Discussion of chemical action of soil alkalies and acids on concrete.


Discusses action of these agents and protective coatings for concrete.


Discusses action of electric current and electrolysis.


Discusses protective coatings for reinforced concrete exposed to carbon dioxide, sulphur, and salt waters.


Describes laboratory and field tests and results. Thirty-two conclusions. Discusses dangers under practical conditions and protective measures. Tabular and diagrammatic data. Bibliography illustrated.


Discusses effects of various percentages of clay on tensile and compressive strength of cement mortar and concrete. Tabular results.


Discusses investigations to determine effects of marl water on concrete.


SOWELL, J. S. See HUMPHEY, R. L., and J. S. SOWELL, III.


Committs report showing deterioration of concrete as affected by sewer gas and alkalies.


Describes disintegration of concrete sewer at Calexico, Calif. Illustrated.

SHIELDS, W. S. See MACHARGE, W. S., and W. S. SHIELDS, IV.


Describes corrosion of reinforcing and spalling of concrete in two bridges. Discusses limestone screenings in concrete and sulphur-laden fog as possible causes. Illustrated.


Results of tensile tests on 1,000 mortar specimens containing clay. Tabular data.


Description of tile lines at Grand Rapids and Coon Creek.


Discusses action of salt added to mixing water. Also action of salt solutions on set concrete.


Investigation of cement reservoir lining in Germany indicates corrosive action of carbon dioxide to be aided by nitrifying bacteria.

TACKE, Dr. BRUNO. On the Effect of Peat Soil on Concrete. Mitteilungen des Vereins zur Förderung der Moor­kultur im Deutschen Reich. Book 28, p. 234-240.

THURY. See BRARD, modified by d'HERICART and THURY.


Discusses solvent action on calcium carbonate and bicarbonate of carbon dioxide in solution and conditions which may prevent this action. Tabular data.


Discusses concrete failures from contact with salt water and chemicals. Describes various protective methods.


Describes failure of slabs in hydraulic laboratory, Madison, Wis. Illustrated.

WASON, L. C., and others. Effect of Salt on Concrete Sidewalks. Concrete, v. 11, No. 6 (1917), p. 186. Three short discussions of effects of common salt on concrete sidewalks and floors.

WEBB, H. W. See HOLLEY, A. E., and H. W. WEBB, IV.

WELLMAN, G. A. See SOUTHWICK, L. T. B., and G. A. WELLMAN, IV.


WITT, J. C. See II.


WYTRALL, C. DE. Electrolytic Action on Unreinforced Concrete. Eng. Rec., v. 66 (1912), p. 685. Effect of electric current through concrete as observed in two cases.

YOUNG, F. C. See WOODWARD, S. M., and F. C. YOUNG, IV.

EDITORIALS, ANONYMOUS ARTICLES, ETC.:


Alkali from Plaster as a Danger to Concrete. Eng. N., v. 64 (1910), p. 375. Earth containing old wall plaster rejected for fill over concrete.


A report covering six investigations, including about 20,000 tests, with appendix covering further tests on 1,700 specimens. Effects of different percentages of the admixtures on mortars and concretes of various proportions and elements. Full description of tests and results. Conclusions regarding the following: Effect of powdered admixtures on tensile, compressive, and bond strengths; wear, plasticity, and yield, with respect to consistency, age, and proportion of mortar and concrete and kind and percentage of admixture. Waterproofing effects not considered. Eighteen diagrams and 32 tables.

See also Hart, L. H., and D. A. Abrams, V.

Alexander, M. P. See III.

### V. WATERPROOFING OF CONCRETE

**VARIOUS METHODS AND THE EFFECTS OF THEIR USE**


A report covering six investigations, including about 20,000 tests, with appendix covering further tests on 1,700 specimens. Effects of different percentages of the admixtures on mortars and concretes of various proportions and elements. Full description of tests and results. Conclusions regarding the following: Effect of powdered admixtures on tensile, compressive, and bond strengths; wear, plasticity, and yield, with respect to consistency, age, and proportions of mortar and concrete and kind and percentage of admixture. Waterproofing effects not considered. Eighteen diagrams and 32 tables.

See also Hart, L. H., and D. A. Abrams, V.

**ALEXANDER, M. P.** See III.


Full discussion of various methods of waterproofing concrete, including specifications and requirements for many compounds.


Classification of methods for securing impermeability.


Discusses their use and describes tests and results. Tabular data.

**BATES, P. H.** See Wig, R. J., and P. H. Bates, V.


Describes various compounds and their use.

Outlines a method of investigating relative merits of various materials. Includes data on physical properties of concrete, and economic aspects of use.

BOYDEN, H. C. See III.


Gives results of permeability tests.


Describes tests on mortar specimens of Portland and natural cement with various mixes and sands. Tabulated data.


Notes United States patent on waterproofing paste.


Suggests testing of waterproofing materials for concrete.

Waterproofing with Water.


Describes tests by Westinghouse, Church, Kerr & Co. on waterproofing effect of varying amounts of water in mixing concrete. Diagrams.

CHRISTIAN, H. L. See Smith, R. B., and H. L. Christian, V.


Describes tests of mortars with hydrated lime, puzolana, and other powdered admixtures. Tabulated results.

Waterproofing Concrete Structures.


Describes laboratory tests on concrete structures. Tabulated data of results.


Results of tests on "super cement" (Portland cement ground with treated gypsum), showing strength and waterproof qualities.

DOWLING, B. L. See Baker, I. L., and B. L. Dowling, V.

DYCKERHOFF, A. See II.

DYCKERHOFF, R. See VI.

ELECTRO-CHEMICAL SUPPLY AND ENGINEERING Co. See VI.


Results of permeability tests on mortar specimens of Portland and natural cement with various mixes and sands. Tabular data.


Results of tests with various oils.

FERGUSON, L. R. See Toch Bros., R. J. Wig, and L. R. FERGUSON, III.


Discusses impervious concretes.

FOWLER, E. S. See HUFFMAN, O. L., and E. S. FOWLER, V.

FORTIER, S. See II.


Discusses various factors in proportioning concrete which effect permeability. Describes tests. Tabulated data.


Discusses tests of waterproofing effects of admixtures of fats and oils and resulting conclusions as to other effects on the concrete.


Recipes for various coatings, washes, and mixing compounds to render concrete impervious.


Discusses use of electrolytes in gauging concrete and addition of colloids as methods for waterproofing concrete. Theories of decomposition of cement.

Describes laboratory tests and results of investigation of magnesia flue and potash soap as waterproofers. Tabular data.


Gives composition of concrete which proved water-tight. Compressive tests show no drop in strength due to use of soap.


See also III.


Thirty, forty, and sixty day strength, absorption and permeability tests on mortars and concrete made with admixtures of clay and re-ground cement. Results, conclusions, and tabular data.

Humphrey, R. L. See III.


Discusses permeability tests of mortar plates of Portland cement and mixtures of cement with quicklime and hydraulic lime.


Six letters by engineers regarding use of clay in making concrete and mortar.


Tests of seven commercial waterproofing compounds for concrete. Tabulated data.


Describes strength and waterproofing tests and results. Quotes from other investigators.


Tests on 14 commercial waterproofing compounds. Full description of materials, tests, and results. Diagrammatic and tabular data.


Theoretical consideration of permeability and its prevention.

Morrison, A. See Smart, B. J., and A. Morrison. V.


Short nontechnical discussion of its effects on mixing, setting, density, strength and appearance of cement tiles.

National Lime Association. See VI.


Tests show benefits of admixtures of fine material to cement and of pumzzolan and sand cements.


Describes British patent on cementitious materials, made waterproof by admixtures during manufacture.


Strength, permeability and other tests on mortar and concrete mixed with various oil admixtures. Illustrated.


Discusses successful waterproofing concrete slabs near Budapest by use of soft soap in mixing water.

Studies microscopical actions and chemical modifications taking place on addition of "pudlo" to concrete.


Student thesis. Strength and absorption tests on mortars to determine effects of alum, clay, two commercial waterproofing compounds, and a commercial coloring compound. Tabular data and diagrams.


Strength, permeability, and absorption tests on mortars and concretes mixed with admixtures of asphaltic oil. Tabular data. Discussions.


Describes efficient method of preparing and testing specimens. Illustrated. Tabulations.


Discusses necessity for waterproofing. Aquab (a mixture of menhaden oil and sodium silicate) as a waterproofer.


Gelatinous precipitate from cement agitated in water used as waterproofer.


Pressure tests to determine effect of hydrated lime on permeability of concrete. Tabular data. Illustrated.

Thompson, S. E. See Fuller, W. B., and S. E. Thompson. V.

Toch Bros., Wig, R. J. and L. R. Ferguson. See III.


Discusses some of the properties necessary in use for floors and underground masonry and some investigations desirable. Discussions.


Five papers discussing the merits of various methods of waterproofing including asphalt mastics, elastic membranes, dry and liquid compounds, and hydrocarbon paints. Each advances arguments favoring some proprietary product.

Westell, F. J. D. See Olsen, H. M., and F. J. D. Westell, V.


Effect of integral waterproofing on rate of water absorption. Gives results of tests.

Wig, R. J. See Toch Bros., R. J. Wig and L. R. Ferguson, III.


Laboratory tests on mortars and concretes with and without various waterproofing preparations. Full description of materials, methods, and results. Tabulated and diagramed data. Illustrated.


Describes elaborate permeability tests on concretes of various composition. Tabular and diagrammatic data. Results. Conclusions. Illustrated.

Editorials, Anonymous Articles, etc.: *Concrete that is Waterproof*. Farmers' Advocate (London, Ontario), v. 55 (1920), p. 450.


Describes German tests of water-repellent cement, lime putty, and tar.


General discussion of use and effects.


Discusses various methods of waterproofing and results of tests.

Impermeable Concrete for Marine Work, Notes on Methods for Securing. See III.
VI. ALKALI-RESISTANT CONCRETE

SPECIAL INGREDIENTS AND METHODS FOR PRODUCING RESISTANCE TO ALKALI AND SEA WATER; INCIDENTAL EFFECTS OF SAME


BIEDE, I. Electric Cement. Travaux Publques (1922), Nos. 158, 159.


BLEINIGER, A. V. See II.


CANDLOT, E. La Fabrication Du Ciment Fondu. Chimie et Industrie, v. 7 (1922), p. 456-457. See also III.

CAREY, A. See KYLE, J., and A. CAREY. VI.

CAY, W. D. See III.
BULLETIN 1314, U. S. DEPARTMENT OF AGRICULTURE


Colinet. See III.


Using *Iowa Gravel in Concrete.* The Iowa Engineer, v. 22 (1921-22), No. 4, p. 1-3. Discusses grading and proportioning of gravel aggregate in relation to the strength of the resulting concrete. Tabular and diagrammatic data.


Goffette, J. L. See III.

Greenman, R. S. See IV.


CHALLENGE

Lippincott, Kyle, Klaudy, Jewett, Liljamir, Jeanneret, to Los tufa, ing, treated.

In conclusion alkali p. und treated.

Concrete societies).

Concrete cement concrete, containing various parts of cement mortars in sea water.

Chemical Alteration of Cement Mortars Containing Puzzolan in Sea Water. Ciment, v. 17, p. 41–44.

Abs., Chem. Abs., v. 6 (1912), p. 1511.

Chemical tests covering one year of fresh and cured parts in 3 per cent MgSO₄ solution. Discussion and conclusions.


Chemical tests on mortar cubes of natural Portland, slag, and puzzolanic cements exposed to various salt solutions and sea water. Illustrated.


Two papers with discussions and recommendations concerning composition and treatment of cement and aggregate, the making and placing of concrete, and general methods of procedure in laying concrete in sea-water works, both in situ and block construction.


LOSSIER, HENRY. Le Breton Arme et le "Ciment Fondu." Le Genie Civil, v. 80 (1922), p. 79–83.


Rich mixtures or addition of puzzolan as protection. Tests noted.


MARKUS, O. See IV.

MURLAT, M. DE. See III.


Tests in air and water on concrete slabs reinforced with polished steel and made with admixtures of varying quantities of lime and gypsum.


Discusses iron-ore cement and its use.

NITZSCHE, H. Cement "Basillus." Bet. u. Eis. (Sept. 15, 1923), p. 232. See also II.


Series of seven articles of from 3 to 7 pages each, comprising a collection of letters, papers, articles, and excerpts of same by various engineers and cement experts and containing opinions, observations, experiences, and results of tests by many authorities, as well as deductions, conclusions, and specific recommendations by the author regarding the composition and manufacture of sea-proof concrete.


Laboratory and field tests in fresh and salt water showing superior resistance to salt solutions of mortars treated with carbon dioxide or made with "red cement." Discussion and tabular data.


Describes tests which show diatom-earth, properly used, to be beneficial to physical and chemical properties of sea-water concrete. Diagrammatic data.

Mead, R. K. See III.


--- Technical chemical discussion of sea-water action and of tests made with briquettes of various composition in artificial sea water. Recommendations as to composition of cement and use of puzzolan material, etc., to obtain sea-resistant concrete. Tabular data.


See also III.


--- Discusses limits of fineness for Portland cement and superiority of iron-ore cement in this respect and others.


--- Describes covering eight years, comparing behavior of Portland and iron-ore cements in sea water. Results and conclusions.

Poulsen, A., M. Gary, and C. Schneider. See III.


--- Suggests neat cement and tar or paraffin coatings.


--- Discusses manufacture, physical and chemical properties, with tabular data on chemical analyses and physical tests.

Rohland, P. See II.

Schneider, C. See Gary, M., and C. Schneider, III. Poulsen, A., M. Gary, and C. Schneider, III.


--- Discusses the origin and nature of tuff tress and its use with lime and Portland cement to obtain sea-proof mortar and concrete. Diagrammatic data of a few strength and sea-water tests.


--- Cement as a construction material. Precautions in making and placing concrete. Leaching action of waters.

Spackmann, H. S. *Cements Rich in Alumina; Their Development, Value, and Fabrication. Zement (1922), No. 15, p. 185–187; No. 49, p. 324–325. See also II.


--- Discusses division of properties of cement and aggregate and methods of mixing and placing necessary for sea-resistant concrete.


--- Discusses nature of action on concrete and the requirements of ingredients, mixing, placing, and curing for successful results. Notes cases of failure and success.

Tetmajer, L. See Dyckerhoff, R., and L. Tetmajer, VI.

Troche, A. *Fused cement (from a lecture by R. Christiani).* Bet. u. Eis., v. 22 (1923), p. 271–275.


--- Detailed description of extensive tests on concrete and mortar specimens. Much tabular and diagrammatic data, illustrated.


--- Three-day accelerated tests on Portland and iron-ore cements in artificial sea water. Tabular data. Discussions by R. J. Wig and P. H. Bates

Wrochem, J. V. See BurcHartz, H., and J. V. Wrochem, VI.

Editorial, Anonymous Articles, etc.: *Cement with High Content of Alumina, etc.* Le Genie Civil, v. 82 (1923), p. 5–8.


--- Discusses chemical aspects of the use of Denmark “heath clay” in the manufacture of cement or as an admixture to Portland cement to produce sea-proof concrete. Results of field investigations.

Impermeable Concrete for Marine Work. Notes on Methods for Securing. See III.


--- Water, Gas Tar, and Coal Tar, How to use on Concrete. Irrigation Age, v. 31 (1916), p. 103.

--- Describes use on Boise, Idaho, project with suggestions.