

CEMENTS, MORTARS AND CONCRETES, THEIR PHYSICAL PROPERTIES

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Cements, mortars and concretes, their physical properties by Myron S. Falk

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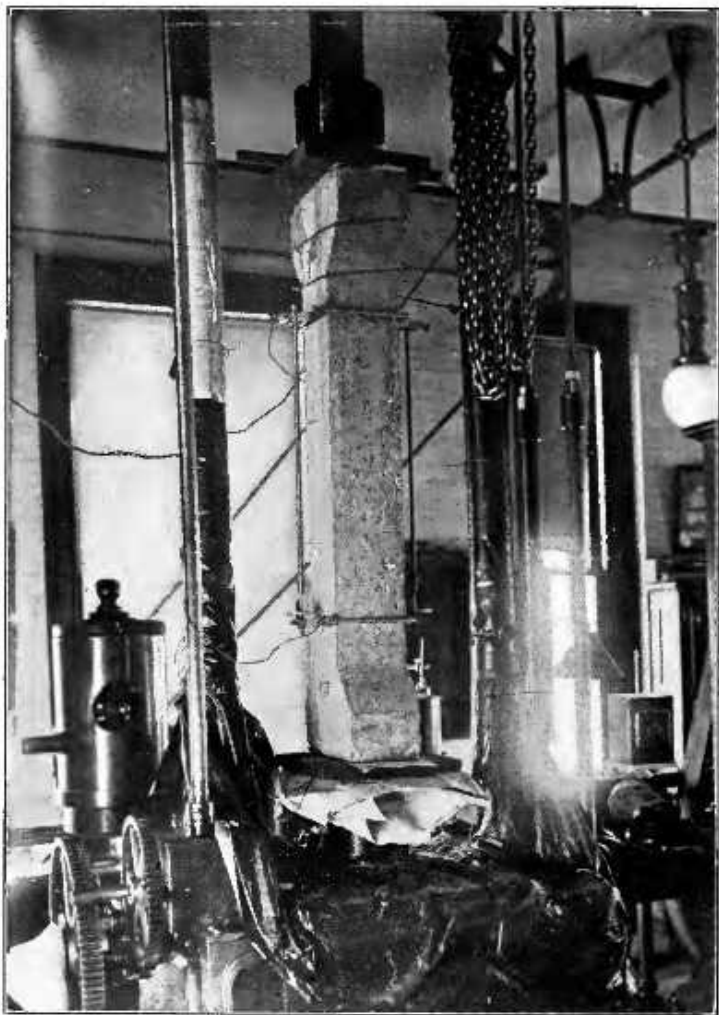
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MYRON S. FALK

**CEMENTS, MORTARS
AND CONCRETES, THEIR
PHYSICAL PROPERTIES**



Showing Method of Determining Elastic Behavior of Concrete Bars, 6x6-Inches in Cross-Section. Specimen, with Electric Extensometer Attached, Mounted for Compression in the 150,000 Pound Emery Testing Machine of Columbia University.

CEMENTS, MORTARS AND CONCRETES

THEIR PHYSICAL PROPERTIES

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GENERAL

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BY

MYRON S. FALK.

INTRODUCTION.

The purpose of this treatise has been to set forth as concisely as possible the physical properties of cement and cement mixtures, with principal reference to those properties which concern the engineer. The results of investigations made upon these materials have been examined with great care. Engineers desiring such data on cements, mortars and concretes, have hitherto been obliged to refer to numerous scattered articles and books. It has been the author's object to abstract, classify and summarize all the reliable data extant, filling in certain gaps with data of his own. The following headings outline, for the greater part, the scope of the work:

General Physical Properties:

- Changes in Volume When Setting.
- Coefficient of Expansion Due to Temperature Changes.
- The Action of Sea Water and Salt.
- Porosity and Impermeability.
- Effect of Freezing.
- Adhesion of Iron Rods to Cement Mixtures.
- Fatigue of Cement Mixtures.

General Elastic Properties:

Tensile and Compressive Properties.

- Coefficient of Elasticity.*
- Elastic Limit.*
- Ultimate Resistance.*

Flexural Properties.

- Coefficient of Elasticity.*
- Modulus of Rupture.*

Shearing Resistance.

The sources from which the experimental data have been obtained are furnished, in every instance, with those data; it is

therefore unnecessary to give separate credit to the various experimenters at this point. It is proper to say, however, that use has been made only of those results which gave evidence of careful work, so that no conclusions might be invalidated by reason of the unreliability of the experiments. Free use has been made of the Annual Reports of the Watertown, Mass., Arsenal, of the Transactions of the American Society of Civil Engineers, and of the Proceedings of the Institution of Civil Engineers of Great Britain. The experiments, not previously published, made under the author's direction in the laboratories of Columbia University, have also been included.

It is believed that the results obtained relating to the elastic properties of the material, such as the values of the coefficients of elasticity and the ultimate strengths, have been so analyzed that these values may be determined in advance, for any mixture, within small limits of error; but future experiments and future improvement in the manufacture of cement mixtures may cause considerable changes in these figures.

In order that a cement's physical peculiarities may be more clearly comprehended, it has been thought advisable to consider as a preliminary some of the chemical characteristics of cements. In connection with the discussion of chemical compositions, the theories of the setting of cements have therefore been analyzed, and it has been possible to abstract, in an appendix, Mr. Clifford Richardson's theory as to the constitution of Portland cements. In addition, a chapter, together with an appendix, treating briefly of the ordinary commercial tests has been included.

M. S. F.

August 22, 1904.

CONTENTS.

CHAPTER I.

CHEMICAL PROPERTIES OF CEMENT.

ART.	PAGE
1. Theories of Setting	1
2. Chemical Analyses.....	3
<i>Portland Cements</i>	3
<i>Natural Cements</i>	6

CHAPTER II.

PHYSICAL TESTS OF CEMENT.

3. Commercial Physical Tests.....	9
4. Specific Gravity Tests	10
5. Fineness Test.....	11
6. Test for Time of Setting.....	13
<i>Action of Plaster of Paris</i>	14
<i>Temperature Affects Time of Setting</i>	16
<i>Retarding the Set</i>	17
<i>Temperature Changes During Setting</i>	18
7. Tests of Tensile Strength.....	19
8. Ratio of Compressive and Tensile Strengths.....	26
9. Variations in the Making of Tensile Tests.....	29
10. Variations of Sands in Tensile Tests.....	30
<i>Effect of Clay in Sand</i>	34
11. Test of Constancy of Volume.....	39

CHAPTER III.

GENERAL PHYSICAL PROPERTIES.

12. Variation in Volume of Cement Mortars in Air and Water.....	40
13. The Coefficient of Expansion Due to Temperature Changes	43
14. The Action of Sea Water on Cements.....	45
<i>Strength in Sea Water</i>	47
<i>Gauging with Salt Water</i>	50
15. Porosity and Permeability.....	51
<i>Feret's Conclusions</i>	52
16. The Effect of Freezing on Cement Mixtures	55
17. Adhesion of Iron in Concrete.....	61
18. The Fatigue of Cement Mixtures	66

CONTENTS.

CHAPTER IV.	
ELASTIC PROPERTIES IN GENERAL.	
19. Treatment of Stress-Strain Curves.....	70
CHAPTER V.	
TENSILE PROPERTIES.	
20. Coefficient of Elasticity and Ultimate Resistance.....	75
<i>Conclusions</i>	97
CHAPTER VI.	
COMPRESSIVE PROPERTIES.	
21. Coefficient of Elasticity and Ultimate Resistance.....	99
22. Ultimate Compressive Resistance.....	121
<i>Setting Under Water</i>	130
<i>Wet or Dry Concretes</i>	130
<i>High Temperatures</i>	132
23. <i>Conclusions</i>	132
CHAPTER VII.	
FLEXURAL PROPERTIES.	
24. The Theory of Flexure as Applied to Concrete.....	142
25. Flexural Coefficient of Elasticity.....	144
26. Modulus of Rupture in Bending.....	149
27. Shearing Resistance and Conclusion.....	157
APPENDIX I.	
Report on Uniform Tests of Cement by the Special Committee of the American Society of Civil Engineers.....	159
<i>Sampling, 159; Chemical Analysis, 159; Specific Gravity, 160; Fineness,</i> <i>161; Normal Consistency, 162; Time of Setting, 163; Standard Sand,</i> <i>164; Form of Briquette, 164; Moulds, 164; Mixing, 165; Moulding,</i> <i>165; Storage of the Test Pieces, 166; Tensile Strength, 166; Constancy</i> <i>of Volume, 167.</i>	
APPENDIX II.	
Constitution of Cement.....	169
Index.....	171
Authors' Index.....	175