

*Significance
of Tests and
Properties of*

Concrete and Concrete-Making Materials

*Paul Klieger and
Joseph F. Lamond
editors*



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The quality of the papers in this publication reflects not only the obvious efforts of the authors and the technical editor(s), but also the work of these peer reviewers. The ASTM Committee on Publications acknowledges with appreciation their dedication and contribution to time and effort on behalf of ASTM.

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Foreword

This publication is a revision and expansion of *Significance of Tests and Properties of Concrete and Concrete-Making Materials (STP 169B)* published in 1978. That publication in turn replaced editions of *Report on Significance of Tests of Concrete and Concrete Aggregates* published in 1935, 1943, 1956, and 1966. The present publication includes a number of new materials and test methods which have been developed, or materials which have increased in importance since the 1978 edition. A most useful addition is the inclusion of two new chapters on cement prepared by authors who are members of ASTM Committee C1 on Cement. Previous editions did not contain chapters specifically devoted to cement.

As in the previous publications, chapters have been authored by individuals selected on the basis of their knowledge of their subject areas, and in most cases because of their participation in the development of pertinent specifications and test methods by ASTM Committee C9, and in some cases by ASTM Committee C1. Authors developed their chapters in conformance with general guidelines only. Each chapter has been reviewed and, where necessary, coordinated with chapters where overlap of subject matter might occur.

This latest edition, has been developed under the direction of the Executive Committee of ASTM Committee C9 on Concrete and Aggregates by coeditors Paul Klieger, Consultant on Concrete and Concrete Materials, and Joseph F. Lamond, Consulting Engineer, both members of ASTM Committee C9.

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Paul Klieger

Before establishing his own consulting firm in 1986, Paul Klieger was employed by the Portland Cement Association (PCA) for forty five years. Mr. Klieger received a BS degree in Civil Engineering from the University of Wisconsin at Madison. He is a registered Professional Engineer in the state of Illinois.

While at PCA, he accomplished research and development work relative to the properties of materials used in concrete and their influence on the strength and performance of concrete in a variety of environments. Special emphasis was placed on durability in severe environments such as freezing and thawing, sulfate soils and waters, and seawater. Other assignments dealt with problems associated with corrosion of reinforcing steel in concrete and possible deleterious reactions between cement alkalis and certain siliceous and carbonate aggregates.

While with the Construction Technology Laboratories, Inc. division of PCA, he managed and conducted contract research, development, and consulting activities related to evaluation of the performance of concrete and masonry in field structures, including laboratory studies required to resolve performance problems. His research included the suitability of cements, admixtures, and aggregates; sulfate attack; alkali-aggregate reactions; corrosion of reinforcing steel; seawater exposure; freezing and thawing, and deicer scaling; and the use of fly ashes, ground slags, and silica fume in concretes.

Mr. Klieger is a Fellow and Honorary Member of the American Concrete Institute, a Fellow of the American Society for Testing and Materials, and an Honorary Member of ASTM Committee C-9 on Concrete and Concrete Aggregates. He is also active with the Prestressed Concrete Institute and the Transportation Research Board.

Mr. Klieger continues his interests as a Consultant on concrete and concrete materials and serves as an expert witness in litigation.



Joseph F. Lamond

Since 1990, Joe Lamond has been a Consulting Engineer in Springfield, Virginia specializing in the field of concrete, concrete materials, and concrete construction. He received his Civil Engineering degree from the University of Massachusetts at Dartmouth and is a Registered Professional

Engineer in the Commonwealth of Massachusetts.

Mr. Lamond was employed by the U.S. Army Corps of Engineers and was involved in the design and construction of concrete materials for the Army, Air Force, and Civil Works projects. There he developed guide specifications and design criteria for mass concrete, roller-compacted and structural concrete for the construction of dams and flood protection concrete structures and rehabilitation of existing structures. He retired in May 1989 as Chief Materials Engineer.

Mr. Lamond was also Engineering Director for the Pyrament Division of Lone Star Industries, Inc. He was project manager for the structures program on chloride-induced corrosion in bridges for the Strategic Highway Research Program.

Mr. Lamond is a Fellow of the American Concrete Institute and served on the Board of Direction from 1989-1992. He is Chairman of the Fellows Nominating Committee and actively serves on five technical committees. As a member of the American Society for Testing and Materials he serves on seven subcommittees and is Chairman of the Subcommittee on Testing Concrete for Strength. Mr. Lamond is also a member of the Transportation Research Board, the International Concrete Repair Institute, and is listed in *Who's Who in Science and Engineering*.