



Natural Cement

Michael P. Edison
Editor

STP 1494



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Foreword

ASTM publications on hydraulic cement technology do not usually include treatises on American History, and historians do not often study the science and technology of hydraulic cements. Yet technology and history are inexorably interwoven, and that is nowhere more evident than it is in the field of historic restoration.

Historic restoration, by nature, is a multi-disciplinary undertaking, including both technical and historical components. Sound technical decision-making requires an understanding of historical practices, and sound historic preservation decision-making requires an understanding of the underlying materials science. Over the past 20 years, there has been a growing revival in the use of traditional materials for the restoration and maintenance of historic buildings and structures. Yet it is only recently that the pivotal role of natural cement in 19th and early 20th Century construction has been rediscovered.

Although there is a wealth of historical and technical documentation of past uses and practices for natural cement, some publications are rare, and not readily available to restoration practitioners. There are also technical challenges associated with incorporating traditional technology into contemporary work. New research is required to update our understanding of traditional materials and performance expectations must be redefined in terms of modern standards and testing protocols.

This STP is designed as a unique resource, providing historical and technical foundations in the original uses of natural cement, while disseminating current information on contemporary practices and results of recent research. The publication is divided into three sections:

1. Papers from the First American Natural Cement Conference, held in Rosendale, NY in March, 2005
2. Papers from the Second American Natural Cement Conference, held in Washington, DC in March, 2006
3. Supplemental Historical and Technical Resources

The conference papers are the first original material published on natural cement in more than 30 years. In joining them with the supplemental resources, this STP represents the most comprehensive work on the subject since the publication of *American Cements* by Uriah Cummings, more than a century ago. The supplemental resources were selected as follows:

ASTM C 10 - 06 Specification for Natural Cement

The current standard for natural cement, as of the time of this publication, was adopted on September 1, 2006. The reinstatement of one of ASTM's oldest standards was a critical step toward re-establishing natural cement within the mainstream of contemporary construction materials. While providing assurances that today's natural cement will meet the expected technical performance requirements, the standard maintains a strong historical connection to the traditional material.

Report of Committee C on Standard Specifications for Cement (1904)

In 1904, during the period predating establishment of the current system of standards numbering, Report of Committee C on Standard Specifications for Cement established comprehensive standards for natural and portland cements.

Excerpt: Internal Navigation, (1817)

The history of American natural cement began in the early 19th Century canal-building era. Young's 1817 compilation, *Internal Navigation*, provides a snapshot of the state of technology in canal construction and operation at the time just prior to the commencement of construction of the Erie Canal and the discovery of natural cement rock in Fayetteville, New York. The excerpt details the earlier uses of Dutch trass in lime-pozzolan mortars for canal construction, and predicts that the limestone materials required to produce hydraulic mortars will be found in New York State.

Excerpt: Essays on Hydraulic and Common Mortars and on Lime-Burning, (1838)

The adoption of natural cement technology for use in construction of seacoast fortifications can be largely attributed to the work of Colonel Joseph G. Totten of the Corps of Engineers. Working at West Point and at Fort Adams in Newport, Rhode Island, Totten experimented with various forms of lime and cement over the course of 13 years of construction. His conclusions, published in 1838, heavily favored the use of natural cement from Rosendale, NY. Totten also favored the use of lime hydrates over lime putty, for structural applications, based on its superior performance in his experiments.

Excerpt: Handbook of Railroad Construction; for the use of American Engineers, (1857)

The practices for use of natural cement in the mid-19th Century are concisely summarized in an excerpt from the 1857 *Handbook of Railroad Construction*. It provides a formulary for natural cement mortars, concretes, stucco, grout and coatings, and includes a clear reference to the early practice of using hot-mixed hydrated lime in American engineering construction.

Excerpt: American Cements, Uriah Cummings, 1898

In the late 1890s, natural cement production was at its peak, with some 70 producers operating in 15 states. At the same time, American portland cement was rapidly gaining market share, and Cummings, a natural cement producer, sought to defend what he saw as the superior durability and performance of natural cement.

In his closing arguments, he cites the wonderful record of natural cement, listing several hundred prominent buildings and structures and identifying the sources of the natural cement with which they were built. This list is reproduced as a valuable reference, as many of these buildings and structures remain standing today, and some will undoubtedly endure for centuries to come. A number of these structures have been the subjects of recent maintenance efforts, and in each case the forensic evidence has confirmed Cummings representations.

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