



The Third American Natural Cement Conference

Genesee Grande Hotel

Syracuse, New York

September 5-7, 2007

The Birth of the American Cement Industry: Central New York and the Erie Canal

Hands-On Natural Cement Workshop

Chittenango Landing Canal Boat Museum

Chittenango, New York

September 8, 2007



**The Society for the Preservation of Historic Cements
and The Historic Preservation Planning Program in the
College of Architecture Art and Planning at Cornell University**

ANCC is presented by :

The Society for the Preservation of Historic Cements
and The Historic Preservation Planning Program at Cornell University

In association with:

The Cornell University Departments
of City & Regional Planning and Civil Engineering,
The Onondaga Historical Association,
The National Council for Preservation Education,
American Society for Testing and Materials
and The Association for Preservation Technology Northeast Chapter

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Bob Rodriguez, Hueber-Breuer Construction Co., Inc.
The Erie Canal Museum
The Syracuse Convention & Visitors Bureau

Conference Committee:

Jeffrey M. Chusid
Kristen Olson
Maya Haptas
Sara Johnson
Beth Crawford
Randy Crawford
Michael Tomlan
Kenneth Uracius
Mark Soeth
Dennis Connors

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Wednesday, September 5

2 - 5 pm

Session 1: Fundamentals Short Course: Tiffany Ballroom,
Genesee Grande Hotel (3 AIA/CES LUs)

The Basics of Masonry and Natural Cement
Kenneth Uracius, Stone and Lime Imports

As the European Lime Revival reached the United States, Ken Uracius became a student of traditional lime, lime putty and hydraulic lime technology and an active advocate of the use of historically accurate materials in restoration work. He soon came to realize that American buildings were very different in their construction, thus beginning his quest for the forgotten truth. The history and technology of natural cement use in the United States that he rediscovered led to the recent introduction of authentic Rosendale natural cement products for use in restoration. In recounting his quest, Ken connects the dots between the technology, the people and the places where natural cement was used.

6 - 8 pm

Opening Reception and Keynote: Tiffany Ballroom,
Genesee Grande Hotel (2 AIA/CES LUs)

Introduction
Jeffrey M. Chusid, Cornell University

Welcome
Cynthia Field, President, SPHC

Syracuse and the Canals
Dennis Connors, Onondaga Historical Association

Syracuse's heritage was linked to the Erie Canal from its inception. The city's historic 19th century salt industry was, in many ways, a major catalyst for construction of the canal. Syracuse's location also made it ideal for connecting the "Grand Canal" with Lake Ontario via the Oswego Canal of 1828. And despite the removal of both canals through the city in the 1920s, there is still a considerable physical presence shaped by these canals, including one virtually unknown, triple-arched 1838 stone culvert in the heart of downtown.

*A late 19th-century view
of the Erie Canal running
through Syracuse at Clinton
Square.*



Thursday, September 6

8:00 am

Breakfast: Tiffany Ballroom, Genesee Grande Hotel

*Cement Kiln and
Quarry, Manlius NY
circa 1900*



9:00 am

Plenary Session: Tiffany Ballroom, Genesee Grande Hotel

The Race to Discovery

Michael Tomlan, Cornell University

The Race to Discovery of natural hydraulic cement is really a story of Man's continued pre-occupation with the nature of this material and how it works best. The narrative includes several parts, including the efforts of late twentieth-century investigations searching for what might have taken place during the early nineteenth century. This story centers on what the principal historical figure, Whitesboro (Oneida County) engineer Canvass White, knew, when he knew it, how he knew it, and what role he played in the dissemination of the knowledge of the material.

10:00 am

Session 2: History: Tiffany Ballroom,
Genesee Grande Hotel

Perspectives on the American Natural Cement Revival: ANCC1 & 2
Leya Edison, Rosendale Natural Cement

Publication by ASTM International is pending for STP 1194, a 320-page collection of 11 papers from the First and Second American Natural Cement Conferences. This presentation revisits the two earlier conferences, and introduces the forthcoming book on natural cement, the most comprehensive publication on this subject in more than a century.

Totten and Gillmore: Natural Cement and the Origins of Building
Science in the US

Jeffrey Chusid, Cornell University

Natural cement was an important solution to needs arising from 19th century American Economic Development and Defense. The value and efficacy of the material beyond its initial use in the Erie and Delaware and Hudson

Canals was largely established by two army generals, who played an enormous role in the historical understanding and use of the material in the course of significantly advancing the science and art of building technology in the United States.

Military Fortifications: Lessons Learned
Douglas Cubbison, Fort Drum

Between 1885 and World War II the United States Army constructed a large number of massive concrete coastal defensive fortifications. In 2005 the US Military Academy prepared a preservation study of these fortifications for the US Department of Defense. Inspections of a number of these fortifications indicated that vertical water infiltration from earthen parapets is not a serious source of water damage. Rather, the overwhelming majority of water infiltration into these fortifications is through horizontal surfaces. Accordingly, an approach was developed to validate that a cost effective strategy can be developed to resolve horizontal water infiltration in this type of fortifications.

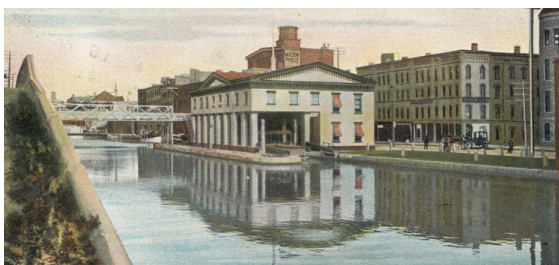
11:30 am

Session 3: Finding and Identifying Natural Cement

Bus Tour and Demonstration: Syracuse, the Weighlock Building and the Jamesville Quarry (Box Lunch Included)
John Walsh, Testwell Laboratories, and
Kenneth Uracius, Stone and Lime Imports

Syracuse is the birthplace of American cement, but what is natural cement rock? Kenneth Uracius and John Walsh will guide us through the national distribution of natural cement down to the microscopic features that make American cement unique.

*Weighlock Building
(Erie Canal Museum),
Syracuse NY*



Petrographic analysis is a microscopy method that provides a unique and revealing view of inorganic materials. Hydraulic cements rarely react completely and telltale residuals are detected when the forensic petrographer is properly trained in their identification. Combined with accurate chemical analysis, the petrographic examination not only identifies the original components but often allows for a quantitative assessment of material proportions and original binder chemistry. Such data is crucial for the proper conservation and rehabilitation of historic structures. Portland cement, hydraulic lime, and natural cement in any combination may be present in

19th century and early twentieth century masonry construction. A comprehensive petrographic examination serves as the basis for the successful creation and implementation of an historically accurate project specification.

2:30 pm

Session 4: Technology:

University United Methodist Church
(Across Genesee Avenue from the Hotel)

What We Do and Don't Know
Norman Weiss, Columbia University

The recent resurgence of interest in American natural cements comes at a time when many potential users, particularly in the field of building conservation, demand technical data to support the decision-making process. Scientific studies are relatively few in number, largely because the peak use of the material was in an era prior to the development of modern instrumental methods of analysis. Engineering data are more plentiful, but were often published in reports and journals that have been somewhat overlooked. A review of this information further suggests that the historical inter-relationship of the natural cement and portland cement industries in this country is of considerable complexity.

Using the New ASTM Standards
Michael Edison, Edison Coatings, Rosendale Natural Cement

ASTM C 10 Standard Specification for Natural Cement, one of ASTM's oldest standards, was reinstated in 2006 after a 28-year hiatus. This paper reviews the current Natural Cement standard, and details how it is designed to assure that today's natural cements are the same as the historic materials, in both composition and performance. Pending and potential future revisions to the standard are discussed, and its usefulness in engineering and architectural specification work is illustrated.

Panel Discussion: Preservation Ethics and Material Authenticity
Norman Weiss, Ken Uracius, John Walsh, Michael Edison,
Michael Tomlan, Cynthia Field

Does specifying a particular binder matter? Are we looking to natural cement for product performance, historic use, resource longevity or something else, more intangible, such as integrity or authenticity?

5:30 pm

Walking Tour of Downtown Syracuse

Led by Dennis Connors
(Limited Attendance Event. Sign up by 11:30 am)

Total AIA/CES LUs for Thursday: 8.5

Friday, September 7

8 am

Breakfast, Tiffany Ballroom, Genesee Grande Hotel



*Detail of the
Onondaga County
Courthouse,
Syracuse*

9 - 4 pm

Session 5: Significant Sites in Cement History and Use

Bus Tour to Onondaga County Courthouse, sites in Fayetteville, and along the Erie Canal, with Lunch, Tour and Demonstration project at Chittenango Landing Canal Boat Museum. Beth Crawford, Rich Applebaum, Joan Dichristina, and Kenneth Uracius

Bus leaves Genesee Grande hotel at 9 am,
Returns via Syracuse Hancock Airport by 4 pm, hotel by 4:30

Total AIA/CES LUs for Friday: 6.5

Saturday, September 8

9 - 4 pm

Natural Cement Hands-On Workshop

Chitenango Landing Canal Boat Museum
Kenneth Uracius

(8 AIA/CES LUs)

(Separate Registration required for this day.)

Discussion, production, and use of lime, hydraulic lime, natural cement, and early Portland cement. The class will slake lime and quick lime as was done by Totten at Fort Adams in 1828. This material will be used as a binder alone and mixed with natural cement. Pointing will be discussed in relation to what was done in the 19th century in the United States (not Europe) and applied to brick and stone mock-ups.

Natural Cement Rock, Jamesville



About the Presenters

Richard L. Applebaum, P.E., SECB, is a principal with Klepper Hahn & Hyatt Structural Engineers & Landscape Architects. Mr. Applebaum holds a Bachelors of Architectural Engineering degree from The Pennsylvania State University and has been employed with Klepper Hahn & Hyatt since 1978. Mr. Applebaum specializes in structural engineering of architectural structures, as well as structural and building envelope restoration of historic and older buildings. Notable projects include the structural renovation of Blair House, in Washington D.C., facade restoration of Crouse College at Syracuse University, East Halls, West Halls and Alumni Hall at Colgate University, and the Onondaga County Courthouse in Syracuse, NY.

Jeffrey Chusid is a preservation architect and faculty member in the Historic Preservation Planning Program at Cornell. He has taught at Harvard, the University of Southern California, and the University of Texas, as well as lecturing, writing and curating exhibitions on modernism, the work of Frank Lloyd Wright, and the fate of historic resources in areas of cultural exchange and conflict. His professional practice includes preservation planning, treatment of cultural landscapes, building conservation, and new architectural design; the projects themselves being located in California, Texas and New York in the US, as well as China, Ukraine, Bosnia, and Fiji. His interest in cement stems from more than a decade of work with the (concrete) textile-block houses of Frank Lloyd Wright in Los Angeles.

Dennis J. Connors has worked in historical agencies since 1972 and as curator for history for the Onondaga Historical Association since 1999. He was employed originally by the OHA from 1992 to 1999 as its Executive Director, until the new curator of history position was created. Previously he was the Supervisor of Historic Resources for Onondaga County Parks where he oversaw operations for the Salt Museum, Pioneer Museum and Ste. Marie among the Iroquois site. He helped conceptualize and manage the \$2.5 million renovation of Ste. Marie during 1989-1991. Dennis has a BA in History with a concentration in Museum Studies from the State University of NY at Buffalo. He has served on the board of the Onondaga Citizens League, is a long-standing member of Thursday Morning Roundtable and is a past member and chair of the Syracuse Landmarks Preservation Board. He recently served as a contributing author and editorial advisory board member for the New York State Encyclopedia Project. He has authored and edited four books on Syracuse area history.

Elizabeth L. (Beth) Crawford is a Senior Associate with Crawford & Stearns • Architects and Preservation Planners of Syracuse and has been a Designer and Project Manager with the firm since 1983. She has participated in the preservation, documentation, and rehabilitation of hundreds of buildings across New York State. Beth's responsibilities include project coordination, building documentation, and interior use planning and design. Ms. Crawford has participated as a team member on numerous historic building condition assessments and historic structure reports including the 1856 Octagon House (Camillus, NY), the 1767 Glebe House (Poughkeepsie, NY) and was the project manager for the renovation and restoration of the Harriet May Mills House in Syracuse. Beth is an extremely active volunteer with area preservation groups, serving as Vice-President of the Preservation Association of Central New York. In addition, Ms. Crawford is an Adjunct Instructor at Syracuse University where she teaches two required preservation courses in the Department of Design.

Douglas R. Cubbison is the Command Historian with the 10th Mountain Division, Fort Drum, New York. Previous to this he was the Cultural Resources Manager for the U.S. Military Academy, West Point, New York for five years. Mr. Cubbison is a 1980 Distinguished Military Graduate of Indiana University of Pennsylvania. He possesses ten years of active duty and active reserve military experience, leaving the inactive reserves as a Major, Field Artillery, U.S. Army. Mr. Cubbison has four years experience serving as a test engineer with Department of Defense strategic and tactical weapons systems and over fifteen years experience performing National Environmental Policy Act (NEPA), National Historic Preservation Act (NHPA), and Cultural Resources Management regulatory compliance for Department of Defense, Federal, State, Local and Private testing, research & design, and construction programs. Mr. Cubbison also has significant experience advising Federal, State, Local and Private agencies and organizations in the preservation, interpretation and development of historic, natural and recreational facilities and parks. He has been active in 18th and 19th century living history since 1971, and is currently the U.S. Commander of the Company of Select Marksmen and operator/proprietor of the 18th Century William Pitt Tavern and 19th Century White Star Saloon. His areas of particular interest are 18th and 19th Century American Military and Social History.

Leya L. Edison is Vice President and General Manager of Edison Coatings, Inc. in Plainville, CT, currently manufacturing Rosendale natural cement. She served as Conference Moderator of the First and Second American Natural Cement Conferences, and authored the Foreword for the pending ASTM Natural Cement book. She is a member of ASTM Committee C1.10 on hydraulic cement and is a Director of the Society for the Preservation of Historic Cements, Inc. She holds a BSN degree from Florida State University and has done postgraduate work in an unrelated field.

Michael Edison, chemical engineer, is President and Founder of Edison Coatings, Inc. in Plainville, CT. His engineering career spans more than 30 years, during which he has worked in the development and formulation of custom mortars and coatings for stone, masonry and concrete. Edison Coatings is currently processing Rosendale natural cement rock into natural cements, and is compounding these materials into a variety of traditional masonry mortars, renders and concrete materials. Edison has authored a number of articles on repair and coatings technology and has been a frequent lecturer at restoration industry events. He has had technical articles published by APT Journal of Preservation Technology, ICRI Concrete Repair Bulletin, Journal of ASTM International and SWRI Applicator, among others. He is a past chairman of the Central New York Section of the American Institute of Chemical Engineers, a Past President of the Connecticut Chapter of the International Concrete Repair Institute and a current Director on the Board of the Association for Preservation Technology Northeast Chapter. He chairs ASTM Task Group C1.10.04 on Natural Cement.

Cynthia Field graduated from Bryn Mawr College and earned the M.A. and PhD at Columbia University. With her interest in museums and architectural history, she applied for and received a post doctoral fellowship at the Smithsonian Institution. That post doc evolved into the position of Chair, Architectural History and Historic Preservation at the Smithsonian, from which she retired in 2006. She is presently Architectural Historian Emeritus at the Smithsonian. While directing this program, she continued to conduct research, publish, and teach. Recent publications for which Field both wrote and edited include the books *Adolf Cluss: Architect, from Germany to America* (2005), *The Mall and the Nation*, (2008), *Paris on the Potomac*, (2007), *The Castle; An illustrated History of the Smithsonian Building*, (1993). Her preservation work on Smithsonian buildings led her to develop an interest in nineteenth century building materials. Dr. Field is also an adjunct professor at the Corcoran College of Art and Design, and a Board Member of the National Building Museum and Society of Architectural Historians.

Michael Tomlan, a historic preservationist expert in building conservation technology, documentation methods for preservation, and the history of the preservation movement, directs the Graduate Program in Historic Preservation Planning at Cornell. He is project director of the National Council for Preservation Education and a member of the editorial advisory boards of several journals, including the *International Journal of Heritage Studies*. Dr. Tomlan serves as Advisor to the Global Heritage Fund and has consulted on projects for the World Monuments Fund, the J. Paul Getty Trust, and rehabilitation and restoration projects in Arizona, New Jersey, Illinois, Indiana, Maryland, Tennessee, New York, and Pennsylvania. Since 1992, he has been president of Historic Urban Plans, Inc., an Ithaca-based business. In 2005, he was elected to the College of Fellows of the Association for Preservation Technology International.

Kenneth Uracius has been working around masonry for all of his life, and has 20 years of experience in directing major masonry construction and restoration projects. He is currently with Stone and Lime Imports, a firm dedicated to mining, promotion, distribution and technical support and training for traditional masonry materials.

John Walsh is a former NSF Graduate Research Fellow with a Masters Degree in Structural Geology from Columbia University. His early research focused on carbonate microstructure in natural fault zones; an experience ultimately leading to a career studying the microstructure of cementitious materials. He is now a Geologist and Senior Petrographer at Testwell Laboratories in Ossining, NY where he specializes in the reverse engineering of existing materials and investigating failures related to material deficiencies and environmental exposure. He is currently serving as Secretary of the Society of Concrete Petrographers and is active in various ASTM subcommittees. As a native fifth generation New Yorker, the investigation of construction materials and practices in historic NYC structures was a natural progression in John's career. He is currently researching the petrography and chemistry of the Rosendale cement that has played an important role in many of New York's landmarks and early infrastructure.

Norman R. Weiss is a technical specialist in the analysis and preservation of traditional building materials. Trained as an analytical chemist, he is recognized for his activities in the field of masonry cleaning and repair. He has worked on hundreds of stone, brick and terra cotta buildings, principally in North America. Among his best known projects are the west front of the U.S. Capitol, New York's Trinity Church, and Frank Lloyd Wright's masterpiece, Fallingwater. His current research is in the consolidation of limestone and marble. He has taught at Columbia University since 1977, and is a frequent lecturer for the National Park Service, and for preservation societies and masonry industry organizations throughout the United States. Prof. Weiss is Vice President of MCC Materials, Inc.



HYDRAULIC CEMENT: ITS PROPERTIES, TESTING, AND USE.

By FREDERICK P. SPALDING, Assistant Professor of Civil Engineering at Cornell University Member of the American Society of Civil Engineering.

FIRST EDITION. FIRST THOUSAND.

NEW YORK: JOHN WILEY & SONS. LONDON: CHAPMAN & HALL LIMITED 1898.

ART. 13. NATURAL CEMENTS.

The term Natural Cement is commonly employed to designate a large number of widely varying products formed by burning natural rock without pulverization or the admixture of other materials. These cements are usually of higher hydraulic index than the Portlands, and consequently more lightly burned. The index varies from about 60/100 to 150/100.

The quick-setting natural cements, or Roman Cements as they are called in Europe, are obtained by burning, at a comparatively low temperature, argillaceous limestones of rather high index. These cements are usually characterized by a very rapid set, and slowness in gaining strength subsequently. The feeble burning gives incomplete reactions, and the formation of the silicates of lime is not so complete as in the heavily burned Portland cements. A considerable percentage of aluminate of lime is present, which is the cause of the quick set, and there is usually a strong proportion of sulphate of lime, which is regarded as a necessary ingredient having the tendency to make the set more slow, where it might otherwise be too rapid for practical use. Some unburned material is also commonly present in such cements, remaining as inert matter. Material of this character becomes inert when the temperature of burning is increased to the point where the chemical reactions would become complete, the heavy powder previously mentioned being formed at a much lower temperature than in cement containing a higher percentage of lime. Table III gives results of analyses of a number of the leading European Roman cements collected from various sources, and showing the ordinary range of variation in composition for good material.

The semi-slow-setting natural cements of Europe are often known as Natural Portland Cements. These are often of a composition quite similar to Portland cement, but usually have a higher hydraulic index and are given a somewhat lighter burning. They are, however, more heavily burned than the Roman cements. Limestones in nature are not so homogeneous as the artificial mixtures used in making Portland cement, and the proportion of lime cannot be so great as in the more homogeneous mixtures without danger of producing an objectionable quantity of free lime in the cement. The use of material of this character, therefore, requires much care in order to produce good results. As the hydraulic index becomes greater the homogeneity becomes less important, as free lime becomes less likely to occur and less dangerous, and irregularities only have the effect of increasing the quantity of inert matter, which causes mortar made from the cement to gain strength much more slowly than with Portland cement of low index. It is to be observed that the material spoken of as inert, and which delays the gain in strength in the early period of hardening, may not be altogether inert, and may contribute to the final strength of the cement, as it is of a puzzolanic character and perhaps ultimately combines with the hydrated lime in the mortar.

These cements occupy an intermediate position between the artificial Portland cements and the Roman cements, and may approach either in composition. In fact, the same raw material may frequently produce either if burned lightly giving the quick-setting Roman cement, or burned more heavily a slow-setting natural Portland. Heavy burning increases the amount of silica combined with lime at the expense of the aluminates, thus relaxing the rapidity of set and increasing the early strength of the mortar.

The Llagnesian Natural Cements are those in which a portion of the lime of the Roman cement is replaced by magnesia. Very little is known as to the action of the magnesia in these cements. It seems probable that the magnesia replaces lime or combines with it in the formation of double silicates and aluminates, and that it bears some part in the setting and hardening of the mortar. That certain magnesian salts possess hydraulic properties is well known, their action according to M. Fremy being probably much slower than the corresponding lime-salts. The action of cements of this class is somewhat similar to that of Roman cements: they gain strength very slowly, but may be either quick or slow setting. The composition of the magnesian cements varies from that of the Roman cements to one in which the proportion of magnesia is as large as that of lime. As the proportion of magnesia to

lime increases, the hydraulic index, considering magnesia as lime, frequently decreases and becomes less than would be admissible in Roman cement.

Magnesian cements are but little used in Europe, but in the United States they form the largest part of the natural cements in use, and many of them have been found by experience to be very useful and reliable materials. The Rosendale cements are of this character. The rock from which these cements are made differs greatly in character in the same locality, and in the different strata of the same quarry. In some of the works the nature of the product is regulated by mixing in proper proportions the clinker obtained by burning the rock from different strata. Each portion of rock must be burned in such degree as is suited to its composition, and hence as the material is not pulverized before burning it must be burned separately and mixed afterward. To produce uniformly good cement, therefore, requires close and careful attention; and for this reason there is often considerable difference in the quality of cement made by works in the same locality and from very similar material.

Cement of high index, unlike Portland cement, is usually materially changed by age. When these cements are kept exposed to the air for a considerable length of time, they gradually become slower-setting and perhaps eventually lose the power of setting altogether", sometimes becoming puzzolana, which again becomes active cement by reburning.





