

Building Stones of America: 50 Years of the NIST Stone Test Wall

by

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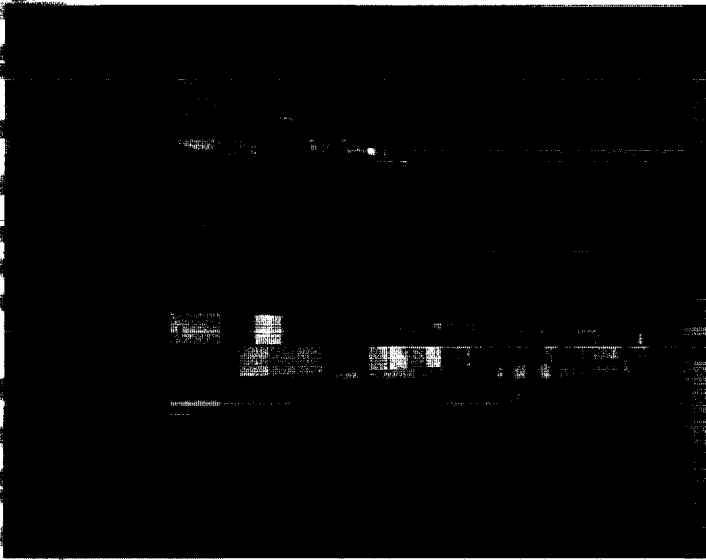
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NIST

National Institute of Standards and Technology
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Stone wall at the NIST Gaithersburg site, Fall 1992.

Smithsonian Institution.

In 1942, a committee was appointed to consider whether any worthwhile use could be made of the collection. It was decided that a study of actual weathering on such a great variety of stone would yield valuable information. A plan was developed for building a test wall at the National Bureau of Standards (NBS) as a cooperative study between NBS and ASTM Committee C-18 on Building Stone. Subsequently, in 1948 a test wall was constructed at the NBS site in Washington DC.²

The move of NBS in the middle 1960s and the occupancy of the old NBS site by the University of the District

are from 16 foreign countries. The wall is constructed in a mirror-image pattern with the left-wall stone set in lime mortar and the right-wall stone set in portland cement mortar. Over 30 distinct types of stones are represented, some of which are not commonly used for building purposes. There are many varieties of the common types used in building such as marble, limestone, sandstone, and granite.

The wall provides a rare opportunity to study the effects of weathering on different types of stones, as the climatic conditions are the same for all stones. It offers a comparative study of the durability of many common building stones that have been used in monuments, commercial and government buildings. Also, the wall has preserved a valuable collection of building stone and should be useful as a reference for builders in identifying the kinds of stone that may be locally available. As the wall passes half a century in age, interesting degradation features have been observed.³

In 1998, the Inorganic Building Materials Research Group of the Building and Fire Research Laboratory (BFRL) in NIST started a project to evaluate and document the changes due to 50 years of weathering. The project is supported by a 1998 Preservation Technology and Training Grant.

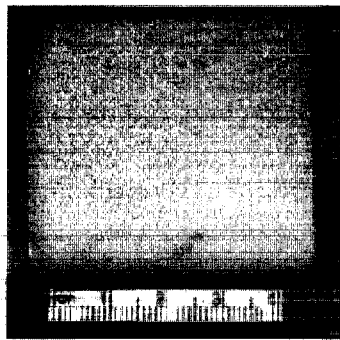
This study involves three distinct tasks: 1) development of a methodology to image and describe degradation features of stone and mortar, application of the methodology in creation of a database containing

of Columbia placed the wall in jeopardy. It was moved intact in May 1977 to its present site at NBS, now the National Institute of Standards and Technology (NIST) in Gaithersburg, Maryland.

The purpose of the stone test wall is to study the performance of stone subjected to weathering. It contains 2,352 individual samples of stone, 2,032 of which are domestic stone from 47 states, and 320

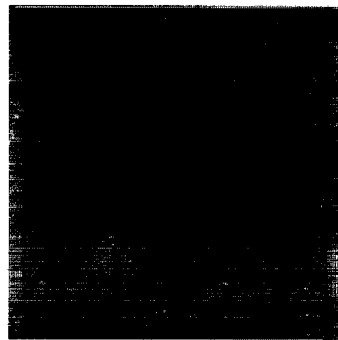
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In 1880 the Census Office and the National Museum in Washington, DC conducted a study of building stones of the United States and collected a set of reference specimens from working quarries. This collection was merged with the Centennial Collection of US Building Stones that was first displayed at the 1876 Centennial Exhibition in Philadelphia. Descriptions of producing quarries, commercial building stones, and their use in construction across the country were compiled and reported in the 10th



Archived Ohio Sandstone

census of the United States in 1880.¹ This collection of stones, now augmented with building stones from other countries, was placed on display in the



Same stone in wall.

¹ G.W. Hawes, "The Building Stones of the United States and Statistics of the Quarry Industry," in Report of the 10th Census of the United States, Vol. 10, 1880, 399 pp.

² D.W. Kessler and R.E. Anderson, "Stone Exposure Test Wall," Building Materials and Structures Report 125, 1951, National Bureau of Standards.

³ P.E. Stutzman and J.R. Clifton, "Stone Exposure Test Wall at NIST," in Proceedings of Degradation of Natural Stone, J.F. Labuz, ed., American Society of Civil Engineers Annual meeting, Minneapolis, MN, 1997.

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detailed descriptions of the wall and archived stone specimens, and making that database publicly available through digital media and Internet access; 2) detailed petrologic studies of the archival and selected wall micro-core specimens to characterize them with respect to their texture and mineralogy; and 3) correlation of mineralogical and micro-structural features with stone performance, and comparison to performance of similar stones from the same producer that have been used in building construction.

The project consists of creating an archive of images of both the actual stone in the wall and all the archive specimens that have been stored indoors. Development of a database allows organization of the images and stone descriptions and easy access to the data. This database will be updated as new data become available, i.e. microscopic investigation of the stone texture and mineralogy, photographs of buildings constructed

with these particular stones, and any other research related to the stones.

Approximately two-thirds of the stones in the wall have an archival companion specimen that has been imaged and added to the database. The database allows users to search for the different stones using several categories: state or foreign country, the stone type, or a specific stone number. It is also easy to browse around the wall just by clicking on the wall's picture; the user gets a display of all the database information and two images, one of the indoor specimen and one of the specific archival stone in the wall. The database will be accessible through the Internet in a few months.

Previous studies of the stone collection provide a brief description of rock type and source of the stones used in the wall but not images and descriptions of their mineralogical, textural, or surface characteristics. The detailed stone descriptions and images will serve as a baseline from which to evalu-

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ate their resistance to weathering in subsequent studies. Additionally, the database will assist preservation specialists, stone conservators and historic preservation architects with an interest in stone, weathering effects, and historical collections to access image and descriptive data of a large number of specimens, while providing detailed images, stereoscopic image sets and descriptive text detail not previously possible. In subsequent studies, petrologic analysis will improve our understanding of the influence of the various weathering agents upon a wide variety of stone, our understanding of the stone degradation processes and our selection of appropriate preservation measures.

— Paul E. Stutzman and Jaime Raz

Mr. Stutzman operates the Building and Fire Research Laboratory's microstructure laboratory at the National Institute of Standards and Technology. His research interests include the microstructural characterization of cement clinker, high performance concrete, mortar and dimension stone.

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