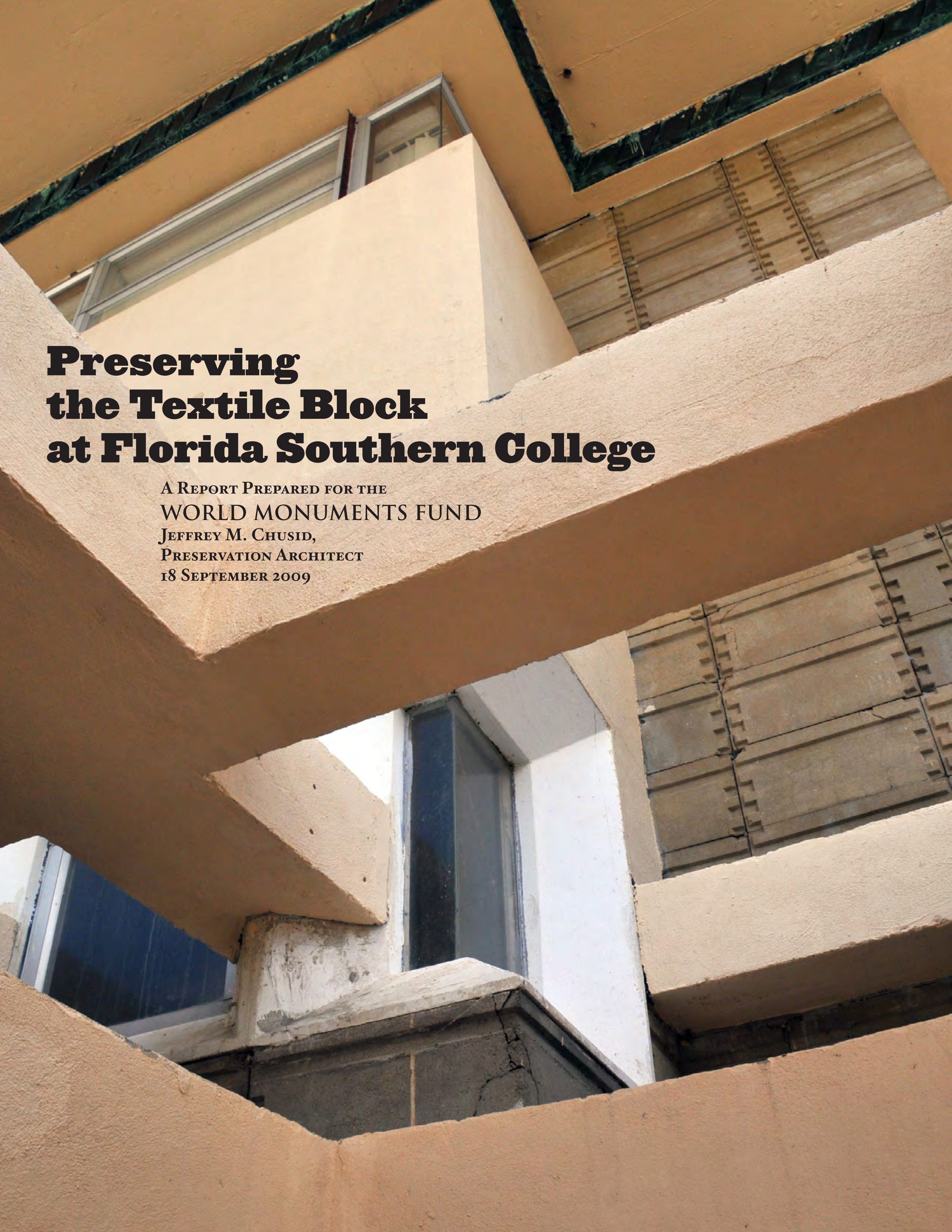

Preserving the Textile Block at Florida Southern College

A Report Prepared for the
WORLD MONUMENTS FUND
Jeffrey M. Chusid,
Preservation Architect

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Contents

WORLD MONUMENTS FUND

In April 2009, World Monuments Fund was honored to convene a historic gathering of historians, architects, conservators, craftsmen, and scientists at Florida Southern College to explore Frank Lloyd Wright's use of ornamental concrete textile block construction. To Wright, this material was a highly expressive, decorative, and practical approach to create monumental yet affordable buildings. Indeed, some of his most iconic structures, including the Ennis House in Los Angeles, utilized the textile block system. However, like so many of Wright's experiments with materials and engineering, textile block has posed major challenges to generations of building owners, architects, and conservators who have struggled with the system's material and structural performance.

WMF was honored to include Florida Southern Historic Campus on our 2008 World Monuments Watch. The nomination was compelling for both the technical conservation challenges it presented and the opportunity to bring wider attention to this under-recognized site. Thanks to the strong and enlightened leadership of Dr. Anne Kerr, FSC has taken important and decisive action to address conservation challenges while growing a competitive, 21st century academic environment. Under Kerr, FSC was awarded a prestigious Getty Campus Heritage Grant that resulted in a thorough report by Mesick, Cohen, Wilson, Baker. In addition her many other advocacy efforts, this set the stage for a 2009 Save America's Treasures award for the second-phase restoration of the Annie Pfieffer Chapel—the most elaborate and iconic Wright-designed structure on campus. Our convening was aimed at assisting FSC to address the long-term preservation needs of the textile block at Annie Pfieffer Chapel and other Wright-designed structures on campus, and to share those findings with the larger Frank Lloyd Wright conservation community.

This report represents the discussions and preliminary findings of the gathering at FSC. Included in the report is a scope of work for subsequent material investigation of the textile block structures at FSC. I am pleased to report that this scope was recently approved by the National Park Service as an appropriate match to the SAT award and that WMF will commence work immediately. Once that work is concluded, we will again share our findings with the international community, hoping to advance our collective understanding of Wright's genius and the methods and materials best suited to protection his textile block structures.

WMF is grateful for the extraordinary time and expertise our participants shared during our two-day gathering in Lakeland. It was especially gratifying to have Eric Lloyd Wright and Arnold Roy share their firsthand discussions with Frank Lloyd Wright. We hope you find the report both stimulating and anticipatory of the work that lies ahead.

Sincerely,

Bonnie Burnham

Bonnie Burnham
President

350 Fifth Avenue, Suite 2412 | New York, NY 10118 | Tel 646-424-9594 | Fax 646-424-9593 | www.wmf.org

FLORIDA SOUTHERN
COLLEGE

In April 2009, Florida Southern College had the honor of welcoming to our campus many of the world's foremost experts on Frank Lloyd Wright's textile blocks. I am immensely grateful to the World Monuments Fund for convening the Textile Block Symposium, the first ever to address the preservation and long-term conservation of Mr. Wright's extraordinary legacy of textile block designs.

Florida Southern College comprises the largest single site collection of Frank Lloyd Wright structures in the world, and the ideas generated from the Textile Block Symposium will have a profound and lasting impact on Mr. Wright's only college campus. At the same time, I am delighted that the ideas and work inspired by the Symposium promise to have far-reaching applications for the many other beautiful textile block structures produced during Mr. Wright's prolific and celebrated career.

I wish to thank Bonnie Burnham for her exemplary leadership to focus international attention on our world's great treasures and her vision to bring together noted architects, scientists, artists, and scholars to ensure their enjoyment by future generations. It was a privilege to serve as the host site for the Textile Block Symposium, and Florida Southern College looks forward to partnering with the World Monuments Fund on the exciting textile block initiative in the months and years ahead.

Sincerely,

Anne B. Kerr

Anne B. Kerr, Ph.D.
President

Anne B. Kerr, Ph.D.
Office of the President • 111 Lake Hollingsworth Drive • Lakeland, FL 33801 • (863) 680-4100 • fax (863) 680-5096
akerr@flsouthern.edu • www.flsouthern.edu

Executive Summary

The twelve buildings Frank Lloyd Wright designed for Florida Southern College comprise not only the largest single collection of his built work in one location, but the largest single example of the textile-block construction system—Wright's 35-year experiment in developing a new method of building for the modern era. The structures that resulted from using this system, however, today constitute one of the greatest preservation challenges in modern architecture. This report briefly describes the system and its history, previous preservation efforts at other textile-block sites, and then presents the findings of a symposium held at Florida Southern College under the auspices of the World Monuments Fund.

The findings take roughly three forms. The first is a set of images with analysis of the deterioration affecting the blocks on the Wright-designed campus buildings. The second is a discussion of preservation issues and challenges raised by touring the campus. The third is a set of recommendations for a documentation and testing program. This program is considered essential for informed and successful treatment of the textile-block structures at Florida Southern College. It is also seen as an outgrowth of similar efforts being undertaken at other Wright-designed sites that employ the system, and as helpful to those efforts.

This study should be read in conjunction with the Campus Heritage Preservation Plan prepared by Mesick Cohen Wilson Baker Architects, which provides a context for understanding the conservation issues presented here. In the same way, the work undertaken at Florida Southern College should be viewed as informative for all the block buildings designed by Frank Lloyd Wright between 1923 and 1959. Parenthetically, the WMF meeting at Florida Southern College provided the first substantive opportunity for many of those associated with the conservation of Wright's textile-block buildings to come together to reflect on the past three decades of their work, most of which has occurred in Los Angeles.

Among the complex issues encountered in conserving the blocks is that of scale. The blocks themselves present thousands of individual conservation projects, as their variable composition, manufacture, installation and exposure over the years have impacted each in its own way. Next, there are conservation problems associated with the system as a result of how the interwoven steel reinforcing has fared over time, and from the effects of lateral loads and thermal expansion. Finally, there are the conservation issues related to the buildings' functions and the provision of comfort, from the consequences of adding air-conditioning to changes in use. In addition to understanding how each of these scales impacts the other, any solution, or more likely, range of solutions proposed for the blocks and for the system will need to take into account the College's concerns related to cost, integrity, and maintenance.

Finally, the brief discussion found here is not meant to replace a continuous exchange of information between sites that will be critical to advancing the state of knowledge regarding the block. There is considerable technical data that has been developed over the years at each site, as well as many people with varied experiences, who can and should be part of an ongoing conversation on the conservation of Wright's textile-block buildings.

Introduction

This image captures many of the conservation issues found in the textile block at Florida Southern College. The reinforcing steel has rusted and broken away part of the face of a block. Continuing rust jacking has also cracked the blocks above and below the partial block. Repairs have been attempted with non-compatible materials without stopping the progression of the damage. Meanwhile, the wall itself seems to be suffering a structural failure, collapsing the two wythes together.

The purpose of this report is to provide guidance to Florida Southern College and to the preservation professionals involved with conserving the Frank Lloyd Wright-designed structures on its campus. In particular, it is concerned with the challenges posed by the textile-block system used by Wright between 1938 and 1958 for twelve buildings and their associated site structures, primarily retaining walls.

This report summarizes observations and discussions held during a site visit and symposium organized by the World Monuments Fund at Florida Southern College in April of 2009. Additional material comes from research, writings and conservation efforts at the textile-block buildings designed by Frank Lloyd Wright in Los Angeles in the early 1920s,[1] previous studies and reports prepared for Florida Southern College,[2] archival materials collected by the college and its architects, and recommendations made after the site visit by various team members.

The symposium, which was held from 29 April to 1 May 2009, consisted almost equally of time spent examining the buildings in depth and discussing the conditions and treatment options. The 25 team members consisted of many of those most experienced with Wright's textile-block designs, including the preservation architects for the Storer, Freeman and Ennis Houses in Los Angeles and for Florida Southern College. Additional team members included materials conservators, engineers, historians, contractors, college faculty and staff, a representative of the National Park Service, and staff from the World Monuments Fund.

Preservation Philosophy

Wright's textile-block buildings are among the most difficult conservation challenges in contemporary preservation practice. The importance of the system's modularity and interweaving to the designs and to the architect means that the *way* the buildings were constructed is as significant as any other aspect of the building. The hand-made nature of the process means that virtually all the historic fabric is also significant, representative of the craft of the makers and as an example of intentions on the part of both architect and client for a product of unskilled labor. The inter-connected nature of the system makes the repair or replacement of individual units difficult, while the very design of the system inevitably leads to numerous failures that will continue to occur during the life of the original construction, and likely for the life of any replacements built in the same manner. The result is not just a costly long-term commitment to ongoing preservation on the part of the owners of such structures, but also a difficult set of choices relative to normative preservation practice as codified in the Secretary of the Interior's Standards.

One of the fundamental questions is whether anything can be done to avoid large-scale replacement of the original historic fabric. Each year, more original blocks fail. (For that matter, even some of the areas reconstructed in the 1980s are failing.) And this has implications for the integrity of the buildings.

1 These sources include *Wright in Hollywood*, Robert Sweeney, Architectural History Foundation, 1994; *Historic Structure Report for the Freeman House*, Jeffrey Chusid, University of Southern California; *Saving Wright*, Jeffrey Chusid, WW Norton, 2010; David DeLong, *Frank Lloyd Wright: Designs for an American Landscape 1922-1932*, Harry Abrams, 1996. Recent preservation projects have been undertaken at the Ennis and Freeman Houses.

2 In particular: Concrete Blockwork Analysis, Florida Southern College, Troughton McAslan and Ove Arup and Partners, undated; Florida Southern College Campus Heritage Preservation Plan, Mesick Cohen Wilson Baker Architects (undated).

There are structures, such as the traditional adobe dwellings of the southwestern US, in which the materials are understood to have a shorter life than the building. In those cases, however, it is understood that any substitution will be the same kind of material, and that the repair or replacement will be undertaken in a manner that is a continuation of the process used to build in the first place. However, it is unlikely that blocks made today for Wright's textile-block buildings will be manufactured and installed by unskilled labor (students) as they were originally. Even as early as the 1940s, professional builders hired at Florida Southern College have used block made off-site by concrete block manufacturers to specifications written by preservation architects and engineers. There are several reasons, among them the need for a consistent product, and one that complies with contemporary building codes.

There is an ongoing debate in the preservation community about the significance of the textile-block as a material object. Some argue that each hand-made block is an individual creative work, distinct in its composition, form and history from any other, and therefore worth conserving to the greatest extent possible. Others maintain that the blocks are significant as a material and system *in toto*, and that individual ones can be repaired or replaced as needed as long as the textile-block system is maintained. Besides the obvious issue of resources required to undertake conservation projects at the scale of the individual block, the two attitudes lead to another paradox. Maintaining the original historic fabric in the form of damaged or deteriorated blocks means, in some cases, inserting a secondary construction system to do the work that the originals can no longer perform. Take the example of the retaining walls on the site. The existing damaged blocks in these locations can be repaired and reused if a new concrete-block or poured-in-place concrete wall is inserted behind the original one to take the structural load and handle the movement of water. Conversely, the textile-block system can be used, albeit somewhat modified, to reconstruct those walls, but that would require replacement of some or all of the original fabric.

Difficulties arise when playing out the scenarios. In the United States, authenticity typically resides in the integrity of the historic fabric. If the original material is removed to construct a new textile-block wall, and that wall eventually fails or is replaced, then all physical traces of the historical wall are gone. If the original material is to be conserved, however, it presupposes a commitment to a level of ongoing maintenance and curatorship, as well as acceptance of a distinctly patinated appearance—complete with cracks and patches.

The pragmatic answer for Florida Southern College is probably a combination of these approaches. There is a theoretical concern that a regular campaign of replacement would eventually result in all new buildings. In reality, however, the block is not universally at risk. Block on the interior of buildings, and in exterior locations where protected from rain, can be expected to last indefinitely. There are three important exceptions: 1) when threatened by unrelated work, such as the installation of equipment or by painting, 2) when impacted by leaks, and 3) when the block is subject to the transmission of distress from elsewhere, such as through settlement or thermal expansion. With these caveats, there should always be original block on the campus. The question is how much, and where. And it should be monitored.

One reason for monitoring is that not all blocks are made equal, or have equal significance. Some blocks are unusual because they are configured for rare conditions, such as obtuse corners or ventilation. Other blocks, such as at the Administration building, appear to be one-of-a-kind samples made during the early development of the block mix, and their unusual color and the resultant pied effect in the building are essential character-defining features for that site.

Another significant reason for work on the buildings is the issue of keeping the buildings functionally useful and comfortable. The minimalist design of the original buildings relied on natural ventilation, some shading and a great deal of forbearance on the part of the inhabitants—which was not unreasonable for the time and place of their construction. Today, there are greatly increased demands on the buildings not only to provide pleasant, climate-controlled environments, but also to accommodate contemporary college instructional and administrative needs. This has a range of implications, from making the behavior of the building materials more complicated as they respond to very different conditions inside to out, to trying to preserve character-defining spaces and features while adding new functions and equipment.

This latter topic is a major focus of the recent Campus Heritage Preservation Plan, and is addressed well there. Therefore, this report will focus on the first group of concerns relative to repair or replacement of the blocks. It will do so with reference to the following established preservation principles:

Less Is More: It is desirable to do as little work as possible to a historic site so as to minimize alterations to its historic character and to lessen the risk of damage or inadvertent alterations to the original historic fabric. A corollary to this principle is that the least invasive or aggressive repair measures should be tried first.

Historic Fabric Is More Valuable Than Replacement Fabric: Where possible, new material should be sacrificial to the original material in the building; measures that can preserve original fabric should be considered even where these measures may introduce new, a-historical details or assemblies.

Document All Work: There should be a secure location that contains the records of all work done to the West Campus, everything from when a block was replaced, to when it was patched, and by what and by whom, to when a sprinkler was installed nearby. Building maintenance records are extremely important for later conservation projects. Ideally, written notes should be accompanied by "before," "during" and after photographs.

Mark New Work: All replacement elements, especially block, should have on it a mark that lets conservators and other know the date it was installed, and connects it to a data base with additional information as to who made it, its composition, and the reason for its use.

Historical Reality Trumps Speculation: While there is great deal of information available about Wright's ideas and intentions, where it conflicts with the historic condition, the latter is more important from a historical perspective. In other words, making alterations to a site because the architect would of or could of if only he had the resources, or had thought about it more, or had a more cooperative builder or client, is counter to the historical reality that values all parts of the story equally. This is particularly an issue with the work of Frank Lloyd Wright, where many feel that his involvement, and the aesthetics of the site, are the most important part of the historical narrative.

There is some subtlety to the last principle. Where there is a need to change the existing assembly because it is flawed, or where there are to be alterations or additions, doing the new work in a manner that is compatible with and sympathetic to Wright is appropriate.

Even aggressive interventions, as at the Polk Country Science Building, may be acceptable if they keep the buildings functional, fix problems with the block, and maintain the integrity and visual appeal of the textile-block system.

History and Significance

Frank Lloyd Wright developed the textile-block construction system that he used on the twelve buildings at Florida Southern College in the early 1920s, for three houses and a partially completed school in Los Angeles.[3] (The name derives from the concept of weaving steel reinforcing horizontally and vertically between the blocks.[4] Wright had high hopes for the system, but many of his early explorations were speculative, done without committed clients, while the onset of the Great Depression forced the abandonment of the largest real block project planned at the time: San Marcos in the Desert. At roughly the same time, however, he 'loaned' the system to Albert McArthur for the Arizona Biltmore Hotel. Wright then used it on several other houses over the years. A variant of the construction method called the Usonian Automatic was used on additional houses Wright designed until his death in 1959. And he also designed a number of homes that used commercially made block and were constructed traditionally. All together, Wright designed some 50 projects in concrete block. By far the largest of these turns out to be Florida Southern College, which has 12 individual structures built in the textile-block system on its campus.

Ideas behind the System

Wright, like many modern architects of the early 20th century, had a life-long fascination with concrete. His own innovative uses of the material include Unity Temple of 1905, and the Guggenheim of 1959. Concrete's plastic qualities, its ability to mimic other materials, and its seeming ease of manufacture on site, were all intriguing. In particular, concrete appeared ideal for advancing the modernist ethos of building more and better for less time and money through standardization of parts and the use of unskilled labor. Another term Wright used to describe his system was "mono-material" because he imagined that the block would serve as a building's floor, ceiling, and wall; structure, skin, and ornament. All this supported the modernist vision of simplified construction. However, while other designers may have been content with turning over the manufacture of individual building components to an industrial process, Wright maintained hand craft in both the design and production of the textile blocks, at least for the first several decades of the system. That

3 The three houses are the Storer, Freeman and Ennis residences, built between 1924 and 1926. The Little Dipper Nursery School of 1923, located on Olive Hill, site of the (non-block) Hollyhock House, was begun and then abandoned when relations between Wright and his client deteriorated. The Millard House, also from 1923, while also constructed in concrete block, used a very different system that Wright only tried out on that one structure. For more history, see *Wright in Hollywood* by Robert Sweeney. A key point Sweeney raises is that Wright's system is effectively a variation of Nel-Stone, a construction system designed by William Nelson that likely served as a model.

4 The name shows up a few years after the first three houses were built, and is apparently 'borrowed' from NATCO, the National Tile Company, whose own "textile-block" was a widely-available and -marketed construction system using terracotta units and steel reinforcing.

Frank Lloyd Wright's son Lloyd, with whom Wright developed the textile block system, used it only as an accent in his own works in the 1920s, such as the Derby House, below left. The Milard House, below right, was constructed from a different system. It used 16" square blocks, as did the others, but without the two-way steel reinforcing among other differences.

The textile-block projects from Los Angeles, 1923–26. Clockwise from top left: The Freeman House, the Little Dipper School, the Storer House, and the Ennis House.

Above: a sketch of the speculative Doheney Ranch project, Wright's theoretical essay on block architecture in the Hollywood Hills. Below: a stone panel from Uxmal, Mexico, a primitive 'mono-material' precedent.

provided a source of both variability, which was aesthetically desirable, and inconsistency, which has been problematic for the durability of the structures.

Wright's system was intended to be inexpensive and easy to build, but in a way that also remained true to his principles of organic architecture, especially the idea of formal consistency at every scale, from the patterns on the blocks to the massing and design of the overall building. He selected a dimension for the blocks that would clearly distinguish them from either a brick or a traditional concrete block. Initially, he had proposed 24"x24" blocks, but those would have been too heavy for a single man to lift. All variants afterwards effectively kept the weight to between 60 and 80 pounds, with the coffered back a major strategy for lessening the weight even further. There are additional characteristics of the system meant to support the goal of implementation by unskilled labor, including the lack of a mortar bed. These are described in greater detail on the next page.

Aesthetically, the block system is central to another paradigmatic exploration of modern architecture: the search for the primitive root of building. There seemed to be two major impetuses for this. One was the fascination with "primitive" art that was breaking through the artifice of high art design in every aspect of modernism, from dance to art to architecture. The other was the need to strip unessential, even 'deceptive' architectural ornament and features from buildings. The early block buildings were geometrically pure in the same way that the technology sought to be simple and monolithic.

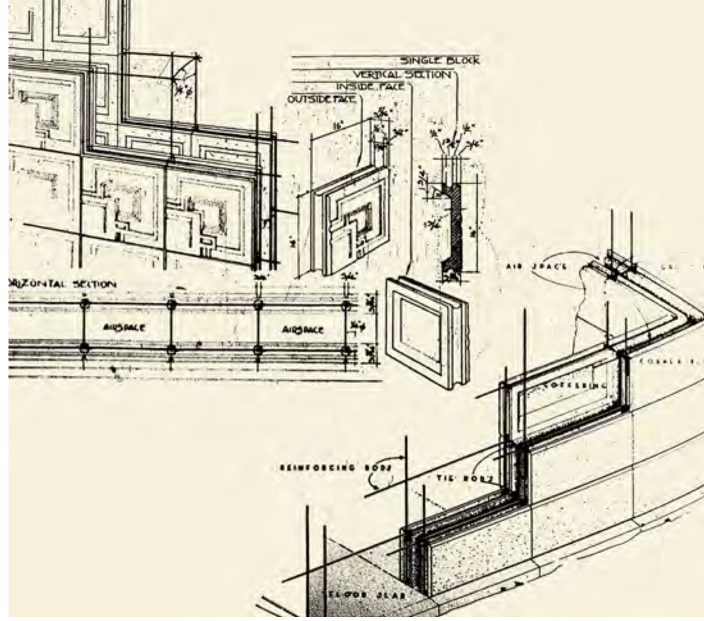
Intriguingly, much of the early development of the textile-block system seems to be a result of its location in Southern California. The thick walls, cubist massing, and homogeneous materiality recalls the architecture of the Spanish mission and hacienda. The thick concrete construction also provides a measurable degree of comfort in a hot, dry climate. And Wright's first images of block buildings, and bridges, as depicted in the designs for the speculative Doheny Ranch project, show buildings that have been made from the local sands perching like rock outcroppings amongst the craggy Hollywood Hills. Finally, Los Angeles in the early 20th century had neither plentiful forests nor a well-developed steel industry to provide building materials, but had plenty of the basic ingredients of concrete. Nonetheless, with the Lloyd Jones House of 1928, built in Oklahoma, Wright expanded the system beyond the deserts of California and Arizona where it began.

Description of the System

The textile-block system consists of pre-cast masonry units that are stacked in columns and rows. Each block is grooved around its edges to permit the placement of continuous steel reinforcing both vertically and horizontally through a wall. After the blocks are dry stacked in rows and columns, the reinforcement is encased in a soupy grout that both serves to protect the steel and to bond the masonry units together. These grout tubes were meant to replace mortar beds. In most walls, blocks are set in double wythes, back to back with an inch of air space in between. While the system was originally intended to work horizontally as well as vertically, it is rarely used as a ceiling, or as a floor above ground level.

Blocks are made by hand using wooden or metal molds. These molds frequently imprint patterns on the faces of the blocks, or even penetrate the block completely to provide openings for light and air. There are different blocks for different conditions, such as corners, as well as to provide variations within the ornament on a façade. The mix used to make the blocks is a dry one, so as to allow the blocks to be cast quickly, and then removed from the molds to cure, and also to provide a sandy texture.

At Florida Southern College, most blocks have two concrete mixes: a pigmented surface layer and then the same concrete without the colorant for the remainder of the block. This is visible wherever there are penetrations through the block. This feature, however, was introduced at the suggestion of President Spivey; it is somewhat counter to the mono-material idea of the system and introduces its own set of durability and conservation issues.



Richard Neutra's sketch for Wright of two variants of the textile-block system. Top left, blocks from the Ennis House; lower right is a later version with a rectangular block, and without ornament. It should be noted that the plan of the Ennis Scheme is inaccurate in one regard. The gap between wythes was only 1 inch.

Conservation Issues with the System in Earlier Sites

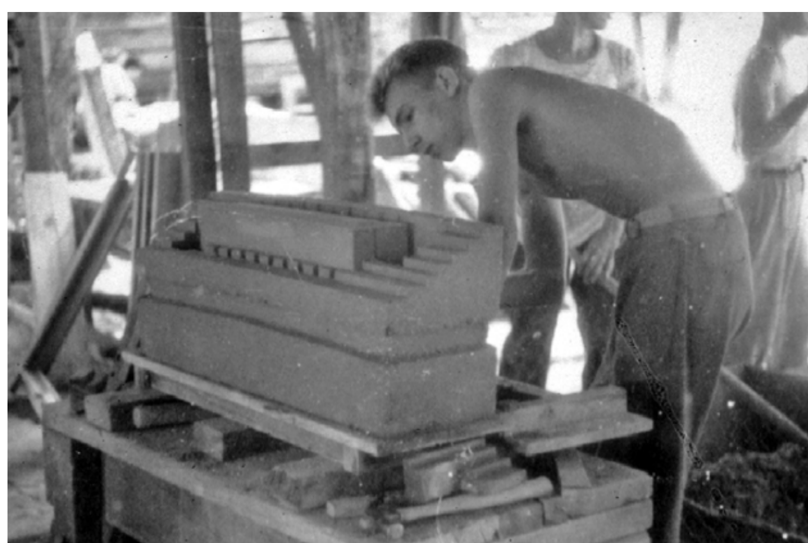
A number of problems with the textile-block system arose during the construction of the Los Angeles houses. Most of these can also be found at Florida Southern. Interestingly, some of these problems were anticipated in the professional literature as early as the 1910s, due to several decades of experience with cast stone—concrete blocks that resembled stone. In particular, there were warnings about the vulnerability of dry mixes to deterioration over time.

In Wright's system, the dry mix led to porous, weak block that rapidly lost its alkalinity (an added protection for the steel reinforcing). The need for a mix that would fit into intricately patterned molds and leave a relatively even surface also meant that Wright rejected using course aggregate (anything over ¼" in diameter). This also contributed to the weakness and porosity of the block.[5] A final problem with the mix was its composition: the proportion of cement to sand was typically too low, while sands and other foreign materials were deliberately varied in color and amount in order to make the blocks more visually interesting.

The absence of a mortar bed meant that the blocks were difficult to align, because the much-used molds and the hectic block-making process resulted in dimensional variation in the blocks; and there was no way to make up for these variations. Even a variation of a $1/16^{th}$ of an inch over 16 feet led to significant gaps. The alignment, therefore, would be adjusted on site by the use of wooden shims. The lack of a mortar bed also meant that the grout be-

5 The absence of coarse aggregate also means that, by most definitions, the blocks in Wright's system are not concrete, but rather a kind of mortar. However, they are used functionally as concrete blocks, so that is how they are referred to in this report.

Below left: historic block and block molds, at Florida Southern College. Below: student with freshly made block, photo from original construction on campus.



ing poured into the channels formed by the block-edge grooves often came out through the joints. This was addressed by temporarily filling the joint gaps with clay. Finally, without a mortar bed the walls had to be braced as they rose, because the 16" tall and 3-1/2" wide blocks were unstable until the grout tubes between the blocks had set. At Florida Southern, the use of a 9" tall block should have considerably lessened this problem.

Another problem came from the practical impossibility of creating a standard, repeatable, all-purpose building unit. The Freeman House, at roughly 2000 square feet possibly the smallest structure designed in the system, had 74 different block types. At Florida Southern College there are at least 40. The variations are a result of aesthetics—how the patterned, plain or perforated blocks are arranged on a façade, and location—corner blocks versus field blocks, ventilation blocks, coping blocks, etc. In addition, the way two wythes come together to form a wall often requires cutting the blocks in the field, or casting them with mitered edges.

Wright apparently imagined the block system as having a certain flexibility in response to movements such as earthquakes. The blocks were to rotate around the grout tubes. However, because the blocks are set without a mortar bed, there is no soft material to absorb thermal expansion. Long facades expand in the sun, putting pressure on the corners. This phenomenon was evidently not anticipated.

The two wythes of a textile-block wall are connected, periodically, by a steel rod which hooks around the vertical reinforcing of each wythe. Where it penetrates the block, a hole has to be made in the field to accommodate it. These ties have the effect of blocking the grout tube formed by the edge channels, preventing grout from protecting the steel. The system for introducing grout, pouring it into the channel after each row is set, also assumes that the grout will be sufficiently liquid to go down the vertical channel and then spread to each side, filling up the horizontal tube. This was a near-impossibility when the blocks were only 16" wide in Los Angeles, let alone in the case of the much wider block in Florida. The grout wicks water to the block, becoming increasingly viscous, and the shorter vertical tubes clog and then set, long before the material makes its way to and along the horizontals.

Another major issue is that manufacture by many different people using a mix made up in small batches introduces variability in the quality of the blocks, their color, and their durability. The molding process itself is difficult, often resulting in cracks and the need for touch up afterwards. In addition, the blocks, once made, require several weeks to cure during which they need to be kept moist in order to extend the process of hydration. While Florida presents a more humid environment than the southwestern desert, tests from blocks at the college show that there was inadequate moisture and curing, just as happened in Los Angeles.

Finally, although the system was originally intended to provide structure as well as enclosure and ornament, in reality additional concrete or steel structural members are needed to hold up roofs or to frame large openings. Often these elements were poorly accommodated within the domineering design grid established by the block system. Many details of the LA buildings were worked out during construction, resulting in delays and cost overruns. Subsequent projects seemed to improve only slightly on this phenomenon as can be seen by viewing the often-anxious correspondence between Taliesin and Lakeland in the late 1930s.

Recent Conservation Projects at the Storer, Freeman, and Ennis Houses

Preservation projects have been ongoing at these properties, and at the Millard House, since at least the 1980s. As noted elsewhere, the California textile-block houses have been experiencing many of the same problems as those found at Florida Southern College. In addition, the west coast buildings have been subject to a series of significant seismic events over their life times, culminating in the 1994 Northridge Earthquake. Prior to that date, most of the attention was on the repair or replacement of individual blocks, attempting to stop leaks through both roofs and walls, and alterations resulting from changing needs. After 1994, most attention was on large-scale block replacement and structural upgrades, although the previous issues remained.

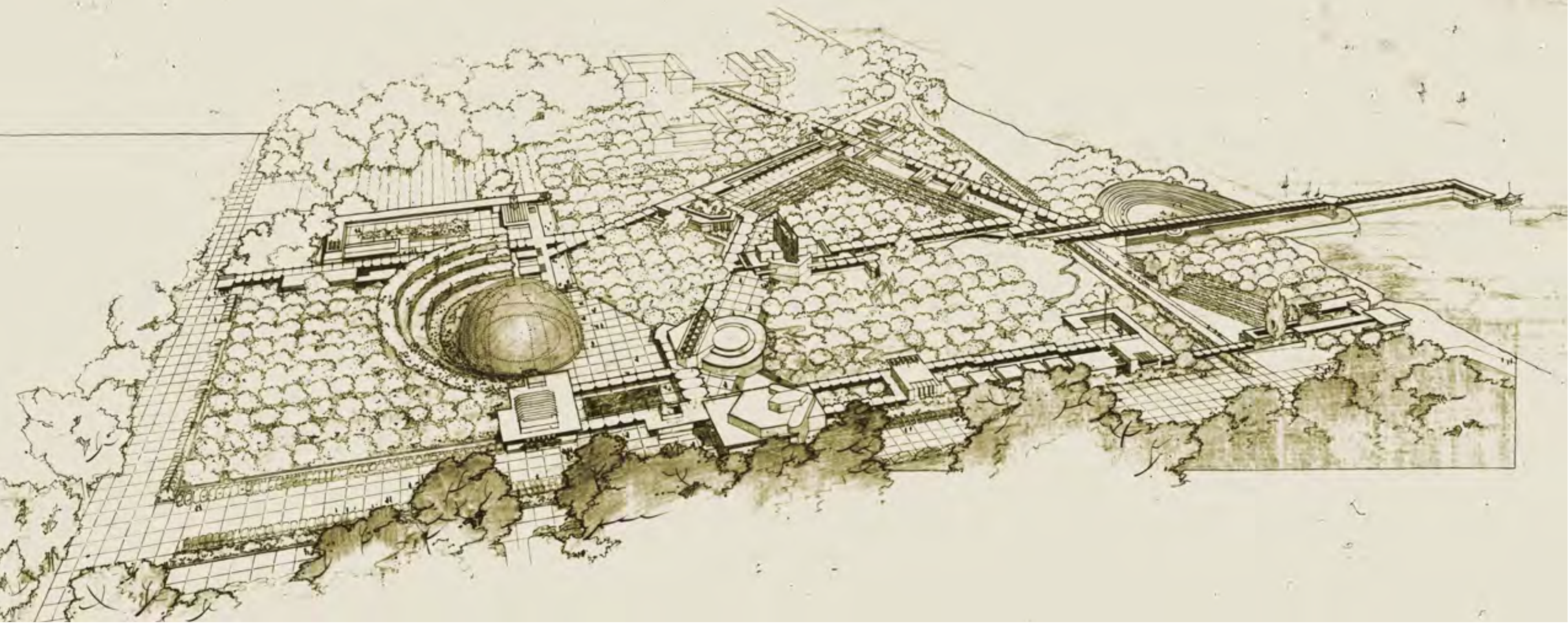
Analysis of the blocks at these houses show that different mixes were used between them, and that at least in the case of the Freeman House and the Millard House, different mixes were used over the course of construction. The three textile-block houses all suffered from 'ring fractures," which are cracks at the center of the channel around the perimeter, which may have been initially caused by the block manufacturing process but were exacerbated by expansion of the steel reinforcing against the dense grout mix. This led to a condition where the face of the blocks was not well adhered to the back, and to large areas of failure during an earthquake. However, the Storer House, which has the best protection from an overhanging roof, and which also had many blocks repaired earlier than the others, has suffered far less catastrophic damage than the Freeman or Ennis Houses from this or any other deterioration.

The Ennis House was painted with a thick coating several decades ago in an attempt to stop moisture infiltration and block deterioration, but that has led to serious problems with trapped moisture, and accelerated erosion behind the coating. Removal is still an unresolved issue. The Freeman House undertook a substantial structural rehab in 2000, which has made the building stable, but caused a significant loss of original block, as yet un-replaced.

All three houses have successfully replaced block, however. The Ennis House has done this to the greatest extent, replacing entire planes of block that had experienced ring fracturing (200 in total), as well as inserting new structure in retaining walls and the motor court. This was done under the direction of Wiehle Carr Architects, using block manufactured by hand to current specifications by a commercial manufacturer. (Wiehle, as a Taliesin apprentice, spent 9 months working at Florida Southern in 1950, on the Industrial Arts Building.) At the Freeman and Storer Houses, a few areas of new block (mostly un-patterned) have been installed, along with both individual whole blocks and some faces where the backs of the blocks and the intertwined steel cores were still intact. These blocks have also been manufactured by hand.

Considerable experimentation went into developing the expertise necessary to employ the molds and produce an acceptable block. Additional experimentation went into developing a mix that would look and feel like block already in the buildings. This took years in every case, although visible differences between new and old still exist. The new block at

The 1994 Northridge earthquake severely compromised the south façade of the Ennis House



Wright's sophisticated design for the West Campus included buildings, vegetation and constructed landscape features such as walls, esplanades, fountains and sculpture.

the Storer and Freeman Houses were generally not made to code strength requirements; the Ennis House block was. It is probably true at all the sites that analyses of the existing block mixes, or the grout, did not play a substantive role in the design of new blocks or grout. The criteria for new blocks were to match visually and to perform appropriately (meaning, structurally where required).

Similar amounts of time and effort were spent at the Storer and Freeman Houses figuring out how to remove rust from steel that was still intact (using a small sandblaster), and then preparing a new subsurface that would accept the face of a partial block, in developing a strategy for installing new reinforcing where required, and in testing water-resistant coatings. (The latter were successful for short periods of time.) The Getty Conservation Institute also conducted experiments on consolidating the block, and recommended using epoxy. However, application was done only to disks taken from relatively intact block, not from the highly friable block encountered in the worst (and still common) locations. At the Freeman House, experiments were also conducted on injecting grout into the horizontal channels where it is typically missing or only partially filled. These were not successful.

Critical to all three properties was reconstructing the roofs. This was done both to add structural diaphragms, replace roofing and to insert flashing and counter flashing that was never part of the original designs.

Among the architects, conservators and engineers known to have worked on or studied the LA houses in the past twenty years are the John Ash Group (Gordon Olschlager), Wiehle and Carr, Simpson Gumpertz and Heger (John Fidler), Troughton McAslan with Ove Arup, The Getty Conservation Institute, Offenhauser and McKeel, Marmol Radziner, Martin Eli Weil, Melvyn Green, Historic Resources Group (Peyton Hall), Eric Lloyd Wright, Nabih Youssef, T. Jeff Guh, Duane Chartier, Jeffrey Chusid, Robert Timme, and Wank Adams Slavin Associates (Steven Gottlieb, Norman Weiss).

Florida Southern College

For all its difficulties, Wright was still committed to the textile-block system when he was contacted in April 1938 by Dr. Ludd Spivey, the president of Florida Southern College, about designing new buildings for the school. The system had a number of things to recommend it: concrete was still relatively cheap, it was a durable material for a school occupied by active young men and women, and the system could, theoretically, make use of the unskilled labor of the students. So, despite complaining in 1927 about the effects unskilled labor had on the LA houses in an article for *Architectural Record*, Wright again proposed his system to Spivey.

Wright made a few major changes in the block system at Florida Southern, when compared to the LA projects. First, he continued to use the rectangular dimensions he introduced in the late 1920s at the Arizona Biltmore and other projects. This allowed him to develop a more sophisticated design grid, using two sets of proportions. The 9-inch high by 36-inch long block at Florida Southern College also made for a slightly more stable wall during construction, as well as fitting into the 3 foot by 3 foot 3-dimensional grid used throughout the West Campus. Finally, while Wright attempted in the LA houses to use the local sands and decomposed granite from their hillside sites as the fine aggregate in the block mix, he was unable to accept the results from the local sands available at Florida Southern. Thus he required the addition of a pigment (which was expensive) at the face of the blocks, and coquina shell as either part or all of the aggregate.

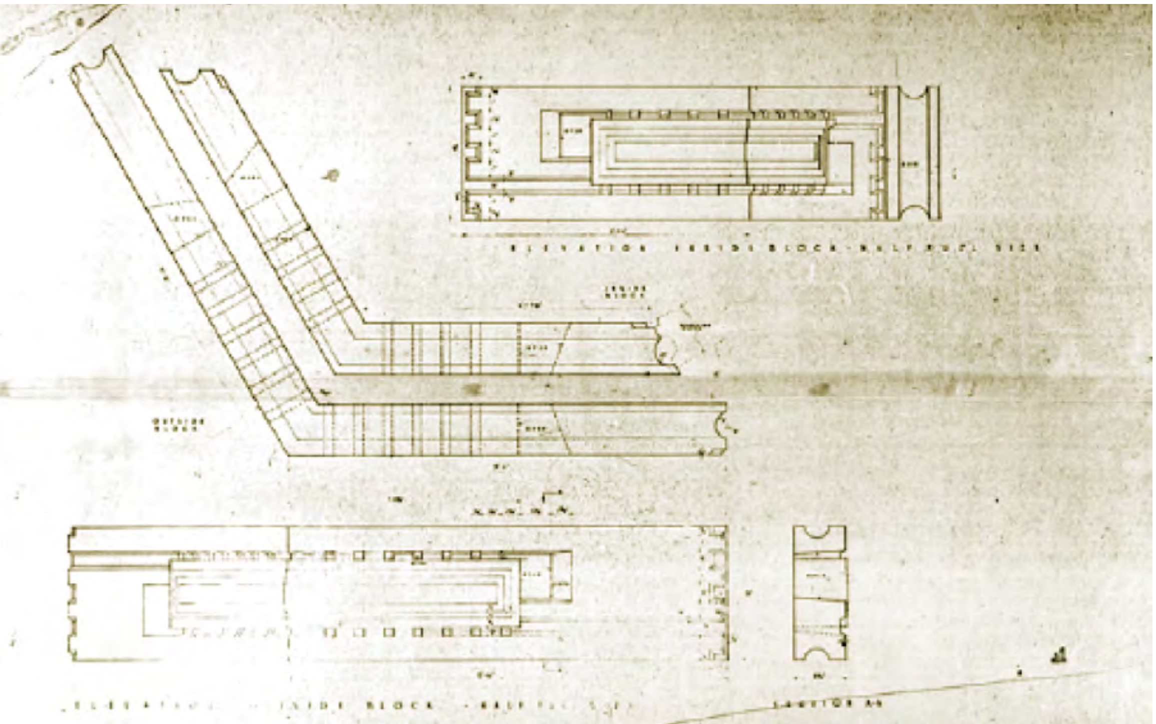
The result of Wright and Spivey's collaboration was twelve buildings, the "West Campus" of Florida Southern College, which occupies about one-third of the total campus. However, the buildings were only part of the Master Plan the architect developed for the 30 acres under his control. It included significant landscaping features as well, all organized according to the 3-foot grid. Within this system, Wright listed the buildings, sculpture, plant arbors and other elements as "units" of this plan. The various pieces were meant to work together as a single design.[6] With the addition of the esplanades running between, along and through buildings, there was essentially a single piece of construction set within a designed landscape on the sloping site by Lake Hollingsworth. This Master Plan was generally followed for the next two decades.

A contract was signed on September 20, 1938 between Spivey and Wright. That same day, Wright wrote his ideas for the site:

- *The general plan is a pattern of terraces and arbors connecting the various buildings—a free pattern in itself the most important single feature of the design, I think. And then, each separate building finds a better way of doing the thing to be done in it than has been seen elsewhere you will see.*
- *Each building is individual in character—practical in effect—yet contributing its share to an occult symmetry—delightfully informal and easy as a whole.*
- *The reflex enters into architecture in these plans for Florida Southern as against the regimentation characteristic of the classic or Gothic architecture, which have become a college habit in America.*
- *We are making the ground, trees, buildings, the young people inhabiting them, and even the instructors themselves—all living factors in one comfort giving, protective, sympathetic building, divided into special buildings for special activities. What I am most proud of having done in this effort is to have succeeded in making all units into the one gracious pattern—a complete whole for college work.*

The deaths of both Frank Lloyd Wright and Ludd Spivey ended building to the Master Plan. Work on the campus since then has generally responded to the Wright work, although not all equally successfully. The significance of the designs and composition of the built work is well described in the Campus Heritage Preservation Plan. The remainder of this report will focus on the conservation of the block, although any decisions taken on individual sites

Wright's plans for the textile-block buildings had to address close to 40 different block types. Here are the drawings for the obtuse corner blocks being made by a student in the image below.



even to undertake repairs or conservation should be done in the context of a Historic Structure Report for the building that addresses the many other aspects of the building, its use, and its relationship to the overall campus and campus master plan.

A History of Changes

Restoration work at Florida Southern College began early, with the repair and modification of Annie Pfeiffer Chapel after a hurricane in 1944. Another major campaign on the chapel took place in 1981, replacing substantial quantities of block. Evidently, this project included the addition of admixtures to the new block mix to enhance water resistance. Throughout the West Campus, the addition of air conditioning and other system upgrades over the years has significantly impacted the buildings.

In 1993, Florida Southern College hired Troughton McAslan Architects, with Ove Arup Engineers, to study the West Campus, and to undertake a major rehabilitation of the Polk County Science Building.

Mesick Cohen Wilson Baker was hired by the College in 2006 to develop a Campus Heritage Plan, funded by the Getty Grants Program, and to undertake specific projects on the campus. These included the restoration of the Waterdome and work at Annie Pfeiifer Chapel. The material assembled for their report is an exhaustive collection of all drawings, photographs, correspondence and other documents from the history of the site.

As part of Mesick Cohen Wilson and Baker's work, Testwell laboratories was hired to provide an analysis of a sample of concrete block. That 2007 report and the 1993 students done by Arup are also referenced in this report.

A walk through the campus reveals myriad instances of block repair executed by maintenance staff over the years. Much of it is informal or expedient, resulting in cosmetically unattractive conditions and often failing to address the underlying problems. In this regard, Florida Southern College is not unlike many owners of textile-block buildings in scrambling to address failures without having the plan or the resources to do a comprehensive job.

The administration building has block demonstrating a wide range of colors, likely because it was built of samples left over from block-making experiments during the early years of the project.

Site Conditions and Analysis

Prior research and observations

There are a number of useful observations found in prior studies of the block, especially the Troughton McAslan Block Analysis and the Testwell Report of 2007. These include the estimate of some 40 block types found on the West Campus; and an overview of the variability to be found in the composition of the blocks. Some blocks had both white and gray cements, while others had only gray cement. Some blocks had only coquina shell aggregate, some only sand, and some had a combination. And many had a pigmented surface layer.

The Testwell report noted problems with the gradation, shapes and aspect ratios of the aggregate, along with cement grains that had never been exposed to enough water to form a paste and then a cured concrete. The blocks were fully carbonated, meaning that they had lost their alkalinity and thus their ability to protect the reinforcing steel from oxidation. And there was sufficient porosity to allow both CO_2 and moisture to migrate freely through the blocks. On the other hand, there was no evidence of undesirable chemical reactions between the various mix ingredients. And while some biological growth was visible, it seemed to cause little damage.

The ability of the water to reach the steel was visible in both rust deposits found within the block and grout samples, and in the field, where water penetration to the steel has caused extensive rusting of the reinforcement and subsequent spalling of the concrete.

Finally, blocks in protected locations, such as under the shelter of the esplanades, were seen to be in much better condition than where they were exposed to the weather or to water run-off from roofs or gutters. There was also dirt and plant growth on blocks that experienced surface water, apparently because of the vulnerability of the porous surface to the adhesion of these substances.

All these observations are consistent with the experiences of other sites where the textile-block system has been used.

WMF Site visit

During the April 2009 site visit, all of the phenomena listed above were observed in the field, along with other conditions listed below. It should be noted that the only "new" observations made by the WMF team had to do with the progress of certain phenomena, not with their nature. In particular, damage was observed at the Polk County Science Building that was believed to postdate the Troughton McAslan rehabilitation project.

It should also be stated that in-depth understanding and insight comes from spending protracted periods of time observing and analyzing. There are many aspects to the conditions of the blocks, such as dynamic movement over time, that cannot be well understood during a short visit. While many team members have had the kind of long-term 'relation-

Scenes from the WMF symposium at Florida Southern College in April 2009.

ships' with other textile-block buildings that permit one to begin to synthesize all the types of damage and possible causes encountered at these sites, each site is essentially unique. The particular block mixes, the particular block designs, configurations and combinations, the particular skills or abilities of the crew, along with the climate, uses, site management during and since construction, and many other factors all combine to make the story of the block at Florida Southern its own drama, requiring its own solutions. These solutions will be informed by the experiences of the other sites, but they should not be governed by them.

Appendix A is a set of images and commentary that document some types of damage afflicting the textile-block at Florida Southern College. More extensive study is required to determine other possible decay mechanisms, to establish connections between damage and site conditions, and to establish a quantitative assessment of the scope of damage.

Taxonomy of Conservation Problems in the Textile-Block System

Conservation challenges with the textile block system can be categorized into three sets of issues: l

1. problems with the individual blocks
2. problems with the system: the grout tube and steel reinforcing
3. problems arising from use or location

In virtually every situation there is actually an overlap of multiple causes and consequences. However the categories help us to understand what is going on, and may also assist us in developing appropriate treatments.

1. Problems with the block include issues of manufacture, composition, and exposure and response to environmental stresses.

- porosity—the many air cavities within the block that allow easy movement of water and carbon dioxide. Some are the result of imperfect curing (cement particles that never formed into a paste), others the result of imperfect compression of the mix.
- strength—while the block has adequate compressive strength in most situations, there is variability; and blocks in retaining wall situations are often not strong enough to resist horizontal forces.
- erosion—certain blocks exposed to weather experience loss of the binder, and ultimately some of the aggregate as well. This is related to the porosity problem, and to the uncured cement.
- biological staining—surface and interior molds and other plant growth appears to be only unsightly, not injurious to the block.
- surface dirt—dirt is a problem on retaining walls, and in areas where water from roofs and drains wash across the surface of blocks
- efflorescence—some blocks appear to be subject to moisture moving through them, possibly in conjunction with the addition of air conditioning as well as possibly related to water penetration into the space between the wythes. This leads to surface salt deposits (as well as to problems in the reinforcing).
- carbonation—the porous and only partially cured blocks are almost all totally carbonated, thus no longer providing an alkali environment for the steel reinforcement.
- color changes—pigmented blocks appear to be changing color over time, in part depending on their exposure
- color variability—different aggregates and cements, combined with the variable use of pigments, means that blocks can be found in a wide range of colors. This is problematic for repair and replacement.
- failures associated with the internal steel reinforcing (as opposed to the main system reinforcing steel in the joints)—apparently unique to the blocks at Florida Southern College, many if not most have steel mesh or wire reinforcement. Some is rusting and staining and/or spalling the block

- failures associated with the use of two different mixes-—an idea proposed to Wright by Spivey, the use of two different mixes in the blocks (one pigmented), raised concerns about adhesion. Apparently the joint between mixes has become a fracture plane in some blocks.
- failures associated with the penetrations and glass inserts—leaving openings for ventilation and glass inserts has produced areas vulnerable to stress cracking, and the process of installing the glass may have exacerbated this phenomenon.
- production cracks—the process of making the blocks, and then patching missing concrete areas afterwards, produced hairline fractures and cold joints in many blocks.

2. Problems arising from the grout tube and joint reinforcing include issues associated with detailing, assembly, and exposure and response to environmental stresses:

- Missing grout—the process of pouring grout into the channels around the block was flawed, and most blocks lack grout in the center of the horizontal joints, and elsewhere on occasion.
- Rusting of the reinforcing and ensuing spalling of the grout and block resulting in cracks and missing pieces—the most common serious damage to the block is caused by expansion of the reinforcing steel in the joints leading to cracks and missing chunks of block face.
- Rusting of the ties between the wythes—many of the ties connecting the block wythes are missing, others are rusting and cracking the grout at the joints.
- Displacement of the blocks due to rusting of the reinforcing—in some cases, the expansion of the reinforcing steel is pushing blocks (or parts of blocks) out of plane.
- Partial or complete separation of the block face from the back—the most severe form of damage from rusting reinforcement causes a fracture completely through the block, which then either loses its face, or is structurally non-performing.
- Relative hardness of the grout and block—the liquid grout is typically a much harder and denser material than the block, the opposite of proper masonry practice. It can crush the block during normal building movement.

3. Problems arising from use or location include issues of composition, manufacture, detailing and assembly in specific conditions that induce failures not seen when the blocks are placed or used differently, or where subsequent interventions have led to damage:

- Thermal expansion at building corners—because of the absence of a mortar bed, thermal expansion of the blocks is unrelieved, and over a long expanse of wall may be the principle cause of blocks failing at the corners.
- Ventilator blocks—certain blocks are designed to allow air movement through the walls. The configurations make the blocks vulnerable to cracking, and the use may cause moisture problems. These need to be studied further.
- Retaining walls—use of the textile-block system in situations where it must resist lateral forces, and is also subject to flows of ground water, is highly problematic.
- Pilasters—areas where folded or structurally reinforced block are stiffer than the surroundings can concentrate forces leading to cracking and other problems.
- Unsympathetic alterations or repairs—from poorly conceived and applied patches and caulks, to partial or complete replacements, the block walls are a catalogue of unsightly and largely unsuccessful attempts to repair problems in the walls.
- Damage from work not related to the textile-block system—from the addition of electrical conduit to the insertion of mechanical ducts, there are numerous instances of changes to the buildings that have had deleterious effects on the blocks. Most of these are from some years ago, as more recently this kind of work has been minimized.

In any particular location around the campus, damage to the textile blocks is likely to be a combination of several of the issues just identified. This will be evident in the accompanying gallery of images, which illustrate the conditions encountered at Florida Southern during the WMF symposium. The substantial number of causes for distress in the textile-block system, along with the large variety of types of distress, raise significant issues of conservation approach and methodology. Some discussion of those issues follows the commentary on the images.

Issues and Challenges

The two days of discussions addressed a wide range of methodological, ethical, and technical issues. The following excerpts come from notes taken during those talks, and raise some of the key issues that need to be considered as work on the textile-block moves forward.

The Textile-Block System

There are three components to the textile-block system: the blocks, the steel reinforcing, and the grout tubes.[7] While most of the attention is devoted to the block, most of the damage comes from failures of the other two components to perform as designed. Even in cases where reinforcing is gone, and block is damaged, it is not always clear whether the consequences are cosmetic or if there is a structural problem that may lead to significant building failure.

The absence of grout in some instances may actually be beneficial to the system, as it allows room for the steel to expand harmlessly. By the same token, the absence of steel in some areas may also be of negligible consequence for the stability of the system, and enhance the longevity of nearby blocks. However, each situation needs to be evaluated individually before determining whether a potential problem exists.

Given the interwoven nature of the system, how can a repair be best accomplished while minimizing the impact on surrounding historic fabric? Where the grout tubes are intact and the steel free from significant rust, and the problem is a deteriorated, cracked or incomplete block, then consideration should be given to in-situ consolidation, patching, or replacing only the face (or a slightly thickened version). Where the steel is missing, the

7 In the buildings, additional elements include concrete slab floors, poured-in-place beams and columns, doors and windows, and other items that are either critical to holding up the building or are character-defining. These are also important to the development of an appropriate treatment, but are not the subject of this report.

grout tube is damaged, or there is considerable rusting and spalling, then intervention may include removing grout, cleaning the steel, or inserting new stainless steel, preparing new 'tubes' to accept a block face, and then attaching the new face to the substrate. New steel can be inserted several inches into grout on either side of a replacement block, if needed.

Sometimes the block system is structural, in the sense that it works as retaining wall or supports other building elements. In most instances, however, the system is only part of an enclosure. In those cases, it may not be necessary to replace missing steel. In locations, such as garden walls, where the system is structural, but has failed, new elements that take the structural loads may be appropriately inserted between the historic block walls and the loads.

All elements of the textile-block system need to be examined, and all are susceptible to improvement. This ranges from the block mix to changing the configuration of the channels at the block edges to using stainless steel or other reinforcing. Three basic scenarios will cover most interventions: where an individual block is being repaired in situ, where an individual block is being replaced, and where a field of blocks is being replaced. Additional work may include removing paints or other coatings, and inserting or repairing non-block systems of structural features.

In examining the system, and its problems, one needs to determine whether a crack goes straight back or if it moves at an odd angle. One must test whether the fragments of the block move or whether they are stable.

Many of the cracks are symptoms of other problems like metal expansion or thermal expansion. These need to be addressed if this is going to be effective. The system, for example, may need to introduce expansion joints.

The buildings at Florida Southern are composite structures with both poured concrete and block, and it is not always apparent what is load bearing. No one has had a real chance to investigate at how these buildings function as a system. While existing drawings can be helpful in evaluating the structures, many of the buildings, especially the earlier structures, were largely designed on site.

If one feels it is appropriate or necessary to redesign the system, could one do away with either the top or bottom channel in each block? Or do we leave the top channel and fill it with a better, more thoroughly applied grout—this might help prevent the movement of air through the block. Another variant to consider is one is which the top channel is actually turned into a projecting element so that it interlocks with the bottom channel of the block above it, either still with a groove for a steel bar or eliminating the horizontal steel. This would further reduce water infiltration and lateral movement.

Thorough grouting and securing the wall horizontally is important in enough situations, however, that these should be goals for any general work on the site or modification of the system. However, it is difficult to fill the block channels precisely with grout because any overflow and the blocks will not seat properly. Therefore, it may be necessary to introduce a release channel for excess grout on the back. Another alternative may be to use a silicone bead that 'cements' the block, and then tubing in the grout. Funding for tests of this nature needs to be obtained.

The original designs lacked flashing and other elements on walls and roofs that would help to protect the block. These need to be added in many locations, and maintained.

Given the range of possible interventions and alterations being contemplated what is the fundamental aspect of the textile-block system that must be maintained no matter what? At the least, it should always be a unit masonry system with blocks having the same face dimensions as they have historically, and matching as closely as possible to the original in color and texture. Tilt-up panels or other variants of the block system that replace these fundamental characteristics should not be undertaken.

The Block

Florida Southern's different block types, mixes, and locations will likely require an arsenal of different repair or replacement strategies: several answers from which the most appropriate can be selected in any particular circumstance, along with a clear and expeditious process that guides the development of appropriate treatments. This strategy would identify a typological list of problems (cracks, etc) and then specify which techniques are applicable and necessary. A goal should be to create a "Textile Block Conservation for Dummies" that can be used by college maintenance staff or local contractors.

However, this strategy still requires careful investigation of symptoms and existing conditions. If an individual were to identify a crack and then follow a standardized procedure without an in-depth understanding of the crack (whether it is growing, how deep it is, etc.), they could easily select the wrong conservation treatment (an entire element could be replaced when the crack should have been simply filled, or vice versa).

Florida Southern appears to be unique in having steel wire placed within the blocks to make them structurally capable of being manhandled during the construction process. This steel appears to be vulnerable to rusting and can cause damage in addition to that seen in other textile-block projects.

SPR was the only significant additive applied to the mix by Ove Arup at the Science Building. It was the only product that decreased the permeability of the block, by 50 times. But this may be irrelevant in protecting the steel if there is an open walled structure with gaps between blocks. It may, however, decrease the rate of carbonation in the block.

In evaluating the block mix, the key considerations are aesthetics, durability and moldability. The original aggregate-rich surface required a 1:4 mix, which is not durable. A technique for maintaining the appearance while moving towards a more conventional mix is promising. Parenthetically, this is similar to historical cast-stone techniques that had a different surface mix from the base block mix. Walter Burley Griffin, a Wright contemporary, finished some of his blocks with a sand coat after casting. Further considerations for the development of a new block mix should include curing, grading and ratios. The process of making the block raises the question of appropriate compaction and whether the new block should attempt to achieve compressive strengths typical of today's commercial blocks.

When examining the issue of replacements, either of entire blocks or portions, there are several options. Specially shaped blocks can replace needed areas. While there is little purpose in going to a great deal of effort to preserve the back of a block for historical purposes, more damage may be done removing the back half of a block in the replacement process. Therefore face blocks may be safer as a way to maintain the system's integrity. However, a 1.5"-thick block has far less durability than a thicker one, and the three-foot long length of the block is too great for that thin a face piece. Therefore, the replacement face may be relatively thin at the edges where it has to fit to the existing grout tubes, but thicker in the middle.

One thought is to create a stockpile of different block types so that the college can draw on them when needed. This would potentially reduce startup costs significantly. However, given the variation in both type and color, it might be better to create the molds. Even in this case, however, the contractor responsible for the blocks will likely want to create his or her own molds, which may be made of anything from wood to aluminum to rubber.

Again, funding should be sought for development of mock-up walls for the development of repair and replacement strategies, and for new block and system configurations.

Methodologies

Triage is essential when there are potentially thousands of individual repair projects possible. The blocks can be an endless project, costing considerable amounts of money. Funding is problematic, as repairs done properly are essentially invisible, while donors expect to see the results of their support. Small cosmetic repairs may be completely appropriate where it preserves historic fabric and reduces potential costs to the College.

Recording all work on the buildings is also essential. At this point, it is not always possible to differentiate original fabric from replacements. Essential historic character can be lost that way, as subtleties in design may not carry over from one generation to the next.

The original color of the majority of the block has changed. Looking at the core, there is a nice straw color but now the surface has taken on more of gray Portland color. It is not clear whether this is just pigment discoloration or efflorescence. One would have to understand what weathering and the build up of surface accretions has done to the color. This also raises the question of cleaning.

There is also a philosophical issue here –Florida Southern College's west campus is between 50 and 70 years old. Even if one were able to restore the original finish of the Annie Pfeiffer Chapel, since the color of the block has changed significantly over time, can one really arrive at Wright's original intention for the building? Cleaning should take place at each building individually, going period by period. This would probably reveal that each building is different in its pigmentation. Also, the block will certainly be too fragile for certain types of cleaning.

Conservation

This is a Frank Lloyd Wright site and a priority should be to conserve as much original material as possible. If many of the elements are too weak for cleaning, consider using strengthening solutions. These could also add water resistance. However, as noted earlier, the source of deterioration should be known. Strengthening a block will be of little use if an underlying steel bar is rusting.

The first goal is to try and save as much as possible. The caveat to that initiative is that there are blocks that are unsightly and heavily eroded. Having said that, despite the 1:4 mix and the porosity, it is surprising that so little of the blocks have erosion. It is important to realize how much of the block is intact at the site.

Recommendations

These recommendations were developed by Glenn Boornazian, Norman Weiss, John Fidler and Jeffrey Chusid. They are meant to considered along with the suggestions found in previous sections. The College should consider how to undertake some of these recommendations through class work and student projects.

I. Undertake a Quantitative Assessment of Conditions and Damage to Each Structure

Despite several short-term focused rehabilitation efforts, the full scope and nature of the existing damage and ongoing threats to the textile-blocks is still unclear. An accurate quantitative assessment should be added to the qualitative assessments done to date. Because this is a large task to undertake for twelve buildings simultaneously, it is recommended that undertaking an in-depth survey of a building, including crack maps, block-type counts and individual block assessments, be made a component of any major project undertaken on one of the Wright-designed buildings. The proper structure for this kind of study is within the context of a Historic Structure Report (HSR). One should be prepared for each building on the West Campus, again, as part of a capital project or, if funding becomes available, as a prior effort. The HSR will organize all the work required on the building, from conservation to modernization, in a way that facilitates achieving multiple goals most effectively and efficiently.

II. Undertake a Preliminary Survey to Document Exterior Block Varieties

The first survey to be undertaken should be a qualitative assessment of all the possible block types and conditions. Differences in original cement mixes and grouts may require varying conservation treatments. Differences are anticipated between buildings constructed at various periods, as a result of on-site variation in manufacturing methods, and as a result of alterations and repairs over the years on each building.

There is also a wealth of material to be found in a close study of historical documents: correspondence, photographs, job-site records and drawings.

MCWB's inventory of all Frank Lloyd Wright textile block structures on campus should be reviewed and augmented as needed to identify the variety of material types (blocks, mortars and grouts) employed by Wright.

The survey should include:

- Color analysis: Reflectance Spectrometry, Colorimeter and Pico gloss meter—Analysis to document color variation.
- Pachometer– Analysis to document layout and presence of representative metal locations clips, pins, rebar.
- Review with MCWB their prioritization of conditions that require repairs, stabilization, replacement and priority.

III. Testing

Undertaken to determine the condition of the materials, their current performance and future durability, and the nature and causes of deterioration.

The conditions and analyses gleaned from laboratory analysis should be linked to conditions of the same material on the site, including specific locations on a building, orientation, exposure, details and assemblies, surrounding conditions and block type. There are some excellent studies that have been done in the past, but they are either not comprehensive enough, or they do not make the necessary connection between the sample being studies and the conditions under which it lived.

Testing should include:

- Petrography—Review MCWB/Testwell analysis and expand as needed to determine the composition of the various extant mixes—blocks and grouts (aggregates, cements), to understand decay process and potential conservation options).
- Binder (cement) types
- Binder-to-aggregate ratios (in conjunction with ASTM C1324 wet analysis)

- Sand mineralogy
- Aggregate grading
- Pore structure
- Paste adhesion
- Carbonation depth
- Unhydrated cement
- Estimate of mix design
- Possible presence of admixtures and pigments
- Identify Presence of Soluble Salts—Analysis to determine if desalination is required to save or consolidate original material.
- Water Absorption (immersion)—Analysis to determine overall block absorbancy of rainwater entering channels through joints and to identify potential treatment to minimize absorption and retard decay.
- Capillary suction—Analysis related to face of blockwork absorption.
- Water Vapor Transmission Rate—Analysis to determine the rate at which blocks allow water vapor to pass and potential conservation treatment. options. Particular concern would be given to seeking treatments that do not alter permeability and avoiding treatments that could potentially become vapor barriers and therefore accelerate decay.
- Tensile Strength (Brazilian method)—Analysis to determine strength of existing material.
- Ultrasound Pulse Velocity—Analysis to determine potential material performance improvements associated with various consolidation treatments (as needed).
- Gravimetric Analysis—Analysis to separate representative cast mixes into component parts. This, in conjunction with petrographic analysis, will document the composition of original materials and will assist in the development of replication casting mixes.
- Accelerated Weathering (as needed)—Analysis of potental conservation options for compatibility and long term non destructive effects).

The blocks in the round theater were painted by students, and are now being cleaned as part of a restoration of the structure under the direction of Mesick Cohen Wilson and Baker. .

IV. Evaluation of Potential Conservation Treatments

Based on testing (III above), on-site observations, MCWB documentation and project proposals, evaluate the following aspects of potential treatments for the textile block.

- New grout design
- Inject existing voids (for treating existing voids in original locations of wall that will remain.
- Pouring new construction. (Attempt to develop a grout that will flow to fill vertical and horizontal channels between blocks).
- Replication—mixes/casting techniques
- Mix design (including local sand sourcing)
- Casting techniques/mold design for unit replication
- Materials and methods for insertion of new blocks
- Develop and evaluate patch/repair materials and methods
- Cleaning
- Biological soiling
- General soiling
- Paint and mortar stain removal

- Cathodic Protection Pilot
    - Identify an already condemned wall section that otherwise would be replaced.
    - Demonstrate feasibility of making electrical circuit.
    - Assess impact of making connections and concealing anode and junction.
    - Assess effectiveness of system to stabilize existing iron bars

- Chemical Consolidation Treatments (bring some binder strength and acid resistance back to original blocks to save as much original material as possible. Attempt to decrease initial rate of water absorption to limit penetration).
    - Color alteration
    - Change in WVTR
    - Strength treated vs. untreated
    - Acid resistence

V. Mock-Ups

Samples of anticipated work are critical for testing proposed repairs and treatments, both mechanical and chemical, and for developing accepted standards and techniques for future work. There are two types of mock-ups. The first are free-standing walls or other elements that are used as a model, or subjected to special testing on site. The second are samples installed into the building and evaluated in situ.

Both are useful for evaluating proposed methods and materials. It is important to test proposed work before it is applied more broadly to historic fabric on the site in order to prevent unpleasant surprises that result in irreversible damage. It is also important to undertake mock-ups to test under actual site conditions. Finally, mock-ups establish standards of acceptability for the work.

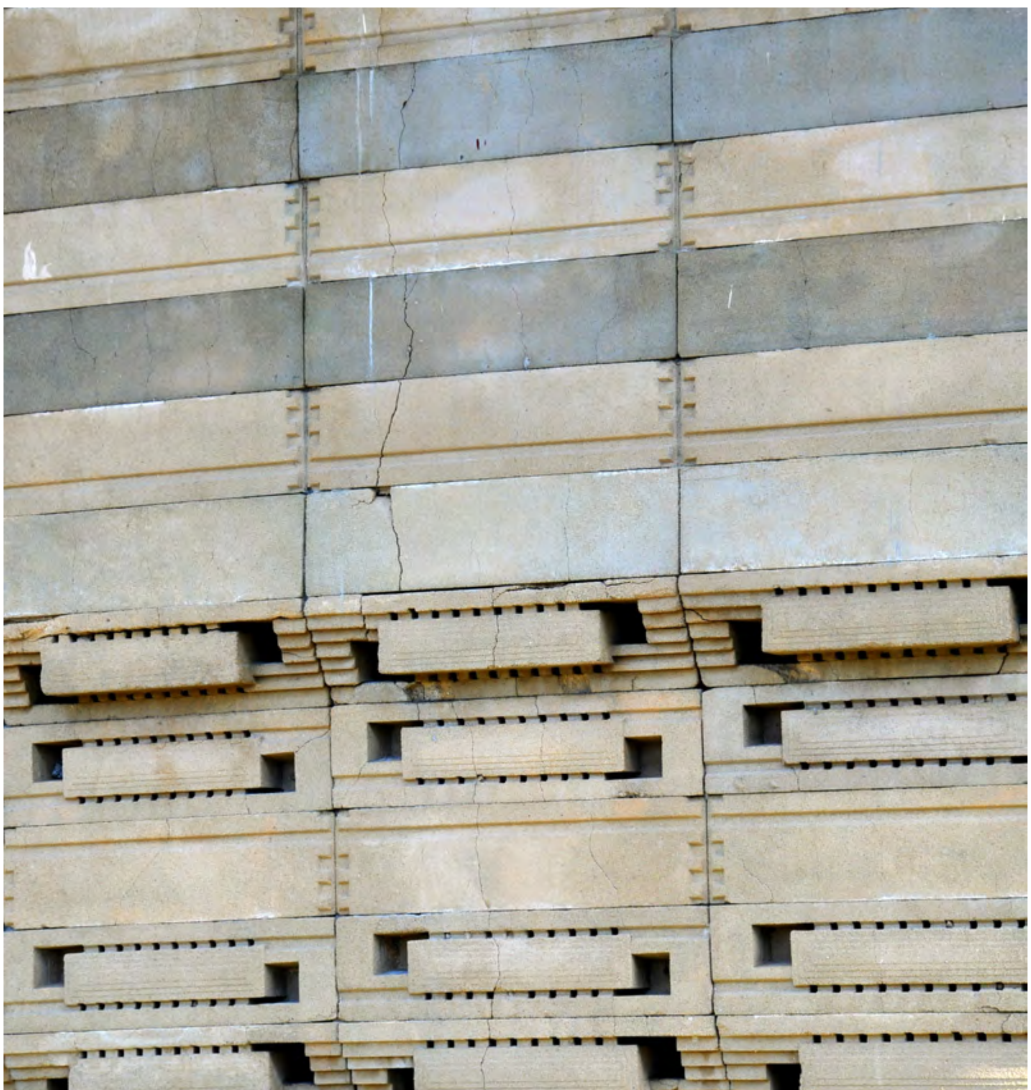
VI. Management and Maintenance

Long-term asset management planning, predictability in repair and maintenance cycles, and tested preventative maintenance regimes are all essential to keep original fabric in good condition. The Campus Heritage Preservation Plan addresses these issues, and its recommendations in this area should be adopted. It is also recommended that there be at least one individual in the employ of the College whose primary responsibility is the textile block. That person should have the historical knowledge and technical background to oversee all work done to the blocks on campus. from repair to replacement, and he or she should have ready access to an advisory committee that can assist with making appropriate decisions for the historic fabric of the campus.

Appendix A

Visual Conditions Documentation

In this image one can see the importance of different block colors to the design of the facade, efflorescence, and a vertical crack that may indicate the presence of a vertical concrete rib which has stiffened the facade at that point.



Corner blocks are particularly vulnerable to rusting of the reinforcing because the bars do not transition the angle smoothly, putting pressure against the outside face, which only increases as rust builds up.

The lower block is not in line with the upper block, suggesting problems with the vertical channel. Cracks at the corner and joint are related. The addition of electrical conduit to the facade is unattractive, as is the non-matching caulk. The blocks are also quite dirty, probably from biological staining.

These blocks are examples of orange pigmented blocks. Cracks are visible around the large glass insert and at the corner (see detail to the left). The texture is mildly eroded, revealing the coquina shell aggregate.

The difficulties experienced by the textile-block system make it tempting to undertake wholesale painting or even replacement of block with patterned panels. However, the result will be artificial in appearance and unconvincing as a replica. It is essential to maintain the masonry unit nature of the system while fixing other aspects as required.

The lower blocks are crushed in this wall, possibly because of a later addition of concrete to the walking surface. Surface water will also make the lowest row of blocks weaker.

The second block in this column is significantly more eroded than those around it. The color difference is probably the result of washing away the surface dirt and exposing the pigmented mix, but it may also indicate a slightly different, and weaker, mix. The upper block is experiencing incipient failure at the large glass insert likely due to expansion of the steel in the joint.

The poured-in-place coffers that accommodate the windows are stiffer than the blocks, but the connection between them and the textile-block system is unknown. Failure of the vertical joint could be the result of expansion of the steel in the joint, or a consequence of the connection between the two systems.

the block on Danforth Chapel shows efflorescence at the top, probably the result of water infiltration from the parapet, as well as staining from water overflowing the flat portion of the lower roof. More efflorescence is visible at the acute corner.

the matrix of grout tubes are harder than the surrounding blocks, and can break them. They are also the component of the system that best resists lateral forces. The outer wythe of the block at the left of the tube is gone, the inner wythe is pushed out by the dirt behind it.

The difference between the two mixes found in most blocks is visible here, where the joint seems to have provided a fracture plane for the block to split when pressured by the rusting reinforcement. The spray of paint is evidently an unrelated accident.

Removal of a vertical duct or other element added previously in this corner exposes damage caused by its trapping moisture next to the block. The block is also vulnerable to expansion and crushing. The lowest block at the left was a ventilator block, meant to accommodate an operable panel.

The block joint here is not in the reveal, but above, in the flush seam. That makes failure in the horizontal joint even more visible and problematic than elsewhere on the campus. The failure in the joint below the coffered area may be indicative of a problem (as in the previous image). Biological staining can also be seen the lower portion of the wall, which would be the most damp.

The presence of extensive efflorescence in this area suggests that the reinforcing is subjected to excessive moisture. The block at the left is also the most exposed to the elements. Both of these factors, along with the issues of stiff corners and imperfectly bent reinforcement need to be explored to understand the source of the crack seen here.

The textile block system seems to be particularly vulnerable to penetrations, such as that caused by the solid railing seen here. (See a similar situation from the Freeman House on page 11.) This is likely due to differential movement, but also to standing water on the coping.

Stairs and retaining walls are capped with long, thin cement coping that is relatively brittle, and does little to prevent water infiltration into the wall. Erosion and biological staining are visible here.

Rusting reinforcement has broken both the grout tube (the lighter concrete) and the block. Blocks in contact with surface water will wick moisture into the reinforcing. Blocks lower on a wall will experience more surface run-off as well. In addition, corner blocks are vulnerable to cracking from thermal expansion of the wall plane.

Coping stones may not be adhered to the wall below. Here one can see the typical failures of the system: grout that only partly fills the horizontal channel, and reinforcing that rusts away as a result. In the case of the coping stones, the rusting steel will lift them, widening the joint and hastening the deterioration. The blocks on both wythes are also experiencing vertical cracks that may be a result of the lateral pressure of the steps and fill.

Thin and brittle coping stones fracture easily. Their absence reveals missing grout and steel.

Conditions seen above are visible here in the next joint down from the top, essentially freeing both both coping and blocks from the wall. Note that the grout from the vertical joint apparently flowed across the gap between the wythes. Attempts were made in the past to repair this, as can be seen from the patches on the coping stones, but without addressing the underlying failure of the reinforcing.

There appears to be at least three different mixes or generations of block in this image, as well as attempts to patch both a yellower and pinker block. The wall needs to be disassembled and re-constructed.

Water moving through the retaining walls causes extensive damage, as does horizontal pressures that buckle the block (note the vertical crack continues up the face of the other blocks). Here, block has split in two across its length, as well as vertically. The face is gone, leaving the back half in place. The grout is only partial in the channel, the steel is rusted out, and the damage continued to the block at the left, which has been partially patched.

This area of retaining wall exhibits the same failure as seen in the last photo, but not as advanced. Again, an attempt was made to patch a missing piece, with a non-color matched patch. Portland cement repairs will be destructive to the block, which is softer.

Appendix B

Team Members

Roy Arnold, Architect. Arnold joined the Taliesen community in 1952. Presently, he serves as a Director and Vice President of Taliesen Architects. His broad range of professional experience includes the following projects: Arizona Biltmore Estates master plan, restoration and additions; California City` master plan; Mesa Civic master plan; Mountain View Estates conceptual plan; Carefree Ranch conceptual plan, Gold Mountain master plan; and the restoration of Frank Lloyd Wright residences in Alabama, Arizona and Wisconsin. Roy worked under the direction of Frank Lloyd Wright on projects at Taliesin and Taliesin West. Roy studied at the Frank Lloyd Wright School of Architecture where he is presently an instructor. Roy is a trustee of the Frank Lloyd Wright Foundation.

M. Jeffrey Baker, Principal, Mesick, Cohen, Wilson, Baker Architects, LLP. Jeff has restored dozens of landmark buildings during his twenty five year career. In addition to his work at Florida Southern, some of his current projects include: the restoration of several Jeffersonian buildings at UVA, Latrobe's Pope Villa, the Emily Dickenson Museum, and Gore Place. Past projects include: Monticello, Poplar Forest, Montpelier, the President's House at the College of William and Mary, Isaac Bell House (McKim, Mead and White), the Newport Country Club House (Whitney Warren), The Elms (Trumbauer), the New York State Capitol, the Vermont State House, the St. Johnsbury Athenauem and Richard Morris Hunt's Ochre Court. Jeff holds a Bachelor of Architecture degree from Rensselaer Polytechnic Institute, a Bachelor of Science, Building Sciences from Rensselaer Polytechnic Institute, and an Associate in Applied Science, Civil Technology from Hudson Valley Community College.

Glenn Boornazian, President, ICR and ICC. In 1988, Glenn started what would become Integrated Conservation Resources, Inc. (ICR) and Integrated Conservation Contracting, Inc, (ICC) in order to integrate investigative architectural conservation services with high-quality conservation and restoration contracting. Today, as President of ICR and ICC, Glenn draws on his extensive knowledge of building materials conservation to provide conservation services for historic buildings and monuments. His expertise includes specialized conditions investigation, materials testing, analysis and assessment, and the implementation of treatment recommendations. After studying at Columbia University's Graduate Program in Historic Preservation, Glenn served as Staff Conservator for the Center for Preservation Research at Columbia University, and Director of Restoration for the Nantucket (Massachusetts) Historical Association. He was an Adjunct Assistant Professor at Columbia University's Graduate Program in Historic Preservation from 1996 — 2002 and speaks widely on historic preservation.

Jeffrey M. Chusid, Moderator, Associate Professor, Historic Preservation Planning Program, Cornell University. Jeff is a preservation architect and planner who headed Historic Preservation programs at the University of Texas at Austin and the University of Southern California before joining Cornell in 2005. Recent research has focused on three areas: the fate of historic resources in areas of cultural exchange and conflict; the conservation of Modernist Architecture in Southern California and India, and the integration of preservation and sustainability. He has consulted for museums including Hearst San Simeon State Monument, the Huntington, and the Pacific Asia Museum, as well as municipalities and historic sites in Fiji, Bosnia, Ukraine, China, Texas and California. Current projects include a book on the restoration of Frank Lloyd Wright's Freeman House in Los Angeles (forthcoming from WW Norton), a monograph on Joseph Allen Stein, and curricula for sustainability education. Jeff was the preservation architect and director for the Freeman House for over a decade.

David G. De Long, Professor Emeritus, Architecture and Historic Preservation, University of Pennsylvania. David received his Master of Architecture degree from the University of Pennsylvania, where he studied with Louis I. Kahn, and his Ph.D. in Architectural History from Colombia University. A licensed architect, he practiced with the New York office of Whittlesey, Conklin & Rossant and was an associate of John Carl Warnecke & Associates, Architects and Planners. He joined the faculty of the Graduate Program in Historic Preservation at Columbia University in 1976 and from 1981 to 1984 was Chair of that program. From 1984 until 1996 he was Chair of the Graduate Program in Historic preservation at the University of Pennsylvania. Among the projects which he supervised as an Associate at Warnecke's office was the master plan for the development of the University of Delaware. He has developed preservation plans for Yale University and for the University of Pennsylvania. De Long's books (some co-authored) include Out of the Ordinary: Robert Venturi and Denise Scott Brown; Frank Lloyd Wright and the Living City; Frank Lloyd Wright: Designs for an American Landscape; Louis I. Kahn: In the Realm of Architecture; Bruce Goff: Toward Absolute Architecture, and Auldbrass: Frank Lloyd Wright's Southern Plantation.

Lynn Dennis, Executive Assistant to the President, Florida Southern College. A graduate of Florida Southern College, Lynn Dennis is in her 37th year with the College. She currently serves as the Executive Assistant to the President, and has stewarded the College's Visitor Center and Esplanade Gift shop, associated with the Frank Lloyd Wright designed west campus, since 1992. Her Wright connection includes two terms (1996-2002) as a member of the board of directors of the Frank Lloyd Wright Building Conservancy and service as the Conservancy's host-site coordinator for the 2001Annual Conference at Florida Southern.

Terry Dennis, Vice President for Finance and Administration, Florida Southern College. A graduate of Louisiana State University's Ourso College of Business Administration, Terry holds the MBA degree from Florida Southern College. He has served Florida Southern College's department for business affairs for 20 years. His areas of oversight include all financial operations, administrative technology, construction, facilities maintenance, and auxiliary services. He currently serves on the City of Lakeland's Planning and Zoning Board and previously chaired the City's Historic Preservation Board.

John Fidler, Staff Consultant, Simpson Gumpertz & Heger, Inc. Fidler is a British architect with two postgraduate qualifications in building conservation. He has over 30 years of experience in the preservation of historic buildings, ancient monuments and archaeological sites, latterly as Conservation Director of English Heritage in London. Other notable positions include being the UK's first Conservation Officer for Buildings at Risk and the first Historic Buildings Architect for the City of London Corporation. Recent projects include the Palmyra World Heritage Site in Syria, the Spanish Royal Presidio Chapel in Monterey, CA., and condition surveys and conservation strategies for the future welfare of the textile block walls of Frank Lloyd Wright's Ennis House. He has published and lectured widely and sits on the editorial boards for Donhead, Taylor and Francis and Butterworth-Heinemann/Elsevier. Under his leadership, English Heritage published the internationally best-selling Practical Building Conservation series, the English Heritage Research Transactions series (where he was also editor and author) and early books on the repair of Twentieth Century heritage, including Modern Matters and Preserving Post-War Heritage.

Amy L. Freitag, Program Director, United States, World Monuments Fund. Amy joined WMF in July 2008 after having served as Deputy Commissioner for Capital Projects for New York City Parks. In this position she led a capital staff of 350 architects, landscape architects, preservation, engineering and administration staff investing nearly $300 million annually in the design, construction and preservation of structures and landscapes throughout New York City. Amy previously served as Executive Director of the Historic House Trust of New York City and held several preservation positions in Philadelphia's Fairmount Park. Amy holds Master degrees in Landscape Architecture and Historic Preservation from the University of Pennsylvania and an A.B. from Smith College. Amy serves on the boards of the New York Preservation Archive Project and the James Marston Fitch Charitable Foundation.

Nora Galbraith, Resource Sharing Librarian, Florida Southern College. Aside from her responsibilities as Resource Sharing Librarian at FSC, Nora is co-author of the book The Buildings of Frank Lloyd Wright at Florida Southern College, published by Arcadia Publishing in 2007.

Dale Allen Gyure, Associate Professor of Architecture, Lawrence Technological University. Dale teaches classes in architectural history and theory, and Adjunct Assistant Professor of Historic Preservation at Goucher College, where he teaches a course in American Architectural History and serves as Co-Director of the Master's Thesis program. Dale's research focuses on American architecture of the nineteenth and twentieth centuries, particularly the intersections of architecture, education, and society. He just finished writing a book on Frank Lloyd Wright's Florida Southern College, which will be published in 2010, along with an architectural history of Chicago high school buildings. Dale has earned a Ph.D. in architectural history from the University of Virginia, a J.D. from Indiana University, and a B.S. from Ball State University. Before becoming a historian, he practiced law in Tampa, Florida.

James A. Jacobs, Architectural Historian, NPS, National Historic Landmarks Program and Historic American Buildings Survey. Jamie has been with the National Park Service for ten years and has researched and written histories on a variety of buildings and topics. Since 2006, he has also overseen the portion of the NHL review process related to properties being considered for architecture or design, work that has included the successful nomination and NHL designation of Frank Lloyd Wright's Hollyhock House, Beth Sholom Synagogue, Price Tower, and Guggenheim Museum. Jamie holds a Ph.D. in American Studies from George Washington University, a master's degree in architectural history from the University of Virginia, and a B.A. in History and the History of Art and Architecture from the University of Pittsburgh. Currently, he is working on a book investigating the design and marketing, and sale and purchase of new houses in post-World War II America.

Anne B. Kerr, Ph.D., President, Florida Southern College Since assuming the presidency of Florida Southern College in 2004, Dr. Kerr has led Florida Southern to prepare a comprehensive strategic plan designed to enhance all facets of the College's student-centered, engaged learning culture. Numerous major transformations are complete or under way, including several new structures designed by Robert A. M. Stern and restoration of several Frank Lloyd Wright structures including the Water Dome and campus esplanades. Works in progress include the Annie Pfeiffer Chapel and theatre-in-the-round. Under her leadership, FSC received funding from the Getty for the campus preservation master plan to restore, maintain and steward the College's treasured collection of Wright structures. Dr. Kerr earned her Ph.D. and M.S. in counseling and higher education administration from The Florida State University; she earned a B.A. in psychology from Mercer University. She formerly served as vice president for institutional advancement at the University of Richmond, previously serving as associate dean of the Crummer Graduate School of Business and vice president for institutional advancement at Rollins College.

Gerard Lynch. Gerard is an internationally acclaimed expert in historic brickwork, master bricklayer, educator, and author. He has been awarded the Silver and Gold Trowels from the Brick Development Association and is a Licentiate of the City and Guilds of London Institute. He is a former Head lecturer in Trowel Trades at Bedford College. He is the author of Gauged Brickwork: a Technical Handbook and Brickwork: History, Technology and Practice 2 volumes and 'The History of Gauged Brickwork, Conservation, Repair. Gerard holds an MA in "Conservation of Historic Brickwork", from De Montfort University, Leicester, and a PhD in "Historic Brickwork Technology ." He runs a successful international consultancy practice and has trained craftsmen in traditional skills, and worked on and advised on many of the most significant historic English brick built properties, as well as important colonial brick built buildings in the USA and Europe. He is a Winston Churchill Fellow, Viscount De L'Isle award winner, a Harold Higham Wingate Scholar, an honorary "Kentucky Colonel," an IPTW Askins Achievement Award Winner, and a trustee of the Preservation Trades Network.

Randall M. MacDonald, Director of the Library, Florida Southern College. Randall is co-author of the book The Buildings of Frank Lloyd Wright at Florida Southern College, published by Arcadia Publishing in 2007, and serves as an on-call docent for the Child of the Sun Visitor Center.

Lee Mayhall, Vice President for College Relations, Florida Southern College Lee joined Florida Southern as vice president for college relations in 2006. In this role, she is responsible for marketing and media relations, publications and the Web site, alumni relations, and corporate and foundation relations. Since her appointment, she has assisted President Kerr in bringing national and international recognition to the College's Frank Lloyd Wright campus and with many of the fundraising initiatives associated with its restoration. Lee earned her Master's degree in journalism from the University of Missouri School of Journalism. She was formerly associate vice president of advancement at the University of Richmond and previous to that served as director of corporate and foundation relations at Washington University in St. Louis. She serves on the Board of Polk County Government Television and the Polk Arts Alliance.

Liam O'Hanlon, Engineer, Liam O'Hanlon Engineers. Liam started his own firm in 2005 after working at Arup for seventeen years and other major New York engineering firms since 1984. He has had major design and management responsibility for a broad range of new buildings and historic preservation projects. His experience includes master planning, project management, structural engineering as well as particular design expertise with traditional building technologies and restorations ranging from a 17th century timber farmhouse museum to a collection of 1950's Frank Lloyd Wright buildings. Liam was the project manager for Arup's work at Florida Southern College in the 1990's. He co-authored "Restoring Wright: Florida Southern College," Modern Matters: Principles & Practices in Conserving Recent Architecture, English Heritage, 1996.

James G. Rogers, Chair, Division of Fine, Applied, and Performing Arts, Florida Southern College. Jim has taught at Florida Southern College since 1992. In addition to his chair position, Jim teaches in the art history program, which he chaired for many years. Jim received his Ph.D. in Art History and Archaeology at the University of Missouri at Columbia. His areas of scholarly interest include Michelangelo, ancient and modern architecture, and contemporary art. Jim's students are engaged regularly in the publication of scholarly catalogues in conjunction with the exhibition programs in the College's Melvin-Burks Art Gallery. Also, for a number of years, Jim has organized the Art and Art History programs study abroad programs, which take students and faculty to different destinations each May.

Mark Tlachac, Docent, Florida Southern College, Wright Lecturer. Mark received his degree in history from University of Wisconsin - Eau Claire. He retired from a successful business career to pursue his interest in the work of Frank Lloyd Wright. Mark is a docent at Florida Southern College and gives frequent talks about Wright and his works. In addition, Mark has produced a DVD about Wright's "Child of the Sun" campus.

Ken Uracius, Project Mason. Ken has over 30 years of masonry restoration experience and has been involved with many significant historic restoration projects along the east coast. He is an advocate for the use of historically accurate materials in restoration work and has played an instrumental role in the reintroduction of natural cement into the marketplace. Ken previously served on the board of directors of the Society for the Preservation of Historical Cements and has conducted traditional masonry material training workshops throughout the country. Presently, Ken is working with Enola Contracting Services, Inc. in Chipley, FL as a Project Manager/Consultant and is Vice President of Stone & Lime Imports, Inc., a Massachusetts firm providing masonry restoration consulting and contracting services. Previously he worked as Project Manager of the Restoration Division at Grande Masonry in Providence, RI and was Project Manager/Superintendent of the Special Projects Division at Consigli Construction Co. in Milford MA.

John J. Walsh, Senior Petrographer and Geologist, Testwell, Inc. John leads a small team of materials scientists dedicated to the forensic analysis of natural stone and cementitious-based building materials. John received his B.S. in Geology at Queens College, CUNY and Masters in Structural Geology at Columbia University as a National Science Foundation Graduate Research Fellow. John is an active member of several professional societies including the Society for Concrete Petrographers, the American Society for Testing and Materials International, and the Association for Preservation Technology. John is a strong advocate for the use of rigorous scientific methods in architectural conservation. Recent presentations/publications include the role of petrographic analysis in the forensic analysis of historic cast stone and concrete distress, presented new chemical techniques for the quantification of historic mortar mix designs, and demonstrated the combined use of microcopy and chemical analysis in establishing provenance and vintage of materials in properties with histories of repair and reconstruction.

Norman R. Weiss, Senior Scientist, ICR-ICC, Associate Professor of Historic Preservation, Columbia University. Norman 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. Among his best-known projects are the west front of the U.S. Capitol, New York's Trinity Church, and Frank Lloyd Wright's concrete masterpieces, Fallingwater and the Guggenheim Museum. His most current research is on the chemical treatment of limestone and marble, and the development of novel lime-based mortars, grouts and paints. He has taught at Columbia University since 1977, where he currently holds the position of Adjunct Associate Research Scholar. Norman is a Fellow and Life Member of the Association for Preservation Technology, a member of the PTT Board of the National Park Service, Vice President of MCC Materials, Inc., and Senior Scientist of Integrated Conservation Resources, Inc. He is Consultant Editor of the UK-based Journal of Architectural Conservation.

Eric Lloyd Wright, Architect. Eric is an architect and founder of Wright Way Organic Resource Center in Malibu, CA. During Eric's early years in architecture, he was an apprentice to his grandfather, Frank Lloyd Wright and his father, Lloyd Wright. His portfolio includes the restoration and renovation of Frank Lloyd Wright and Lloyd Wright works as well as residences and institutional buildings of his own design. Eric's current focus is on the evolution of Organic Architecture and Green Building design. His design philosophy is rooted in the integration of ecology, social responsibility and beauty. Through Eric's years of design experience, he has developed an understanding that it is not the physical walls and roof, but the space within a building that forms its character - its soul. He gives careful thought to a project's physical, social and spiritual environment, with a focus on appropriate materials, quality, craftsmanship, and careful detailing.

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350 Fifth Avenue, Suite 2412
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