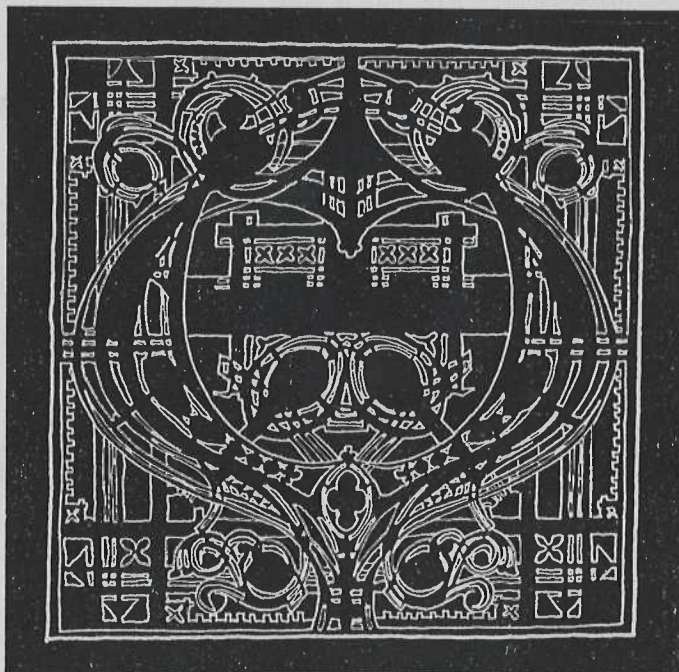


Make No Little Plans

Handbook of Abstracts
for the
1989 Conference
of the
Association for Preservation Technology International
Chicago, Illinois



Sponsored by
the Association for Preservation Technology International
and the Illinois Historic Preservation Agency

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The 1989 APT Conference Committee
and the Board of Directors
of the Association for Preservation Technology International
dedicates this
Handbook of Abstracts
to

J. Henry Chambers

His commitment to excellence shall continue to inspire us.

Acknowledgments

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Preface

"Make No Little Plans"

The Association for Preservation Technology International (APT) is an international alliance of preservationists, architects, engineers, historians, landscape architects, archaeologists, craftsmen, conservators, museum curators, planners, contractors, and others active in the preservation of our built environment. The 1989 conference theme, "Make No Little Plans," reflects the interdisciplinary professional expertise required for the design and implementation of preservation projects. This theme encompasses all aspects of preservation and all disciplines involved in preservation technology.

The abstracts which follow demonstrate the breadth of expertise in the membership. Presentation topics address theoretical and practical considerations of preservation technology, with session topics devoted to Materials Conservation, Stabilization and Repair, Preservation Philosophy and Education, Preservation Case Studies, Landscape Restoration, Craftsmanship and Artisanry, and Preservation Practice.

The individual presentations also clearly illustrate the variety of interest within the membership. Presentation topics range from "Neon, the Electric Flame" and "Historic Asbestos-Containing Building Materials: Can they be Preserved?" to "Preservation Construction: a Contractor's Perspective" and "Heritage Building Codes."

This year's conference introduces new session topics, including "Preserving What's New." The presentations in this track addresses the preservation of buildings and structures less than fifty years of age, our newest historic structures. Another new focus for APT is a session devoted to the topic of "Atmospheric Pollution and Historic Preservation," an issue of growing concern to the entire international membership.

The Conference Committee is pleased to have the opportunity to bring together this wide variety of interests, expertise and concerns, and to assist APT toward its common goal: the advancement of preservation technology.

Harry J. Hunderman, AIA, Conference Chair
Deborah Slaton, Program Chair
APT89 Chicago Conference

Materials Conservation

Carol J. Dyson, Session Chair
Architectural Coordinator
Illinois Historic Preservation Agency

APT: "To provide a useful forum for the promotion of the continued development of preservation technology" (Aims and Objectives of the APT.)

Traditionally, the conservation of building materials has been the "bread and butter" of APT conferences. In recent years, however, the discussion has centered on whether that "battered bread" should be "Scraped or Anti-Scraped." The APT89 **Materials Conservation** track is no exception to these traditions.

With a conference theme of "Make No Little Plans," it is appropriate to briefly explain the organizational plan for this session. Session tracks are divided into the basic materials of wood, metal, stone, terra cotta, and adobe, with the exception of a broader track on roofing materials. Material failures, structural problems and maintenance issues will be analyzed in reference to specific materials. Using case studies, current technologies for analysis, assessment, and repair will be presented. Developing methods, procedures, and practices in the conservation of materials will also be discussed.

Beyond the strict conservation of historic materials, appropriate levels of intervention and substitution will be addressed. Not only the durability of historic materials will be discussed but also the performance of earlier repairs, and substitute materials. Both the short and long-term implications of using today's materials and conservation technologies will be recognized.

If there could be a single conclusion to such a diverse set of session tracks it might be that each project can pose new dilemmas and prompt new solutions. There are no answers carved in stone, but if there were we might be able to suggest ways to conserve them.

Second Generation Sandstone Restoration

David Roessler, AIA
New York, New York

The paper will review possible responses to the problem of how to repair sandstone facades that have been extensively repaired in the past and now require further attention - in other words, how to repair the repairs. The principal case study will be New York's Fifth Avenue Presbyterian Church, a Gothic sandstone building completed in 1875 and the tallest structure in Manhattan until the completion of the Brooklyn Bridge. This writer has been involved with its restoration since 1985.

The decay of sandstones is an old and familiar problem that, over the years, has engendered a variety of repair and restoration methods. It is necessary to understand those earlier methods because present day repairs will often go over them. Conservation responses have changed markedly in this century and these developments will be outlined; for instance old hot wax coatings were replaced by a variety of organic products in the Fifties and Sixties while patches became more refined in composition and method of attachment. Yet despite the many improvements, few of these responses have proved successful and often we must repair the repairs. Today, newer repair methodologies are well established and in recent years conservation organizations in New York and Boston have produced careful reviews of sandstone maintenance and repair options, though these are concerned primarily with first generation repairs.

The Fifth Avenue Presbyterian Church is built of brownstone of average durability and is a good example for this paper because it has been extensively and repeatedly coated and repaired in the past. The following operations will be discussed and illustrated:

- removal of old surface coatings
- removal and replacement of failing patches
- retooling and recarving of surfaces
- attaching new veneers and dutchmen

Mention will also be made of a basic consideration in all such work -whether to leave surface materials alone entirely, retool the surface, or remove original material and replace it.

Sandstone Masonry Repair and Stabilization: A Preservation Challenge

Richard S. Beardmore
Industrial Sciences Department, Construction Management Program
Colorado State University

Since the completion in 1901, the precisely crafted ashlar sandstone masonry of the Rawlins Wyoming State Penitentiary has been subjected to the deleterious effects of freeze/thaw cycles, inappropriate repairs, deferred maintenance and mechanical abrasion. This paper describes the research, tests, evaluation, and other considerations which were accomplished before the final selection of restoration products, field procedures, construction techniques and contract documents format.

Specialized remodeling and restoration is becoming a major force in commercial construction. Knowledge of historic materials and construction techniques must be combined with contemporary state of the art construction products, performed under nontraditional design/construction relationships, and derived from a limited pool of skilled and experienced craftsmen. Knowledgeable architects and structural engineers, material specialists and preservationists need to respond by preparing and managing appropriate restoration programs to meet this challenge.

Discussion includes on-site visual inspection and methodology used to document existing conditions; probable causes of current degradation; laboratory testing and evaluation targeted at replicating the results of proposed or potential field procedures; selection of appropriate restoration products and techniques such as chemical stone consolidation and mortar/stone compatibility; major factors in developing appropriate, defensible construction documents intended for competitive bidding; field quality control and material procurement challenges, and identification and solicitation of the non-traditional, qualified and highly skilled craftsman.

A Spire to the Future

Alan Seymour, Architect
Toronto, Ontario

St. Paul's Presbyterian Church in Hamilton, Ontario, was completed in 1857. The church is highly regarded for its overall design and execution, but especially for its elegant spire, the first and only stone spire erected in Ontario. 185 feet high, built of Ohio sandstone, and completed in the remarkably short time of 6 weeks, the spire has been a landmark in the city ever since.

In the 132 years of its existence, the church has been exposed to the increasingly polluted environment of Hamilton, Canada's steel town. In 1944 an earthquake caused serious damage to the top of the spire and a decision was made to rebuild the top courses in limestone, a most unfortunate error.

By 1987, the stonework of the spire had deteriorated to such an extent that Martin Weaver Conservation Consultant was retained to inspect and report on the fabric generally. Inspection revealed a spectacular deterioration caused primarily by air pollution. Many of the masonry joints were wide open to water penetration from acidic rain, snow and fogs or aerosols. At the top of the spire, daylight was visible between some blocks of stone.

Excessive pollution from the iron and steel works added to that from longer range sources resulting in the addition of large quantities of sulphates which were destroying the masonry in the form of massive deposits of efflorescent and subflorescent salts. Some of the sandstone blocks in the spire had lost more than a third of their thickness and possibly more of their bearing surfaces. The choice of limestone for repairs to the original sandstone masonry was an error which 19th century masons would have avoided. Acidic rainwater running across the limestone removed carbonates and redeposited them in the sandstone below. In their new position in the surface pores of the stones, these carbonates reacted again with the pollutant oxides of sulphur and nitrogen, forming dangerous concentrations of water soluble sulphate salts.

Alan Seymour Architect was retained to carry out the conservation program, which started in November 1988, and is currently in progress. It involves:

- Design of seismic and wind-load resistant reinforcement.
- Removal of the 1944 limestone repairs and replacement of the 1857 sandstone masonry at the top of the spire.
- Removal of numerous loose ornamental finials, obelisks, pinnacles etc. to ground level for poulticing and repairs.
- Removal of deteriorated pointing and stonework inside the spire.
- Installation of stainless steel reinforcement.
- Complete repointing inside and out, and the application of a sacrificial plaster coating inside the spire.
- Re-erection, restoration and reinforcement of all ornamental features removed.
- Masonry cleaning.
- A video film record of the project.

The Restoration Cleaning of the Marble Facades of the Metropolitan Club,
New York, New York

F.G. Matero, J.C. Snodgrass, N.R. Weiss

The Center for Preservation Research, Graduate School of Architecture, Planning and Preservation
Columbia University

Constructed in 1894 by the renowned firm of McKim, Mead & White, the Metropolitan Club building became an immediate landmark due to the chaste splendor of its white marble exteriors. Discolored by urban pollution and widespread ferrous staining, the facades were painted in 1965 as a misdirected attempt to cosmetically improve their appearance.

From 1986-88, restoration studies were conducted to develop a conservation program for the exterior. Paint and ferrous stain removal became a major issue in this research and an extremely safe and successful system of stain removal was developed, despite the failure of commercial systems. This paper will address the general issues of marble cleaning and in particular the common problem of ferrous staining.

Investigation and Stabilization of Marble Deterioration of City Hall
Schenectady, New York

John G. Waite
Mesick Cohen Waite Architects

The Schenectady City Hall was constructed in 1930-1931 to the design of McKim, Mead, and White Architects of New York City. Constructed of quality materials with carefully considered details, the building was intended to be a major landmark which would serve for centuries as the center of civic life for this important industrial city. However, after only fifty years, the exterior marble has deteriorated because of atmospheric pollutants resulting in a condition that is both unsightly and potentially dangerous. To address the problems of the long-range conservation of the building, Mendel.Mesick.Cohen.Waite Architects and the Atmospheric Sciences Research Center were engaged in January 1982. The goal of the initial study, which was prepared by scientists, architects, and building conservators, was to identify the following:

1. Possible causes of deterioration of the exterior and interior marble.
2. Extent of deterioration below the surface of the exterior and interior walls.
3. Sources of atmospheric pollutants which may have contributed to the deterioration of the marble.
4. Proposed remedial treatments of the marble.

The results of the study indicated that the following action was required:

1. Cleaning of exterior marble to remove gypsum crusts and remaining surface pollutants using low pressure water and non-ionic detergent.
2. Removal and refastening of loose marble fragments and elements.
3. Repointing of deteriorated mortar joints.
4. Application of test panels of consolidants to seriously deteriorated areas.
5. Removal of sources of pollutants.

The actual construction work has been completed and the results have been evaluated. The deterioration of the marble has been arrested and interesting observations have been made regarding the source of the atmospheric contaminants. For example, instead of acid rain being the principal cause of the deterioration, it was found instead that precipitation had a positive effect on the long term preservation of the stone. The major cause of deterioration was found to be emissions from the city's automobiles and industries.

Because the building is listed in the National Register of Historic Places and federal funding is being used for its preservation, the study and contract documents have been prepared in consultation with the New York State Office of Parks, Recreation and Historic Preservation (SHPO) and the U.S. Department of the Interior. The American Society for Testing and Materials (ASTM) also participated in the project and published some of the results.

In the presentation, the Schenectady project will be compared with the Tweed Courthouse in New York City, a landmark structure built between 1861 and 1871. Constructed of Tuckahoe marble, the

building has suffered the same type of deterioration caused by atmospheric pollutants. Our firm has just begun work on the restoration of the Tweed Courthouse and results of the analysis of the exterior stone and its cleaning will be completed by the time of the APT conference.

**Repair and Restoration of the Ornamental Limestone Facade
at the Chicago Tribune Building**

Mark Robert Morden, AIA
Wiss, Janney, Elstner Associates, Inc.

Walter S. Arnold, Stone Carver
Chicago, Illinois

The Tribune Tower is one of Chicago's architectural gems. Built in 1925, this stunning masterpiece stands on Michigan Avenue where, along with the Wrigley Building, it serves as the southern gateway to the Magnificent Mile. The design of the Tribune Tower was the result of an unprecedented international architectural competition, sponsored by the Chicago Tribune newspaper. Its purpose was to build a new home for the offices of the Chicago Tribune and to provide the city of Chicago with a new civic monument. In all, 260 designs were submitted from entrants in 23 countries. The winning design was submitted by the New York City firm of Hood and Howells. The Tribune Tower is listed in the National Register of Historic Places, as well as being a local and state landmark.

Sixty years of weathering have taken a toll on the limestone facade of the Tower. In the early spring of 1965, one of the carved ornamental panels broke loose and fell from the fourth floor of the building. The Tribune Company retained Wiss, Janney, Elstner Associates, Inc. (WJE) to investigate the cause of the failure of the stone panel. The investigation revealed that additional stone panels were also severely cracked. WJE determined that the unprotected steel was the victim of corrosive deterioration. The build up of stress in the facade due to the corrosion of the steel was the cause of the cracking and displacement of the decorative stonework. WJE also found some deviations between the stone support drawings and the as-built conditions which may have contributed to the problems.

WJE designed repairs to rehabilitate the facade of the building. These included the removal of key panels of the facade to expose the structural steel; the removal of corroded steel members and replacement with new galvanized steel; the installation of new stainless steel flashings and cotton cord weeps at these steel members; and the reinstallation of the stone panels with new metal ties. Because of the historic significance of the Tribune Tower, WJE recommended the replacement of the deteriorated carved panels with exact replicas, also carved out of limestone. Mr. Walter Arnold was hired as a subcontractor to produce these replicas. Working from the original design and shop drawings, and from the original pieces, Mr. Arnold carved the replacement panels.

Mr. Morden will present a summary of WJE's investigation. He will describe the deteriorated conditions found during the investigation, the cause of the cracking and deterioration of the stone due to corrosion of the unprotected steel support members, and the design of the repair details. Mr. Arnold will explain the process of carving by following works through the stages from rough stone to the final, installed pieces. He will show some of the various methods of working from the original architects drawings and damaged fragments of the original pieces, with explanations of tools and techniques.

A New Fire Escape for a Cass Gilbert Skyscraper,
Boston, Massachusetts

Roger Galliher, AIA
Galliher & Baier Architects

The exterior restoration work included replacement of a deteriorated, non-original fire escape on an eleven story, 1896 building - Boston's third oldest steel-framed skyscraper and Gilbert's last remaining design in Boston. Gilbert's original drawings showed an elaborate fire escape design, probably not built, similar to the interior stairs. Unfortunate! The outstanding terra cotta clad structure would have been enhanced.

Could the handsome Gilbert design be used for a replacement? Perhaps, but the Gilbert design did not meet very restrictive current code requirements. The Building Department was not interested in either history or ethics. Building officials and firemen are reluctant to tread on old fire escapes in Boston. Accidents have happened too often. A compromise design was developed and approved, but not without problems.

Neither the architect nor the structural engineer had experience with fire escapes. Questions included attachment to the building, protection of the decorative facade, erection, and cost. An important question was "What documents are required for realistic bidding?"

Major elements of Gilbert's design were treads, posts and railings. The cast iron post design had also been used on the existing interior stairs and modified replications were made. Question - Should relief detail read or should posts be galvanized for longevity? The railing design was modified for height and opening sizes. Question - Can 80 units be hand-produced at a reasonable cost? Existing cast iron treads could be reused, but again the galvanizing questions arose. Gilbert's sketches also included a decorative casting for the support brackets - our first drawings for carved wood models.

Technical aspects - bracket design and attachment. Chop pockets into terra cotta facade and weld brackets to steel frame. Fill pockets with concrete and cover with GFRC panels. Major problems when architect's nifty solution backfires. High strength bolts, nuts, washers, fish plates, spacers, site measurements and engineering problems tossed at architect. Solutions came, but not easily. Final problem - the swing section and the counterweight size. The clean design appears in place at double size. Owner very unhappy. Possible modifications included a hydraulic mechanism. Solution - lead at 710 pcf vs. steel at 490 pcf.

Paint selection and painting completed the work. The finest fire escape in Boston is now an elaborate, green colored assembly that is both historic and safe!

**Repairing and Replacing Sheet Metal Ornaments
and Building Pieces for Metal Building Fronts:
A Case Study on a Mesker Building**

William Bean, Jr., Restoration Specialist
North Carolina State Historic Preservation Office

In 1981 as an independent general contractor I was hired to restore the facade of a main street building in Navasota, Texas. The building was a turn-of-the-century Mesker Building storefront that had suffered many years of non-maintenance and neglect. Several of the pressed metal pieces were missing.

Through local research I was not able to locate any companies reproducing the elements that I needed to replace the missing parts. After beginning to remove deteriorated pieces of the building front, I made the decision to reproduce the missing elements by making molds of existing ones and casting reproductions from plastic resin.

The repair of the existing pieces was the first step undertaken in the process. A complete cleaning by vat stripping of the entire building front left me with several metal pieces that had either been broken or rusted away over the years. These were repaired with auto body epoxy filler. Hard plastic castings were then drawn from the original pieces. Into these castings was poured Deep Flex Liquid Plastic Resin along with a wire mesh to hold it all together and wooden blocks. The wooden blocks' purpose was twofold. First they displaced quantities of the more expensive Plastic Resin and second they became anchors in which I was to later attach metal clips that I would pop rivet to the adjacent pressed metal pieces.

After adjusting the mixture of the resin I was able to get a good reproduction cast. This was installed, caulked and primed. The entire building was given an oil-based painted finish and now some eight years later the plastic resin pieces and the paint have held up well. No noticeable cracking of the pieces reproduced or early release of the painting upon them has been evident in my monitoring of the finished product.

Restoring Interior Finishes: Cast Iron Elements at Federal Hall

Alfonso Narvaez, Historical Architect
National Park Service, North Atlantic Historic Preservation Center

This presentation will outline the documentary and physical research undertaken in association with the restoration of painted finishes on decorative cast iron elements at Federal Hall National Memorial in New York City. It will focus on the steps taken to substantiate, document and recreate the original faux bronze patina finish covering most of the cast iron elements at the time of the building's completion in 1842. Additionally the paper will discuss the development of specifications and drawings required to execute the work, as well as final supervision and execution of the finished product by John Canning and Company, Ltd.

Documentary and physical evidence on the original colors and execution of the finishes for cast iron elements at Federal Hall (originally built as the New York Custom House c.1834-1842 and later became the New York Sub-Treasury in 1862) clearly indicate the types of pigments and varnishes used, and presents a reasonable chromo-chronology of earlier and subsequent coatings. Documentary evidence includes the painter's contract describing the proposed work, an article by the architect describing the work as finished; fascinating correspondence regarding the ironwork; and an excellent description of the technique from a contemporary manual published a few blocks away from the site just prior to the writing of specifications. Physical evidence included a thorough microscopic paint analysis showing primer and base coats of an earlier abandoned finish, the final original finish, and all subsequent layers. Usable samples were available from all elements and provided a reasonable picture of the finish hierarchy.

Most of the interior and exterior ironwork was finished with a painted faux bronze patina finish by the time the building was complete. All the ironwork had been initially painted white to protect the iron and to afford additional brightness in a building that did not have artificial lighting until much later in its history. At the insistence of the supervising architect, John Frazee, and over the arguments of the Commissioner for Construction, the ironwork was finally bronzed in 1841 with only the undersides of the balconies remaining white. The architect's description stated : "The color is a deep rich olive, composed of six different color paints, and laid on in many coatings...then a blending of gold powder, and two coats of the purest varnish complete the process. The result...is the appearance of real bronze."

The technique used to actually recreated this finish was first developed using a high-build aliphatic polyurethane enamel (because of its excellent gloss retention, long life, and compatibility with clear acrylics) as a base with gold bronze powder laid on in a similar manner to the original and clear-coated with incralac (to keep the luster on the bronze powders); however this proved to be problematic. The final solution was to apply a succession of opaque glazes (scumbling) over the existing gold bronze finish and to wipe away the highlights. This was, in turn, stippled to soften the effect and varnished. The final finish has beautiful rubbed bronze patina quality that does justice to the original architect's intent while remaining in step with current practice and ideology.

In Situ Epoxy Stabilization of Timber Posts: A Case Study

Alan O'Bright, Historical Architect
National Park Service, Midwest Regional Office

The Truman carriage house is a component of the Harry S. Truman National Historic Site accessioned by the National Park Service in 1982. Adapted as a double bay garage by the Trumans, the carriage house is a combination of post and beam and light frame construction, built in two phases during the late nineteenth century. The east half features salvaged hand-hewn heavy timber and the west half dimensioned heavy timber construction. A four inch concrete slab was poured over the entire floor in the 1950s.

A physical investigation was conducted in 1986 with the goal of determining the extent of foundation and framing deterioration. Test pits were excavated around the rubble limestone foundation to determine the condition of the walls. Portions of the siding were carefully removed to access the foundation sills and concealed post surfaces. The posts were bored to ascertain the extent of internal decay and termite damage.

The investigation revealed that the foundation sills had completely deteriorated due to moisture retained by an encroaching grade and the concrete floor. Post bases had also suffered where the concrete floor was poured around them. In the heartwood of some posts, damage extended over six feet above their base. An eastward lean of the structure was due in part of the collapse of the rotted post bases.

The possibility of damaging historic integrity combined with limited construction funding dictated that alternatives to complete structural dismantling for repair of the building had to be developed. Fortunately, most of the decay was internal which left a shell of stable wood at the exposed surfaces of the posts. This condition permitted the development of successful in-place structural epoxy stabilization that retained the historic appearance of the exposed post surfaces. The following construction method was initiated in 1987:

- The board and batten siding was removed and marked for reinstallation.
- A notch was sawed the entire length of internal decay at the surfaces of the posts concealed by siding.
- Deteriorated wood was removed and epoxy consolidant applied on the cavity walls.
- Fiberglass key rods were inserted into a new concrete sill beneath the post bases and treated wood was inserted into the post notches, allowing for a pour hole at the top.
- Modeling clay was used to plug all checks and holes to prevent the escape of epoxy.
- Sand-filled structural epoxy was poured into the cavities in separate lifts.

Viga Restoration: A Reversible Technique

Jake Barrow, Exhibit Specialist

National Park Service, Southwest Cultural Resources Center, Division of Conservation

Throughout the southwest region, vigas are an integral part of the architectural fabric. This structural and decorative timber has its origins in the prehistoric native populations; as well as the Moorish influences which were imported to the Americas by the Spanish in colonial times. Remnants of early vigas are still seen in many ruins, maintained pueblo structures, and Spanish colonial buildings. They are also incorporated in the pueblo revival styles and continue to be used in contemporary architecture. They were widely incorporated in the rustic architecture constructed by the National Park Service in the 1920s and 1930s. Stylistically, vigas provide planes and shadows which break up the mass of walls; sometimes being artificially added to the exterior, becoming a purely decorative element. The rustic exposed timber gives way to a carved squared timber in more refined examples.

Unfortunately vigas are self destructing because they are constructed of wood and are usually exposed to the weather. The logs crack as they dry out and then absorb water in rainy seasons. Moisture penetrates to the core and fungus begins to travel along the cells of the log, eventually resulting in structural failure. This preservation headache is tolerated and perpetuated due to aesthetic affinity. Vigas have become an integral part of the building vocabulary in the southwest and it is incumbent upon preservationist and builders to accommodate this encumbered design.

The National Park Service is faced with this problem in a major way. Of the 38 Parks in the region, many have National Register historic and prehistoric buildings with vigas. The buildings number in the hundreds and the vigas number in the thousands. This is no small problem and can not be solved with a small solution.

A variety of solutions have been tried in the past and generally four of these predominate. First, one may replace the entire viga which is necessary when structural failure is extensive. This often involves roof removal or major structural work. Other approaches are often used when the rot is caught before it destroys the load bearing area of the log. An example of this second approach is to cut the viga off flush with the building line, or back somewhat and cover it over. The architecture changes - and a practical homeowner is exposed. A third alternative, which is used in new design as well as repair, calls for sheet metal caps to be attached shielding the top surface of the log. This is effective, but provides design complexity to normally simple pueblo revival style. A fourth and common solution is to cut the end off and attach a new end. A variety of methods have been developed in the past which usually depend on a pin attached between the two logs with adhesive. The solutions used in this system tend to either be too strong (irreversible) or too weak (they droop and fall off too soon). To be sure, end joining wood effectively and with precision is the woodworker's greatest challenge.

Currently the Southwest Cultural Resources Center of the National Park Service is installing replacement viga ends in a new manner that is technically facile, structurally calculable, and most important - reversible. Several stages are necessary and the techniques vary with conditions (adobe or stone and exposed or concealed joints). Generally the process can be described in the following manner.

First, the vigas must be inspected and a list drawn up which indicates the species of wood, depth of rot, and the diameter and length of the viga (rotted portion). From this list, materials may be acquired and fabrication of stubs may begin; although step 2 is recommended prior to construction of ends. In step 2, the deteriorated vigas are severed at the building line and the rot is removed. Depending on the situation, a router and custom jig are used to prepare the end of the old viga (particularly when it is to be an exposed connection). For deeper connections or hidden connections other tools are used. Either way, it is important that the stub end and the old viga to cut and prepared in the same axis and orientation for solid mating. The router and similar jig perform the final cut on the stub admirably. Once these flat ends have been prepared, a two-inch hole is drilled into the relative center of the two ends to an engineered and calculable depth (a seven-inch viga with a four-inch extension requires six inches of depth on either end). Then a structural fiber glass rod (threaded) is glued into the old viga with epoxy. As in the above example - the extension of the rod would be six inches. It is placed in the proper axis with a flat faced jig and held until setting. The same process is followed with the stub except for the application of mould release agents. Once this epoxy has set, the rod is unthreaded leaving an extended nut cast inside the stub (a mate for the fixed rod on the viga). For exposed joints the stubs are left oversize in diameter for final fitting. The stubs are now taken to the building and screwed onto the extending rods. Fitting may be accomplished in place or the vigas can be unscrewed to accomplish major wood removal. The stubs are drawn up with over 100 lbs of pressure manually to provide tension at the connection point. Various other details are incorporated into the process to facilitate the procedures. Once these viga stubs have been attached they may be detached at any time. The second generation is expected to be much easier - involving 1/2 the work. With records kept, the stubs could be prepared in advance and attached quickly when needed.

The viga connections herein described are stronger than the wood itself as proven by tests performed on samples in an engineering laboratory. The application is predicated on this strength, coupled with the idea that the original viga may remain isolated and protected from deterioration for perpetuity. Only the end becomes a sacrificial element true to the original intent of what ever design may be in force. The authenticity and integrity of a true, whole log becomes anachronistic within the design and intent of exposed viga ends. Yet the substitution is minimal and allows the viga end to gain the natural patina of ageing wood which is often the necessary and desired effect.

To date, viga connections such as these have been accomplished on structures within Carlsbad Caverns National Park (historic district), at White Sands National Monument, at Bandelier National Monument, and at the Old Santa Fe Trail Building in Santa Fe.

Wood Epoxy: A Practical Solution to a Typical Problem?

Ralph Bray, Historical Architect
Missouri Department of Natural Resources

The Battle of Athens State Historic Site is located in the extreme northeast corner of Missouri. Acquired by the state in 1975, the site is the location of the northernmost Civil War battle fought in Missouri, which took place on August 5, 1861. Since that time the town of Athens steadily declined to the point that today only a few buildings and stone foundations remain as evidence of the once prosperous town. Among the few buildings to remain is the Benning House. The large house was built in 1844 and is of wood construction. Though hardly a fleck of paint remains on the house, it stands today because it was well built and has been protected for several years by a pole barn built over it. This spring the building will be the subject of an extensive restoration project which should last through the summer.

Of special interest during the restoration project will be the use of epoxy based wood restoration materials. Even though the building has experienced considerable deterioration over the years, a commitment has been made to save as much original wood as possible, rather than replace it, in order to maintain the historic building's integrity long into the future. A close working relationship with a sympathetic and understanding contractor will be necessary to insure that original siding, trim, framing members and window parts receive appropriate attention and consideration.

Certain concerns do exist, however. How difficult is it to work with wood epoxy and how easily can high standards of workmanship be achieved? How specialized and expensive is the process and are we really aware of what we're getting ourselves into? How time consuming and labor intensive is the process? Are the wood epoxy products on the market alike? What are generally the advantages and disadvantages of each? Which ones are most workable? Which ones provide the best results? Is it realistic to consider wood epoxy on all restoration projects? These questions and many more will be answered when we perform our first major wood epoxy program. Perhaps the overriding question to be studied and considered most thoroughly: is wood epoxy a practical solution for a typical problem?

The Repair and Maintenance of Historic Roofs

Horace H. Foxall, Jr.

U.S. Army Corps of Engineers, Seattle District

David Kemnitzer

Kemnitzer, Reid & Haffler

James Merritt

Merritt & Pardini

The presentation will cover a condition survey study of historically significant buildings with clay tile roofing. These buildings constructed between 1927 and 1939 are located in the historic district at Fort Lewis, Washington.

The purpose of the study was to examine each of the components of the roofing to ascertain the conditions and to establish a maintenance plan on the findings. The presentation will address the following areas:

- A. Types of structures
 - 1. Multi-story barracks
 - 2. Shop buildings
 - 3. Single-family units
 - 4. Miscellaneous structures; i.e., hospital, fire station, and theater
- B. Three Styles of Clay Tile on Structures
 - 1. Flat shingle
 - 2. Spanish
 - 3. Mission barrel
- C. Damage and Deterioration
 - 1. Natural
 - a. Predictable deterioration
 - b. Storm damage
 - 2. Human
 - a. Damage due to unauthorized access
 - b. Vandalism
- D. The Components of the Roof
 - 1. Structure and substructure
 - 2. Vapor barrier
 - 3. Flashing
 - 4. Gutters and downspouts
 - 5. Masonry

- E. Replacement Options. A discussion of replacements that are consistent with the Secretary of the Interior's Standards for Rehabilitation are specific for architectural features such as design, color, texture, and other visual qualities.
- F. Structural Evaluation. The analysis and evaluation of substituting concrete tile for clay tile.
- G. Clay Versus Concrete Tile Test Comparison
 - 1. Cross breaking strength
 - 2. Modulus of rupture
 - 3. Weight comparison
 - 4. Compressive strength
 - 5. Water absorption
- H. Product Sources. Availability of products from clay tile and concrete tile manufacturers.
- I. Available Products, Costs, and Shipping Conditions. Analysis of available products and costs.
- J. Life Cycle Cost Analysis. A life cycle cost analysis was used to evaluate the economic merits of repairing the roofs of six sample buildings under three options with clay tile versus replacing the roofs on the same six buildings with concrete tile.
- K. Laboratory Test. One representative sample roofing tile was removed from each building surveyed. The tests were performed for water absorption and compressive strengths.
- L. Costs and Maintenance Guides. The maintenance guides provide itemized costs, bids for repair from contractors for work scheduled for the Fort Lewis maintenance staff.

Mr. Foxall will address "Investigating the Life of Clay Tile Roofing, the Fort Lewis Experience." Mr. Kemnitzer will address "Repair of Slate Roofs." Mr. Merritt will address "The Repair of Metal Roofs, The Union Station Experience."

Slate, Metal and Wood: Roof Restoration at George Brown House, Toronto

Lawrence Kavanagh, Architect/Supervisor
Property Restoration Unit, Ontario Heritage Foundation

Built in 1876 by George Brown, Father of Confederation and founder of The Glob, the second Empire mansion at the corner of Beverley and Baldwin Streets, in downtown Toronto, was donated to the Foundation by the city in December 1986. A program of preservation and adaptation for office/reception/meeting/museum space is being carried out by the Property Restoration Unit. The approach of the Foundation to adaptive reuse for its historic properties is one of preservation inflected by use: carefully controlling the extent of the necessary architectural interventions in order not to obscure the accumulated layers of history.

The repair and restoration of missing portions of the roof was undertaken as the first phase of the work. Poor initial design combined with years of neglect not only led to severe deterioration of the roof gutter and the dormer windows but also of the soft brick and sandstone facade. Extensive research and documentation preceded the work in order to establish a basis for decisions to be made about the roof elements. Restoration of the roof's physical fabric to make an operable water shedding roof was obviously paramount - decisions about retaining, replacing or removing dormers were based on criteria established during the research. Was the intervention sympathetic to the house design, was it quality an example of the best design/execution of its period, did it contribute to the story of the House and its evolution, was it in good repair and were the costs to restore prohibitive or acceptable?

Although documentation resulted in a fixed price tender for the work at the outset, costs did escalate as more severe deterioration than had been anticipated was literally uncovered as slate, paint and metal were removed. Slate was completely replaced (the original was delaminating) and galvanized metalwork was replaced after it was determined that it could not be reassembled. Dormer roofs were rebuilt, all lower sashes were replaced and rotted or missing details such as capitals, scrolls and finials reinstated. In each case, steps were taken to improve original design and manufacturing processes. Original detail, sizes and lines from the street remain the same; however, as an example of improved detailing, folded, locked and soldered joints, replace lap and nail joints in the sheet metal.

Colour research revealed the green we see today. For future generations, our work is clearly delineated yet the roof reads as it did on that day in 1876 when George Brown strolled up his new front walk.

Investigations and Reconstructions in Terra Cotta:
Alternative Approaches

Anne McGuire, AIA
Anne McGuire, Architect

Buildings No. 1, 3 and 4 at the Naval Training Center, Great Lakes, Illinois, were built between 1906-1911. Building No. 1 also has additions dating from 1941. The exteriors of these buildings are of red brick with terra cotta trim and limestone base. They are contributing structures in the Great Lakes National Register Historic District. Deleterious effects of lake exposure, lack of appropriate maintenance, and improper rehabilitation has contributed to the deterioration of these structures.

The Speaker was hired as a preservation specialist with A.M. Kinney Associates, Inc., the architect, for the restoration of these significant facades.

Before beginning repair/restoration work, the U.S. Navy required preliminary investigation to determine the degree of deterioration. On the first two buildings to receive work, Buildings No. 3 and 4, the investigations were limited. However, on Building No. 1, the U.S. Navy required that a complete Existing Conditions Survey (ECS) be performed in order to provide the Contractor for the Restoration/Repair work with a tight set of Construction Documents describing such items as the location and specific repair or replacement instructions for each defective terra cotta unit.

Data for replacement of the terra cotta units came from varied sources: some units were reconstructed from photographs, others from the original drawings, and still others from field measurements of existing deteriorated units.

Replacement solutions for terra cotta were also varied: man-made full depth units and machine made veneer units were used.

This paper will discuss:

- I. The pros and cons of the limited vs. completed Existing Conditions Survey (ECS): its effect on the cost budgeting, the bidding, the pricing out of replacement terra cotta, etc.; the methodology of performing the ECS whether limited or complete; sample selecting for testing; testing; findings; and the resulting contract documents.
- II. The pros and cons of man-made vs. machine-made terra cotta: its effect on costs, timing, construction and appearance.

Format with subject matter will be as follows:

Setting the Stage: Discussion of the buildings within the district, discussion of three structures and their individual characteristics:

Building No. 1: Main Administrative Building, with clock tower

Building No. 3: Original Instruction Building

Building No. 4: Original Drill Hall

ECS: Rationale, research, timing, teamwork, establishing game plan, preparation of documents, establishing base line, rigging, weather, documentation, sounding, sample taking, sample cleaning, cautions, costs

Findings: Condition of structures (original and additions), condition of cleaned areas, lab test results, mapping the condition of the terra cotta, interpreting the mapping

Contract Documents: Coding of all terra cotta units and scheduling of replacements, description of restoration work, documents describing terra cotta using photographs and original documents, redesigning to utilize machine made veneer units

Construction: Observations and illustrations of the completed work on Buildings No. 3 and 4.
Samples of the existing and replacement terra cotta will be made available.

Terra-Cotta Glaze Deterioration

Sven E. Thomassen and Carolyn L. Searls
Wiss, Janney, Elstner Associates, Inc.

The typical terra cotta block was fabricated by hand-pressing clay into wood forms. The back of the block was open with internal stiffeners called webs. The glaze, which was brushed or sprayed on the surface before the block was fired, was either a slip (clay wash) or an aqueous solution of mineral and metal salts.

Deterioration of terra cotta takes many forms, and one of the more frequently seen is glaze spalling. Glaze spalling can appear as small pinholes in the glaze or the spalling can grow to cover an entire terra cotta block. Once glaze spalling has started, it allows large amounts of water to enter the bisque and in many cases further accelerates the breakdown of the terra cotta cladding. It is important to properly diagnose the causes of glaze spalling before initiating a rehabilitation program.

Glaze spalling can result from fabrication defects, incorrect installation, environmental exposure, improper maintenance, or a combination of these factors. Fabrication defects occur when the clay was not adequately pressed into the molds and weak planes were produced parallel to the face of the block. Spalling has later occurred along these weak planes. Another fabrication defect is crazing or fine cracks in the glaze which occurred as the block initially cooled. Our experience is that crazed glazes, contrary to common belief, are less prone to glaze spalling.

Installation defects which may cause glaze spalling are strain buildup, corrosion of embedded metals, and incomplete anchoring. However, these defects are more likely to result in spalling of large pieces of terra cotta.

Environmental exposure to water and chemicals it transports is harmful to terra cotta. The glaze is usually a durable barrier against pollutants, but these chemicals can readily attack the mortar joints and allow water into the wall system. Water entering the terra cotta often carries soluble salts which are deposited behind the glaze as the water evaporates. Expansion of these salts can exert pressure and spall the glaze.

Biological growth is the most common cause of glaze spalling seen on the west coast. Algae, moss and lichen thrive in the porous environment of the terra cotta bisque just behind the glaze. They prevent the bisque from drying out, and the chemical products of their metabolism disintegrate the mortar and bisque. The formation of biological growth below the glaze can exert pressure which fractures the boundary layer of the bisque.

Improper repairs and coatings can trap moisture behind the glaze and cause glaze spalling. Lack of maintenance can leave openings for water infiltration which leads to glaze spalling.

The investigation of glaze spalling consists of a field survey, field tests and laboratory analysis. Once a diagnosis of the causes is made, appropriate preventive measures can be implemented.

Adobe Conservation: Research and Applications

Neville H. Agnew, Ph.D., Deputy Director, Scientific Research
The Getty Conservation Institute

Michael R. Taylor, Structures Preservation Chief
New Mexico State Monuments, Museum of New Mexico

Adobe, as a building medium, has received little serious research compared to such materials as stone and wood. Recently, it has become apparent that research into the preservation of earthen architecture is in critical need of implementation. More than one third of the world's population live in earthen buildings, and there exists a large number of significant historic structures worldwide that are in desperate need of conservation. In the United States alone, there is a surprising number of historic structures made of earth that are in need protection, not only in the Southwest but in states such as New York, North Dakota and Nebraska.

Realizing the importance and need for such research, the Museum of New Mexico and the Getty Conservation Institute have embarked on ambitious adobe test wall programs at Fort Selden State Monument, the site of the ruined adobe walls of a 19th century military post in southern New Mexico.

In 1985, fifteen adobe test walls were built by the Museum of New Mexico to the northeast of the ruin to experiment with various preservation strategies that might improve the longevity of the historic walls at the fort. This first phase of the project has focused on: (a) Experiments with various chemicals mixed with earth plaster or sprayed onto adobe wall to retard their erosion; (2) Experiments with various foundation treatments to prevent moisture from rising; and (3) Experiments with selected capping techniques to protect the top of adobe walls.

Periodic photographic documentation of the condition of the walls is undertaken. In late 1987, the Getty Conservation Institute designed and, in collaboration with the Museum of New Mexico, implemented a second phase of test wall experimentation. Thirty new test walls were built adjacent to the existing test wall plot to assess various chemical and non-chemical conservation approaches. Chemical consolidants that had proven positive in laboratory tests at the Getty were applied under a variety of application procedures. These chemicals include polyisocyanates and silanes. Other treatments and techniques under study include the assessment of simulated reburial of archaeological adobe structures, structural reinforcing, the use of aerotextile shelters for sites, and drainage systems. Walls in this second phase of the test wall project have been subjected to simulated climatic conditions by use of an accelerated weathering system using an overhead spray.

Photographic documentation to objectively assess the rates of erosion to the test walls is comprehensive. Stereo-photographs are being taken of the walls in Phase II every two months. These photographs will be analyzed to quantitatively determine how much wall fabric has been lost through time.

Emerging results to date of these studies are intriguing and can already offer an important body of information to preservationists involved with adobe conservation.

Terra Cotta Renovation: Pacific Telesis Headquarters Building

David W. Cocke

H.J. Degenkolb Associates, Engineers

The exterior renovation of the terra cotta clad thirty-story Pacific Telesis Headquarters Building was begun in 1981. The project team of Degenkolb Associates, Engineers; Garcia/Wagner Associates, Architects; and Herrero Brothers Construction was charged with the repair and restoration of the first modern skyscraper in San Francisco. A complex phased program consisting of detailed inspection, inventory management, diagnosis of the corrosion and cracking problem, repair when possible and replacement when necessary was implemented by the team. A custom-designed "temporary" scaffolding system was implemented to provide complete accessibility to all exterior surfaces for the inspection and work crews while maintaining full, normal office operations inside the building. Approximately 14% of the terra cotta veneer units were replaced with new terra cotta and a new anchorage system was designed and implemented for the insertion and securing of these new units. Ongoing research on installation methods and materials was necessary over the course of the six-year project duration to address new and old problems uncovered by the work.

Fiberglass Reinforced Plastic Replacement of Deteriorated Terra Cotta:
Meier & Frank Department Store, Downtown Portland, Oregon

Ronald L. Wohl, PE
Mark Robert Morden, AIA
Wiss, Janney, Elstner Associates, Inc.

Adjacent to the recently renovated Pioneer Square in downtown Portland, Oregon, the Meier & Frank Department Store is a well known landmark. It epitomizes the early twentieth-century Terra Cotta Buildings of the Pacific Northwest, and serves as the flagship facility of this Northwest department store chain. The building was constructed in three phases dating to design drawings from 1908, 1914 and 1929, and is listed in the National Register of Historic Places.

During an exterior cleaning in early 1987, deterioration was discovered in the form of local areas of cracked terra cotta, deteriorated mortar and displaced terra cotta units. Of greatest concern were the soffit and modillions beneath a section of the east side 10th floor cornice (dating to 1914). The Owner retained Wiss, Janney, Elstner Associates, Inc. (WJE) to review the conditions and recommend remedial measures.

WJE worked with in conjunction with subconsultant Samuel Holmes Associates (structural engineers) of Portland, Architectural Reproductions (consultants and FRP fabricators) of Portland and Puget Sound Masonry and Restoration (demolition and installation contractors) of Seattle. It was determined that expansive corrosion product from cornice support steel had generated sufficient stress to cracks some terra cotta units and displace others. The cracks appeared in line with the various steel support rods and the flanges of larger steel members.

The Owner's strict requirements for a minimal construction period, combined with the difficulty of removing even relatively intact terra cotta units, and the desire to utilize as much of the existing steel as possible (therefore the requirement for a light-weight material), led to the selection of fiberglass reinforced plastic (FRP) to substitute for the approximately 100 ft. of deteriorated cornice.

This presentation provides a case study of a portion of a project where modern materials were substituted for historic materials. The original deteriorated condition of the steel and masonry will be described, as well as the newly installed structural system and FRP cornice replacement units. A site inspection nearly two years after installation was performed in order to report on the performance of the system over time; the inspection confirmed the serviceability of the selected system to date.

The Cost of Terra Cotta

Susan M. Tindall, CCS, President
Historic Restoration Services, Ltd.

Terra cotta was once a cheap substitute for carved stone and cast iron. Today it is viewed as a high ticket item, a view which may not necessarily be true. This paper looks at the changes in the cost and availability of both terra cotta and installation contractors over the last twenty-five years as adjusted to 1989 dollars.

Preservation Engineering

Stephen J. Kelley, AIA, SE
Wiss, Janney, Elstner Associates, Inc.

Why should engineering services be required at all in the case of historic structures? This is not really an easy question to answer. Engineering services come into play when specific problems arise in a structure with reference to strength (ie. can it adequately support the imposed loads?), stiffness (does it deflect excessively?), or stability (has it displaced in an unstable way?). Generally, engineering services are required when one or more of these three issues - all fundamental to stabilization of a structure - are involved.

The engineer may be called upon to intervene in a project for a number of reasons. Ordinary (expected) factors determined by natural aging processes which demand the attention of an engineer include deterioration of building materials from water infiltration, termites, and fatigue due to wind and gravity loading. Extraordinary (dramatic and unexpected) factors include fire and earthquake.

The engineer must ascertain whether the structure can satisfy criteria of strength and stability. On the other hand, the preservation engineer may not be concerned about large deflections or out of plumbness of an historic structure if observed conditions do not indicate instability. The goal of the preservation engineer is to stabilize the structure with a minimum of intervention.

The following presentations given by engineers, architects and construction technologists are case studies of historic structures in which instability was introduced by ordinary and extraordinary circumstances. Each solution involved a different degree of intervention by the preservation professional.

Three of the presentations exemplify situations where engineering expertise was or may be required to address ordinary factors. These case studies include the Cornish-Windsor Covered Bridge, Saint Francis de Sales Roman Catholic Church, and Trinity Church. Another case study deals with the Highway Tabernacle Church, which was damaged by fire. Another presentation deals with state-of-the-art techniques to preserve masonry buildings to withstand earthquakes. Yet another presentation confronts the dilemma of authenticity and the intervention of the preservation engineer.

The Cornish-Windsor Covered Bridge

David C. Fischetti, PE
Consulting Engineer

It has been estimated that at one time, the United States contained at least 10,000 covered timber bridges.

Today six states contain 78% of our remaining 893 covered bridges. Certainly the remaining covered bridges enhance the quality of life for artists, tourists, and preservationists who seek out these romantic reminders of past technology.

The 458 foot long Cornish-Windsor Covered Bridge, which links Cornish, New Hampshire with Windsor, Vermont, is a special covered bridge now undergoing major rehabilitation. The Cornish-Windsor Bridge is the longest covered bridge in the United States and the longest two-span covered bridge in the world. It is the only remaining notched Town lattice bridge in the world.

The Cornish-Windsor Bridge is a National Civil Engineering Historic Landmark. It is listed on the National Register of Historic Places.

Build in 1866 by James F. Tasker, it was the subject of a book in 1912 entitled, "The Economic Implications of the Bridge at Windsor," by civil engineer Richard Dana.

The original bridge was constructed of Eastern Spruce. Much of the existing bridge fabric remains in this bridge which has, until recently, carried automobile traffic safely across the Connecticut River.

A conservation philosophy, which deals with the primary requirement of highway bridge safety, must recognize that covered bridges are engineered timber structures to be rehabilitated in a sensitive manner using modern timber engineering analysis and design techniques.

This paper will deal with the structural engineering aspects of two proposed methods of rehabilitating the Cornish-Windsor Covered Bridge. A conservation philosophy is presented which works well for covered bridges as well as other timber structures.

Restoration of the Highway Tabernacle Church, Philadelphia, Pennsylvania

Andrew E.N. Osborn
Wiss, Janney, Elstner Associates, Inc.

Brian Newswanger
Thomas & Newswanger

In August 1986, a devastating fire destroyed the roof and damaged interior finishes of the 125 year-old Highway Tabernacle Church. Additional damage was caused by water used to extinguish the fire. Most of the roof structure, consisting of arched scissors trusses, purlins, rafters and decking had to be replaced. Only the lower portion of the scissors trusses could be salvaged.

In the transept, four cast iron columns support the scissors trusses. The cast iron columns were not part of the original structure, but rather were installed during an expansion of the church in 1884. It was apparent that the 1884 expansion involved relocation of exterior masonry walls that had buttressed the roof structure. With the loss of this buttressing action, the four cast iron columns displaced laterally. We believe that the lateral displacement caused shifting and opening of roofing elements, which allowed moisture to enter and damage interior ceiling finishes. Partly because of damage due to moisture, the church undertook a major restoration program in 1924. The restoration included new roofing and the installation of a new ceiling at the lower chord of the roof trusses.

Still, nothing apparently was done to counteract the outward tilting of the main columns. The amount of tilt was measured to be six inches just after the fire, causing an immediate concern about the stability of the roof structure. Shoring and tie rods were installed to initially stabilize the roof until a long-term solution could be designed.

Repair efforts did not begin until some six months after the fire, but then proceeded rapidly. After the damaged roof structure was removed, the main columns were re-plumbed and then held in that position while the roof was reconstructed. The roof reconstruction involved all new purlins, rafters and decking. The attic portion of the scissors trusses were replaced and spliced to the lower truss members. Rubble masonry walls were re-pointed and provided with a reinforced concrete cap beam to promote structural integrity. The new roof decking was plywood, not planks as before, to give the roof better diaphragm behavior, and thus, better stability.

The architectural restoration considered the architectural history of the church, the windows, interior finishes, lighting, HVAC, sound system and roofing. The church is now completely restored, including new stained glass windows, wainscotting, and the balcony rail. Its interior looks much like it did before the fire.

Because of the restoration, the church is functionally superior to the pre-fire structure.

Authenticity vs. Stability: Conservation Dilemma

Ghassan Attar
Public Works Canada

The conservation professionals, especially restoration engineers, are always faced with balancing preservation and stability requirements. On one side, the conservation professional aims at preserving as much as possible of the historic fabric he is dealing with; and on the other side he wants a secure and safe structure that meets as closely as possible, all code and operational requirements. These two are, in most cases, diagonally opposed to each other.

This paper, using an authenticity vs. stability graph developed by the author, will discuss the impact of different level of interventions on the authenticity of historic fabric. The definition of authenticity as considered by the author will be studied and the effect of stabilization, consolidation, restoration and reconstruction on authenticity will then be discussed.

The paper will provide conservation professionals with a tool, a graph which they can established for a specific project, which will help them in deciding on the level of intervention they have to consider in order to balance between authenticity and stability.

The difference between restoration engineering and contemporary engineering approaches will also be discussed. This will be illustrated through the discussion of principles and case studies.

Historic Preservation of Masonry Buildings in Seismic Areas

Randolph Langenbac
University of California at Berkeley

With the recent earthquake in Armenia, and the unspeakable human tragedy which it caused, world attention has again been drawn towards the problem of earthquake hazards in buildings. In Armenia, unlike in Mexico City three years earlier where only a minority of buildings fell, we find a situation where most of the recent buildings of modern engineered reinforced concrete construction have collapsed. In addition, what is most surprising is that the survivors from the collapsed high-rise concrete apartment blocks in Leninakan are now sharing quarters with their relatives who still lived in the older low-rise stone buildings which still exist in the older parts of the city. Unreinforced masonry has long been the object of concern in earthquake areas, and for many people is synonymous with the notion of earthquake hazard. To see the massive destruction of modern engineered buildings of reinforced concrete which has occurred in both Mexico City and Armenia stands in conflict with what has been normally assumed to be expected.

In this paper, I will explore an approach towards the preservation of masonry buildings in seismic areas which is different from the usual contemporary engineering caveat that masonry can only resist lateral forces by brute strength as a rigid box. In many parts of the world, contemporary approaches to a seismic design threaten the historic integrity of many historic buildings by mandating either their complete reconstruction, or the installation of reinforced concrete or steel frames. Instead of being designed to prevent masonry walls from cracking in an earthquake, seismic strengthening should control cracking so as to allow it to be of benefit. When cracking occurs, energy is absorbed. The design may be best when it actually encourages non-destructive cracking across the entire wall. I am applying an important accepted principle from the Historic Preservation concept of the advantages of weak rather than strong mortar and applying it to masonry in seismic areas. If this can be proved to be advantageous, it has radical implications for contemporary construction as well for the strengthening of historic buildings because masonry is still used for new construction in many parts of the world. (In Armenia, the reports indicate that they plan to return to a more traditional masonry-based construction for the rebuilding in Leninakan.)

Since my presentation at the APT conference in Austin, I have investigated the problem of masonry in seismic areas much further, and have also participated in the design of several large scale restoration projects in California which encompass some of these ideas. In a number of seismically active areas, such as in Kashmir, India, certain traditional forms of construction have exhibited a greater degree of seismic resistance than more conventional masonry construction, despite the extremely low strength of both the masonry units and the bonding mortar. The masonry in these buildings is designed in such a way as to move and shift in an earthquake without failing. In my paper, I will present the results of the research of a trip to document the evidence which exists as to the comparative performance of these buildings in earthquakes. In addition, I will be presenting material on the Armenian earthquake, and a report on the seismic strengthening of a large city hall building in the Bay Area, on which I am consulting architect.

In this paper, I will be exploring one of the central dilemmas of preservation - what criteria should be used to determine the relationship between the goals of historic preservation and life safety? The approach towards engineering safety should benefit from the knowledge which has been gained in historic preservation technology, rather than be seen as standing in conflict with it. When it does, there is a chance that this knowledge can bring about an improvement of new construction techniques, and thereby give a greater opportunity for continuity between the past and the present.

Not Only Fireproof Construction:
The Domes and Vaults of Saint Francis de Sales Roman Catholic Church

Kenneth Jacobs
John Milner Associates

Saint Francis de Sales Roman Catholic Church is a rare Philadelphia example of a Byzantine-Romanesque religious building. Reminiscent of Sacre Coeur in Paris, the building was designed in 1908 by Henry Dagit, scion of a continuing line of local architects. The Church is crowned by a series of domes and vaults that employ the patented materials and techniques developed by the R. Guastavino Company. Based on the principals of "cohesive construction," Guastavino construction was a popular and wide-spread method of achieving economical, fireproof, column-free interior spaces without reliance on iron or steel. Stylistically appropriate to all modes from the Classical to the Gothic, the system was used by many of the most prominent architects of the late nineteenth and early twentieth century, from McKim, Mead and White to Ralph Adams Cram. Guastavino construction's tremendous popularity ended shortly after the outbreak of World War II as labor costs increased and steel costs fell, and the acceptance of the stylistic implications of flat plate construction made the ability to achieve graceful, curved forms unnecessary.

By the mid 1950s, deterioration and leakage of the Guastavino roofs at Saint Francis de Sales were so extensive that a program of repair was undertaken to alleviate the problems. This work consisted of nailing a wire mesh matrix to the exterior surfaces of the roof domes and spraying a thin concrete layer onto the matrix. Additionally, glazed ceramic tiles were installed on the cement coating in an attempt to replicate the appearance of the concealed Guastavino material. By the mid 1980s, this attempt at repair has also failed, and evidence of water intrusion was again visible throughout the Church.

In the spring of 1987, John Milner Associates was retained by the Church to conduct a historical and architectural analysis of the building in an attempt to develop a series of maintenance and repair recommendations. As part of the research for that report, investigations were conducted at the Guastavino Archive at Columbia University that was created by Professor George R. Collins. That archive contained a significant selection of construction and shop drawings which were able to suggest compelling explanations for failure of the original Guastavino installation and the subsequent repairs.

Repair to the roof system has not been initiated, and it is anticipated that this work will involve removal of existing deteriorated concrete and tile and installation of a new protective outer layer of an as yet unspecified material. Although such an intervention cannot be considered representative of restoration, the need for simultaneous resolution of the complex technical, financial, and ethical concerns associated with the project suggests that the goal of preservation may best be served by such an approach.

Stabilization of Trinity Church, Newport, Rhode Island

Irving B. Haynes, FAIA
Irving B. Haynes and Associates

Trinity Church in Newport, Rhode Island, is a heavy timber frame building built in 1726 by Richard Munday. Its design is closely related to London churches of Sir Christopher Wren which were masonry structures in concept and execution.

Transforming masonry structures into timber frame structures using mortise and tenon connections left the Church vulnerable to live load deformation primarily because of a weakness in resisting lateral loads.

Over the years the relentless southwest winds have pushed the Church toward the north leaving it six inches out of plumb from sill to plate and over one foot out of plumb at the base of the tower spire.

The Church has also deformed in plan, the center bays (it is seven bays long) being deformed farther to the north than the two (east and west) end bays.

There was no reason to believe that the ongoing deformation of the timber frame would stop and the frame stabilize. Aging, degradation of the wood, and careless modifications and repairs had left the frame in a seriously weakened and deformed condition.

After prolonged analysis it was decided to reinforce and stabilize the wood frame in its racked position.

Detailed engineering analysis led to the conclusion that the reinforcing had to be done with steel. This was so primarily because the stresses were such that wood was not a feasible material. Fire safety considerations made it necessary to design the steel frames such that no on-site welding was required (in close proximity to combustible materials).

The final design consisted of five vertical frames of tubular steel fitted into the wood frame which was then bolted to the steel; and two horizontal trusses (of steel angles), one in the attic on the floor and one in the tower. All the steel frames both vertical and horizontal were tied into each other and the whole assembly anchored through "deadmen" into bed rock twenty to thirty feet below grade.

Essentially now the wood frame is required only to hold itself up as wind loads are now resisted by the steel frame.

Investigation and Diagnostics

Alan O'Bright, Session Co-chair
National Park Service, Midwest Regional Office

Successful planning of a systematic building condition assessment, especially for large structure, is extremely important as the results ultimately dictate project direction. The papers presented in this session demonstrate the significance of the investigation and diagnosis process of physical problems associated with existing buildings. While the case studies in these papers primarily spotlight twentieth-century highrise construction, the process of investigation and diagnosis is virtually identical for projects of any scope and scale.

As we shall see in these papers, information on an existing building originates not only from physical investigations, but also through sometimes exhaustive research in archives and libraries. Original construction documents, chronological photographic records, and even interviews of construction workers and former owners may add to the wealth of information required to resolve a building preservation challenge.

Physical investigation techniques vary in complexity from an act as simple as probing a window sill with an ice pick, or as complex as exploring foundations with radar. The technology developed in recent years has rapidly altered the way we are able to non-destructively investigate buildings, and gather more accurate information.

One aspect of physical investigations which should be developed more vigorously in the future is long term monitoring of building performance. While long term monitoring may be costly, and the data time consuming to interpret, valuable information can be gleaned that could be potentially valuable for the preservation of significant historic structures and recent construction.

A consideration addressed in these papers, unique to other building types, is access to vertically remote places for the purpose of physical investigation. While many of us may be accustomed to performing an investigation from the ground or at the end of an extension ladder at the highest, skyscrapers require coordination, lead time, substantial funding, and raw nerve to scale lofty spaces on scaffolding, boatswain's chairs, or swing staging.

All available physical and research information must be assembled and meticulously analyzed prior to developing treatment alternatives to solve a preservation or conservation problem of an existing building. Selection of the practical solution of solutions must be carefully weighed against the extended life of the building, historic integrity, maintenance, initial and life cycle costs, and many other issues. Competent investigation and diagnosis is a determinant to successful building preservation and renovation projects.

Assessment Techniques Utilized With Historic American High-Rises

Stephen J. Kelley and Conrad Paulson
Wiss, Janney, Elstner Associates, Inc.

Chicago, the cradle of the modern architecture movement in the United States, has long been associated with the birth of the skyscraper. Building techniques and materials such as skeletal steel framing have been used extensively, and have thus become an integral part of the American architectural heritage.

The purpose of the paper will be to discuss assessment techniques utilized for historic skyscrapers with emphasis on structural systems. Techniques to be discussed will include visual investigation, structural monitoring of lateral movements, gravity loading of existing structures, computer modeling, and laboratory analysis. Repair approaches will be addressed through case studies which include:

Chicago Tribune Building, Chicago, Illinois. The Chicago-Tribune Building is a National Register property designed by John Mead Howells and Raymond Hood in 1925. The 25-story structure is the result of the international Chicago Tribune competition of 1922 and is a steel frame structure clad in masonry and limestone. The exterior is presently being investigated and repaired utilizing low tech approaches.

Rookery Building, Chicago, Illinois. The National Register Rookery Building is an early high-rise that was designed by Burnham & Root in 1888 and partially remodeled by Frank Lloyd Wright in 1905. WJE performed structural analyses of the building systems, and field and laboratory testing of terra cotta, brick and mortar, cast and wrought iron, and clay tile.

Cape Hatteras Lighthouse, Buxton, North Carolina. WJE completed the investigation, analysis, and design for preservation of this 120-year-old, 120-foot tall, National Historic Landmark. Work included instrumentation of the masonry structure for long-term monitoring; structural and materials analysis; recommendations for long-term restoration and maintenance; and field and laboratory testing.

The results of the investigative techniques utilized in the case studies will be presented. A general outline will be provided of methods and steps to consider in evaluating historic high-rise structures. In conclusion, the paper will assess the effectiveness, and assign priorities and criteria for their application.

The Fidelity Building

Frederick L. Walters
John Milner Associates

The Fidelity Building has been the subject of a recent extensive rehabilitation program. John Milner Associates was retained to design the rehabilitation of those elements of the building program effecting the exterior envelope in addition to the interior of the entrance lobby. The materials conservation included limestone, granite, new roofing (over twenty-eight different areas), bronze cleaning, marble cleaning, and leaded glass.

Located one block south of Philadelphia's City Hall, the Fidelity Building is an expression of late 1920s Beaux Art tradition with a commanding Broad Street presence. Designed by the local firm of Simon and Simon, the steel framed, limestone clad structure was completed in 1927 on the site of the Old Forrest Theatre under a grueling construction schedule, the first tenant moving into the building only one year after the last Theatre performance. At thirty stores, the Fidelity Building was the ninth largest office building in the world at completion, reflecting the pronounced prosperity of its age.

With the development of the initial masonry survey, it became apparent that extensive repairs were required of the exterior limestone cladding. In addition to required repointing and coping treatment, hundreds of masonry anchors had rusted and spalled the stone. A program was initiated to first ascertain the cause and nature of the anchorage failure, and then develop an alternative re-anchorage method. After review of original structural drawings for column and relieving angle location (which included finding a note saying to anchor each stone), selected test sites were chosen and a portion of the walls opened. The test cuts revealed that most stones had two simple strap anchors extending from the stone into the back-up masonry. Test of the anchor showed a cadmium coated steel. When the Fidelity Building was originally constructed, the use of coated steel anchors was accepted practice (1). Since then a change has occurred and today's standards do not allow the use of any coated steel anchors (2). The reasoning for this change is not stated directly in any source located to date, and could not be supplied by Indiana Limestone Company. But using associated construction information, a possible answer can be derived indirectly. Typical reinforcement steel placed in concrete is afforded protection from oxidation by a chemical formation of a high pH environment (pH-12) associated with the calcium hydroxide products of the cement. When water and carbon dioxide is allowed to enter this protective environment over time, calcium carbonate is formed. This lowers the pH value to a point where corrosion of steel can occur (this being usually below pH 10) (3). In tests done on rainwater collected from the face of a limestone wall, pH-values of 8.0 to 8.2 have been recorded (4). Thus, the placement of cadmium coated steel anchors in a limestone environment, with the presence of moisture, could readily result in the loss of the cadmium coating and the oxidation of the steel. In the anchors of the Fidelity Building, only that portion of the anchor in the limestone had experienced corrosion. The rest was in good condition.

With the above stated conditions, a critical factor will be the presence of water. In the wall assembly of a building like the Fidelity structure, there appear to be two major sources. Atmospheric moisture is always present and depending on the factors of amount, intensity, direction of wind, and

open mortar joints, moisture could reach the interior of the limestone to the depth of the anchors (only 1-1/2" to 2" from the surface in this instance). Second, the lack of a vapor barrier, in association with a pressurized mechanical system and a porous inner masonry back-up wall, humid air from the interior can migrate to the backside of the stone, causing condensation in the colder weather periods. This possibility was confirmed by air blowing out of open mortar joints (also indicating the fact that many stones were originally laid with only edge bed mortar). Finally, the majority of spalled limestone was localized in several areas of the building. No reasonable cause could be identified for this occurrence, only theories proposed. But the theories can begin to bring realization to both our lack of knowledge on the life expectancy of previously used material and current atmospheric building standards effects. Recent studies of coated anchors in the United Kingdom have led to increasing the requirements for coated steel anchors (5). Corrosion studies in the United States have confirmed our need to better understand this phenomena in existing buildings (6).

No simple solution can be presented for buildings like the Fidelity as to predictability of further occurrence or rate of corrosion. The presentation will hopefully assist others in the field to understand this particular problem, the approach and reasoning behind the solution used in this instance, and the recognition of similar problems in building assemblies under their study.

1. The American Architect Specification Manual, Vol. 7, 1925, The Architectural and Building Press, Inc., New York.
2. The Contractors Handbook on Indiana Limestone, 17th edition, Indiana Limestone Institute of American, Inc.
3. Corrosion of Building Materials, Dietbert Knofel, translated by R.M. Diamant, Van Nostrand Rienhold Company, 1975, p.25.
4. Decay and Preservation of Stone, edited by Erhard M. Winkler, The Geological Society of America, Case History II, 1978, p.40.
5. The Performance of Cavity Wall Ties, JFA Moore, 1981, Building Research Establishment, Watford, England.
6. Corrosion of Metals in Concrete and Masonry Buildings, R. Heidersbach and J. Lloyd, Paper Number 258. The International Corrosion Forum, March 25-29, 1985 Boston, Mass.

Engineering Investigation of 20th Century Structure:
A Preservationist's Approach Using Non-Destructive Examination

Michael C. Henry, PE
Watson and Henry Associates

This paper presents an investigation of super-structure and foundation distress in a mid-20th century manufacturing building. The investigation was directed by an architectural/engineering firm specializing in historic preservation, and included non-destructive examination (NDE) methods by ground penetrating radar and pulse-echo testing. The paper discusses the quality and yield of NDE data, the limitations and problems of the NDE methods, and the integration of the NDE data with information from conventional sources, including historical research, to assess the building condition and the mechanics of deterioration.

The three-story 80,000 square foot precast concrete building was erected in 1955-56 along a tidal riverfront in Bridgeton, New Jersey. The building is supported on timber piles. In 1986, the Owner observed hairline cracks at many beam to column connections. An Engineer inspected the building and advised that it was unsafe. The Owner relocated his manufacturing operations, and facing apparently insurmountable repair costs, gave the building to the City. The City retained Watson and Henry Associates to manage an engineering investigation of the structure to ascertain the feasibility of salvaging the building.

Project initiation included assembling historical site records predating erection of the building. Sanborn maps and waterfront surveys provided critical information about site development and evolution. Utility maps revealed active and abandoned storm drains intertwining the pilings. Research of 1950s engineering standards gave probable materials properties and configurations. Survey data provided information on building settlement. Visual examination provided an inventory of distress indicators in the structure.

A test program was developed that included conventional and advanced non-destructive examination techniques. Soil borings provided geotechnical data and two pile caps were excavated for examination. Non-destructive testing, using ground penetrating radar and pulse echo testing, revealed the location and the condition of 234 of the 268 timber piles. Pulse echo testing indicated the extent of subsurface cracking at connections of precast concrete members. Penetrating radar and eddy current testing determined the size and location of steel reinforcement in concrete.

Non-destructive testing data and conventional examination yielded a detailed assessment of the condition of the superstructure and the foundation. Combining this information with the historical records provided insight into the probable mechanics of the premature deterioration of the structural capacity of the building. The investigation permitted determination of the extent of the necessary repairs, and the projected costs of salvaging the building.

Historic Concrete

Stephen J. Kelley, AIA, SE
Wiss, Janney, Elstner Associates, Inc.

Since its widespread appearance in American construction at the beginning of the twentieth century, concrete has been regarded as the material that holds buildings up far more often than the material which gives them distinction. Perhaps because it is better known as a structural than an ornamental material, it has been afforded little attention by preservationists.

A quick review of some of Chicago's best-loved architectural monuments, however, reveals such masterpieces as Unity Temple in Oak Park and Baha'i Temple in Wilmette, both rendered in architectural concrete. The material is certain to receive increasing attention from preservationists as the numerous concrete buildings constructed during the past 100 years achieve historic stature.

The following presentations will establish reinforced concrete as a material of note in relation to the historical monuments of the United States. Case studies include the Brandywine Shoal Lighthouse, Coit Tower, Unity Temple, the fortifications at Sandy Hook, and Fallingwater. An additional presentation explores the origins of concrete unit masonry production in the United States. Together, these presentations address typical problems with the material and various approaches to its preservation.

Structural Rehabilitation of Brandywine Shoal Lighthouse

Michael Johannes Paul, Principal Structural Engineer
Gredell & Paul

One of several working lighthouses operated and maintained by the U.S. Coast Guard in Delaware Bay, Brandywine Shoal Lighthouse marks a hazardous shoal along a heavily traveled shipping channel seven miles west of Cape May, New Jersey. Constructed between 1912 and 1914, the historic lighthouse was the first such reinforced concrete structure located on a submarine site in the continental United States.

Pervasive deterioration, caused by a hostile, open-water, salt-air environment, and aggravated by a loss of regular maintenance following conversion to an automated facility in the 1950s, led the Coast Guard to initiate evaluation and design of repairs in 1982.

Structural rehabilitation involved repair or replacement of elements that were unable to carry their own weight or were fostering deterioration of other portions of the structure. Engineering thus addressed durability and serviceability as much as strength. Concrete repairs were the major part of overall rehabilitation that included safety, security, ventilation, weatherization, and painting.

Repairs to the concrete structure included reinforcement of the caisson; replacement of the first level brackets and overhanging structural deck; replacement of the veranda columns, cornice, and roof; installation of a shear collar below the watch room; and replacement of all deck wearing courses. Project specifications included a comprehensive section on demolition and removal of deteriorated concrete and reinforcing steel.

Structural Deterioration and Restoration of Coit Tower, San Francisco, California

Paul Weir, PE, AIA, Associate Professor
Graduate Architecture Program, University of South Florida

Coit Tower, an historically significant concrete structure on Telegraph Hill of San Francisco, recently underwent restoration. The 212 feet concrete tower was completed in 1932 following a design competition to erect a memorial to Lillie Hitchcock Coit. Architects Arthur Brown, Jr. and Henry Howard won the competition and designed the existing building. Arthur Brown, Jr. is also noted as the architect of San Francisco's City Hall and Opera House. The structure had historically suffered from water penetration problems which were threatening the almost 7,000 square feet of murals executed under the Public Works Art Project during the Depression. Also resulting from water penetration were significant concrete deterioration and structural damage. The Bureau of Architecture of the City and County of San Francisco undertook a restoration program in 1984 and employed Interactive Resources of Point Richmond, California as consultants for the restoration project. The structural restoration was completed in 1988 and the murals are currently undergoing restoration.

This presentation documents the structural restoration process of Coit Tower. The presentation will include slides and discussion of the investigation, documentation, testing and repair processes, including:

1. Visual inspection of the building to document:
 - a. Deterioration and damage of concrete; type size and location of cracks, spalls, delamination and efflorescence, and corrosion of steel reinforcement and structural damage;
 - b. Sources of water penetration; weather exposure, drainage systems, mechanical and electrical systems, roofs, horizontal surfaces and parapets;
 - c. Patterns that may exist between observed damage and potential sources of water penetration.
2. Study of original construction documents to determine original materials, methods of construction, and identify modifications and repairs that may have been made.
3. Testing program to identify existing materials and their physical properties (compressive strength, tensile strength, modulus of elasticity, coefficient of thermal expansion, porosity, absorptivity, color and reflectivity) in order to establish appropriate repair materials and construction processes.
4. Preparation of construction documents to establish scope of work and required standards of materials and construction processes.

Unity Temple: Investigation and Repair

Harry J. Hunderman AIA
Wiss, Janney, Elstner Associates, Inc.

Completed in 1907, Unity Temple has long been recognized as an important and unique work in Wright's opus. The building is one of Frank Lloyd Wright's earliest remaining public designs, and was considered by Wright to be one of his most important works. Unity Temple is both a National Historic Landmark and National Register property. It is also unusual for its cast-in-place concrete construction, exposed aggregate facades, and design aesthetic.

An Historic Structures Report was completed by Wiss, Janney, Elstner Associates, Inc. (WJE) in 1988. The report concluded that the condition of the concrete required laboratory testing to determine the causes of deterioration and the long-term prognosis for the repair and maintenance of the material.

The original concrete was very porous and by the 1960s water penetration had become a severe problem and extensive cracking and spalling had occurred. At that time the exterior was treated with a cement slurry to retard the deterioration. By the early 1970s the deterioration had accelerated and a major repair project was instituted. A pneumatically-applied concrete coating or "shotcrete" was applied over all surfaces of the original concrete except for the decorative columns. This shotcrete surface has held up remarkable well over the past 15 years but cracks have redeveloped and spalling of the concrete has recently reoccurred.

Based on the results and conclusions of the Historic Structures Report, WJE developed and completed a program of testing to determine the nature and causes of deterioration in the concrete at Unity Temple, and to determine appropriate repair techniques. The testing included:

- A hands-on visual inspection of the exterior wall surfaces and soffits.
- The completion of crack maps to identify and document patterns of distress in the exterior surfaces, and to develop a preliminary scope of work for repairs.
- The measurement of deflections in the roof overhangs.
- Examination of the walls and roof surface with metal detectors.
- Copper-copper sulfate testing.
- The removal of cores for laboratory testing and analysis including petrographic examination, evaluation of chlorides, assessment of carbonation, and other causes of deterioration.
- the evaluation of potential water repellent coatings.

This presentation will review the design and construction of Unity Temple and trace the history of its repairs. In addition, the techniques involved in the field and laboratory testing will be defined, the results of the testing reviewed, and the prognosis for repair examined.

Building Blocks: the Origins of CMUs

Richard Bergmann, FAIA
Richard Bergmann Architects

During America's expansion period, the second half of the 19th Century, rapid growth greatly outpaced the transportation system's capacity to deliver building supplies to areas removed from few existing railroad terminals. There also existed an acute shortage of local sawmills. Wood, which had been our favored and abundant "national" building material, was losing its place of prominence due to its rapid depletion. Additionally, wood was inferior to masonry and stone in its fire resistance.

The search for alternate building materials and methods became almost frantic. In fact, "the explosive progress of building techniques produced in one century more innovations in material, structure, form, and method of construction than the whole previous history of the art."* New techniques including the development of the balloon frame (1833) and the introduction of iron as a structural material (1822) expanded the range and size of buildings being constructed. The growing industrialization and mobilization of the country necessitated the continual search for efficient, durable, inexpensive and locally available building materials.

One attempted solution was the development of building blocks or artificial stone, as it was then called. Across the country, patents were issued for a variety of formulations. The manufacture of these blocks consisted mainly of portable wood or iron molds, set up on the job site, filled and tamped with an appropriate formulation of natural materials consisting mainly of slaked lime and coarse sand. The finished blocks, rather than being fired, were removed and stored for a time cure (a reaction with the residual carbonic acid in the atmosphere).

One of the forerunners in this field was Ambrose Foster of Portland, Wisconsin. His 1855 patent will be a primary example in the discussion of the pre-portland cement industry in America. Foster's basic block was 10" long, 3" to 5" high and 4" to 5" wide. It had a variety of hollow core designs and was to be used as an inexpensive substitute for brick and stone. Improvements to the "Foster Block" came rapidly. G.E. Van Derburgh of New York City was granted three patents for "superior" block. It was only a few more years until portland cement was introduced into the manufacturing process. Portland cement was first discovered and used in England during the 1820s, but came into common use in this country only after 1870. Portland cement proved to be a much faster and more durable block than Foster Block or the Van Derburgh improvements.

The 1866 chapel at the Norton Presbyterian Church (Darien, Connecticut) is believed to be made primarily with Foster Block. The chapel is thought to be designed by the New York City architect, Gage Inslee. Early drawings of this chapel appear in Henry Hudson Holly's Church Architecture (1871).

In order to determine an appropriate restoration plan, research is being done to identify and locate buildings of like construction. With a group of buildings of similar materials for comparison, deterioration problems and remedies are to be evaluated.

* Carl W. Condit. American Building Art: The Nineteenth Century
New York: Oxford University Press, 1960, Pg.3

Historic Concrete Fortifications of Sandy Hook, New Jersey:
Part I: Developing a Comprehensive Conservation Plan

Walter Sedovic, AIA

National Park Service, North Atlantic Historic Preservation Center

Sandy Hook's strategic location has made it historically an important defense site for lower New York Harbor. A Series of forts have dotted Sandy Hook since the American Revolution; the last was Fort Hancock. A significant part of Fort Hancock's legacy is an extensive complex of concrete fortifications, built between 1890 and 1943, that remain as a vital link to the history of Spanish-American War era coastal/harbor defense systems. Most of the innovations of coastal defense design during this period, such as disappearing guns and mortar batteries, were first installed here and tested prior to being applied to fortifications defending other major harbors of the United States and territories.

Fort Hancock's extensive use of concrete is notable too as a valuable resource that traces advancements in the development of concrete building technology. Some of the earliest uses of reinforced concrete in this country are located here. Containing over 40 diverse structures, Fort Hancock offers a virtual laboratory of historic concrete. Construction types range from massive pours over 18 feet thick to think shells of a few inches, from sites fully exposed to harsh seaside elements to those fully protected underground. Similarly, an extensive range of deteriorating agents acting on these buildings has been delineated, from vegetation to visitor traffic to inherent problems of design or placement, linked to empirical methods and poor quality materials.

This context of history, materials, and the ambient quality of the site as a "ruins" (the result of limited maintenance since the site was abandoned as obsolete in the 1940s) provides a rich experience for visitors, allowing their imaginations to roam freely; it is a very popular site.

While limited maintenance may have contributed a certain romance to the setting, it was also becoming clear by the early 1980s that serious issues regarding resource preservation needed to be addressed, and the National Park Service's North Atlantic Historic Preservation Center began development of comprehensive plan for long-term preservation of the site. To be effective and realistic, the plan needed to identify and synthesize all resource management issues involve, including site interpretation, visitor safety, material conservation, and--importantly--limitations in budget.

This paper will explore the process of developing strategies to preserve an expansive site with a variety of diverse functions and needs. It will focus on central themes, such as priority-setting and the selection of alternatives, which in turn were based on extensive site surveys as well as research of management and preservation issues. This process--which has application to other similar sites from Guam to California to Puerto Rico--provided the foundation from which basic, often difficult questions could be answered: What are the essential qualities of the site?...Which of the structures can we (or must we) restor or preserve?...Which will have to be left to deteriorate?

Discussion will also include specific steps taken to better understand the technical aspects of the extant historic concrete, including implementation of a prototype study to analyze and catalogue performance characteristics of the material taken from five representative sites within the Fort.

Historic Concrete Fortifications at Sandy Hook, New Jersey
Part II: Technical Investigations

Todd Rutenbeck
Bureau of Reclamation, Denver

Fort Hancock, Sandy Hook Unit, Gateway National Recreation Area, New Jersey, contains numerous historic fortifications. Five gun batteries covering the era from 1890 to 1943 were selected for this investigation. These concrete structures span a broad range concrete technology. Unreinforced mass concrete, twisted reinforcing bars, deformed bars, Rosendale natural cement, portland cement, improvements of mix design, and improvements in placing techniques are all represented. Each factor had a significant effect on durability.

The Bureau of Reclamation undertook an investigation for the National Park Service to determine current structural and materials conditions in order to recommend future structural conservation techniques. Site inspections by a civil engineer and a corrosion engineer were combined with laboratory investigations on concrete cores extracted from the five sites. Laboratory investigations included compressive strength, absorption, density, petrographic examination, X-ray diffraction, and qualitative physical and chemical techniques. Thin sections were cut to aid in microscopic petrographic examination. Petrographic afterbreak examinations were performed on the compressive strength specimens. To evaluate corrosion potential, on site, half-cell readings were taken on embedded metalwork.

The presentation, illustrated with slides, gives technical results, show the effects of changing concrete technology on durability in an adverse environment, discusses methods of materials investigations, and correlates technical findings with preservation management.

Fallingwater: A Test Program Begins for Concrete Restoration

Norman R. Weiss, Adjunct Assistant Professor
Graduate School of Architecture, Planning and Preservation, Columbia University

Stephen E.V. Gottlieb, AIA, Partner-in-Charge of Architectural Preservation
Wank Adams Slavin Associates

Twentieth-century buildings, lacking applied ornaments, depend on the perfection of their surfaces for conveying their architect's ideas of form and space. The surfaces of Fallingwater cannot convey those "perfect" concepts at present due to cracks, carbonate straws and lines, losses, soiling and peeling.

Fallingwater is a cast concrete building entirely covered with stucco. Built in 1937, it consists of a number of cantilevered concrete terraces with integral parapet walls. These are supported by a system of concrete bolsters and stone masonry piers. Fallingwater is sited dramatically over a waterfall, perhaps its most unusual feature. Since its construction, the building has been subject to a number of repair and restoration efforts such as terrace waterproofing and concrete repair, sandblasting and repainting.

In 1988, the consultants visited the site and investigated the construction methods, repairs and present condition of Fallingwater. Preliminary pathologies of concrete deterioration were determined and a report was issued, funded by the Institute of Museum Services and the Pennsylvania Council of the Arts.

In 1989, the authors, acting as consultants, began a test program oriented to saving as much original concrete as possible. This effort consists of various methods of gravity and pressure grouting and remedial fastening, temporary and permanent, for reattachment of concrete.

Existing coatings are of recent vintage. Little historic exterior paint, if any, survives. Current coatings are reapplied frequently, causing a reduction in the effectiveness of their water vapor transmission. Sample areas of these coatings are being removed and new combinations of paints and repellents are being applied to see which combination will best extend the time between reapplications. Technical staff of ProSoCo, Inc., led by Frances Gale, are participating.

Fallingwater has been cited by the American Institute of Architects as being most representative of American architecture and it may be the most famous house in the world. The aims of the concrete restoration test program are to assure that Fallingwater continues to be in as fine condition as possible with as much original material intact as possible.

Preserving What's New

Mike Jackson, Session Chair
Illinois Historic Preservation Agency

The basic idea behind "Preserving What's New" is quite simple: that the principles of historic preservation can and should be applied to structures of the recent past. If a preservation ethic is to become an integrated part of American society, the structures of the recent past deserve to be recorded, studied and selectively conserved, the preservation methodology we apply to recognized historic structures and places. Though historically unrecognized, the structures of the recent past comprise a large part of the built environment. Over 40% of all Americans live in the suburbs, a largely post-World War II environment. This large a part of the American landscape has a story to tell to future generations, which it can if a preservation approach is adopted. In the first thematic session, "Understanding the Recent Past," the questions of why we should consider the recent past historic will be explored. This will be complemented by an overview of the forces of change that are the first to act on any structure.

The rapid evolution of technology in the twentieth century has resulted in many new building products and systems. Some of these products had a very short commercial life, often times in spite of the manufacturer's claims to longevity and low maintenance. Others have become a ubiquitous part of American life. The special preservation problems posed by these new products will be explored in a session entitled, "New Products, New Problems." Neon signs, curtain walls and asbestos-containing products are three new products that will be analyzed from a preservation perspective.

"Investigating the Recent Past" will focus on two different research approaches: the investigation through historic records and the investigation through building materials. The historical researcher of the twentieth century must deal with an abundance of information and a lagging curatorship of it. An enormous amount of printed material about building products will have to be collected and catalogued to provide a truly comprehensive overview of American building materials, a task far beyond the scope of any one institution. The role of the historian in assembling historic materials will be explored through a look at the housing industry. The architectural conservator will find this research material a great aid, but will still begin with the field investigation of failed and failing materials. The examination of a series of half-a-century old buildings in Washington, DC, will focus on the new problems of the conservator.

Residential buildings have been a frequent subject for architects exploring new design theories or building techniques. Three different experiments in home building will be presented as preservation case studies. The Aluminaire house of 1939, the Lustron house of the 1950s and the Usonian Houses of Frank Lloyd Wright will be discussed in a session entitled "Residential Restorations." These innovative houses require conservation strategies to solve the problems of mass produced "machines for living" or the single design detail of a master architect.

The Significance of the Recent Past

Richard Longstreth, Director

Graduate Program in Historic Preservation, George Washington University

When the regulation was established some two decades ago that properties eligible for the National Register of Historic Places be at least fifty years old, the measure was a bold one. Previously most work identified for preservation purposes in the U.S. dated from the colonial or early Republican periods. The focus of academic scholarship was not much different: Victorian architecture was just beginning to emerge as a respectable subject for study, and later work other than that by the alleged "pioneers" of modern architecture was still often regarded with suspicion. Official recognition of properties developed between the mid-nineteenth and early twentieth centuries as historically significant did much to spur the broadening of inquiry and to bolster the then still nascent belief that a major portion of our cultural inheritance was worth saving.

Today, the situation has changed dramatically, in large part due to preservation activities themselves. In recent years, scholarship has regained the leading role in this realm. Numerous facets of the mid-twentieth-century environment are being examined in depth--from work of renowned practitioners to the evidence of popular culture. At its best, this research has yielded a wealth of new insights, not only on an era that can now be viewed in the past tense, one with pronounced differences from the present, but also on patterns that are still very much a part of our contemporary world.

Many people working in preservation are ill-equipped to evaluate the products of the recent past in large part because they are unwilling, or unable, to consider them from a historical perspective. Instead, a viewpoint grounded in either current notions of taste or in antiquarian connoisseurship often creates a bias which relegates this work to second-class status at best. The ramifications of this attitude are unfortunate for the work in question. Many areas developed during the mid-twentieth century are now subject to new growth pressures and will be lost if measures are not soon taken to protect them. Furthermore, if preservation is to be a process whereby the past may remain an integral part of our daily lives, not just a novelty, we can scarcely afford to ignore so great a portion of that past. The enormous growth of preservation beginning in the 1960s occurred in large part due to the fact that the late nineteenth-and early twentieth-century city was being rejected by the next generation. No sadder irony would exist than if preservation were to contribute to repeating the same mistake.

The so-called "fifty-year rule" needs to be rethought, for its parameters are now too limiting and have fostered the destruction of a good many things worth preserving. But before such an initiative is undertaken, historians and others working in preservation must begin to rethink the matter afresh. The current prejudice is not so much predicated upon a fifty-year dividing line as it is on a dislike of things "modern" in terms of both expression and building type.

In analyzing the issues involved, this paper will address key aspects of the problem and of the means by which it can be rectified, drawing from a range of recent preservation cases.

Juvenile Diseases Of Buildings: A Summary By Component Systems

Donald Baerman, AIA, Architect
North Haven, Connecticut

A summary of what tends to go wrong with newer buildings. Illustrated examples of architecturally significant buildings less than 50 years old (with one or two buildings illustrating the problems but perhaps not architecturally significant). The organizational format is the AIA-GSA "Uniformat," less mechanical and electrical equipment, which Gersil Kay described better than I can. How certain of the problems are related to the choice of systems, how an understanding of traditional construction might have avoided some of the problems, and the use of both traditional and new technology in the remedial work. The main idea for discussion, as I see it, is the extent to which one may alter the appearance of a building in increasing its durability.

Foundations

Building: Sweetwater County Library, Rock Springs, Wyoming

Problem and apparent cause: Differential settlement of foundations. Unconsolidated soils and human grave remains under footings. Remedial work: Foundations underpinned with deep caisson. Approximate cost: \$500,000.

Substructure

Building: Southern New England Telephone Co. Administration Building, New Haven, Connecticut. Problem and apparent cause: Leaking into subbasement. Problem started about 50 years after construction. Probably cause is change in water table because of new construction in area. Remedial work: Drill foundations and set pipes to monitor water level. After pipes were set problem did not recur. Approximate cost: \$3,000 about five years ago.

Superstructure

Building: Richard C. Lee High School, New Haven, Connecticut

Problem and apparent cause: Deflection of roof structure, including cantilevers. Significant standing water. Apparent cause: structural design. Remedial work: Cantilevers were raised, and steel bolts were set in polymer grout to act as shear reinforcing. Roof replaced; new roof sloped for drainage by terracing insulation. Approximate cost: \$200,000, 17 years ago, for roof repairs. Cost of structural repairs unknown.

Exterior Closure

Building: The Horton-Ossorio (built for John Horton; presently owned by Frederick Ossorio) residence in Greenwich, Connecticut, was the last residence designed by Eliot Noyes. Problems and apparent cause: Soon after construction it developed severe efflorescence on exterior and interior walls. Probably causes are PVC flexible flashings, mortar choice, and masonry workmanship. Remedial work: Remedial work has included reconstructing the tops of all masonry walls, cutting out all original hard mortar (apparently Type M), repointing with latex and Type N mortar, and capping all walls with sheet lead. Approximate cost: \$500,000, including reroofing.

Building: The Town Houses on the Square project was one of the first new building in the redevelopment of the historic Wooster Square area of New Haven under Mayor Richard Lee. The project was designed by William Mileto and heavily influenced by the New Haven Redevelopment Agency staff. Problem and apparent cause: Severe deterioration in the wall structure (which allowed several walls to blow outward during Hurricane Gloria), use of asbestos panels, and a lack of ventilation and fire rescue-escape windows. Remedial work: Complete removal of all exterior walls and construction of new ones. During the work the apartments were occupied. Approximate cost: \$900,000 for 34 units.

Building: Yale Art & Architecture Building, Paul Rudolph, Architect. Problem and apparent cause: Spalling of concrete at walls. Cause: reinforcing bars too close to the surface. Remedial work: Removal of unsound concrete, abrasive blasting of reinforcing bars and coating with zinc rich epoxy primer. Patching with Jahn system stone patching material. Remedial work done to date is at upper portion only. Approximate cost: \$35,000.

Roof

Building: Yale Art & Architecture Building, again. Problem and apparent causes: Roof leaks. Apparent cause is flashing detail. After almost 30 years roof slabs were showing damage. Remedial work: Replacement of roof with protected membrane roof system. Lead fasciae to minimize visual impact. Approximate cost: Approximately \$215,000.

Interior Construction

Building: Rehabilitated row house, south side, Wooster Square, New Haven. The house is older; the substantial rehabilitation is recent. Architect for rehabilitation (and former owner): Charles Brewer. Problems and apparent cause: Severe efflorescence at interior walls; illness of tenants. Cause: use of capped-over flue for boiler combustion gasses. Remedial work: Tear the cap off. Approximate cost: Unknown, probably less than \$1,000.

Equipment

Building: Wright Nuclear Accelerator Laboratory, Yale University. Problem and apparent cause: Old "Emperor" tank obsolete; new ESTU tank too big to fit through door. Remedial work: Major surgery and repair. Approximate cost: \$1,900,000.

Neon: The Electric Flame

Michael Crowe

National Park Service, Western Regional Office

Neon technology is a twentieth-century phenomenon. It was developed in France and its use spread rapidly around the world after 1925. This lecture will explore the history of the development of neon, types of signs, and letter styles. The presentation will also include the construction of a sign, bending requirements, and maintenance and repair. There will be examples of signs throughout the country with emphasis on examples from the Western United States.

Curtain Walls: Investigation Of Building Water Infiltration

Andrew S. Weber and Dennis K. Johnson
Wiss, Janney, Elstner Associates, Inc.

As modern buildings gradually become part of historic architecture, preservation problems come with them. Water infiltration through the building's skin is one of the most common of these problems. This paper will address the diagnostic methodology used in determining the cause of water infiltration.

The first step in the process for resolving water leakage problems in buildings is to establish the history of the problem. Existing site conditions are documented, including photographing and field-drawn details. If possible, original architectural drawings, construction details and shop drawings are reviewed on site to determine if they agree with as-built conditions. Often patterns will emerge that may lead to a more complete understanding of the problem.

The two tools most valuable during field investigations are the calibrated nozzle and the calibrated water spray rack. Both are designed to be in compliance with the American Aluminum Manufacturers Association (AAMA) Specifications 501.2 and 501.3.

To pinpoint the sources of water infiltration, a process of elimination is followed. By isolating one joint or system element at a time, the spray nozzle or rack can be used to apply water systematically to determine susceptibility to water leakage. This method is continued until all areas or joints determined as being possible contributors to the infiltration problem have been checked and compared. If there remains any doubt after testing regarding cause and effect, inspection openings must be cut and the system partially disassembled to verify that conclusions are correct.

A thorough investigation is cautious and well documented and offers the reward of effectively repairing a problem which for years annoyed everyone associated with it.

Historic Asbestos-Containing Building Materials: Can They Be Preserved?

Richard S. Beardmore and Earlie Thomas
Industrial Sciences Department, Construction Management Program
Colorado State University

Asbestos Containing Buildings Materials (ACBMs) are currently being abated and/or managed throughout the United States under the provisions of the recently enacted Asbestos Hazard Emergency Response Act (AHERA). Due to this heightened awareness of the proven health hazards of ACBMs, the rapidly increasing rate of removal, combined with the extreme likelihood of the presence of ACBMs in adolescent "soon-to-be" historic properties, historic preservation of these structures is facing a tremendous challenge;...how to adequately document ACBM, manage the potential hazard, implement preventive maintenance and repairs, and assure the controls required while preserving these maturing materials in place so they remain intact as part of the interior and/or exterior historic fabric.

Specialized material conservation and restoration is always a challenge when historic preservation demands their continuing durability and performance. Now, due to the risk involved when material conservation is associated with ACBM, knowledge of these adolescent historic materials and their abatement techniques must be combined with responsible, comprehensive, state of the art asbestos intervention/restoration/preservation. Plus this ACBM intervention versus removal must be performed using unconventional building material maintenance techniques and possibly procured from a limited pool of accredited and experienced abatement contractors.

The use of ACBM started in the 1920s and their major use in commercial and institutional buildings sky-rocketed after World War II and continued well into the late 1960s. As a result, the preservation of adolescent "soon-to-be" historic structures will require the safe maintenance, repair and continuing service of these ACBMs if these structures are to be truly representative of the period, including the original material technology which will undoubtedly contribute to their historic significance. Preservation faces a "what's new?" dilemma!

To resolve this dilemma knowledgeable historical architects, industrial hygienists, material specialists, preservationists, facility managers, and maintenance contractors must unite and respond by preparing and managing appropriate intervention programs. And these programs must be developed in concert with accredited asbestos building inspectors, asbestos management planners and abatement contractors if the potential health hazards are to be truly mitigated and/or controlled for the protection of the entire preservation team and the building occupants.

Discussion will draw from research, case studies and "hands-on" experience in order to provide an overview of the following: a brief history of ACBMs and their natural utilization in surfacing and insulating systems; the health hazards of ACBM: what locations, materials and building systems within adolescent structures are suspect (i.e. vinyl asbestos tile, cement asbestos shingles, asbestos containing plasters, asbestos roofing systems, spray-on and suspended asbestos containing acoustical ceiling systems, thermal insulating systems); methodologies used to document and manage known and suspect ACBM; maintenance personnel and occupant education and notification regarding ACBM health hazards; suggested material conservation techniques for the maintenance, repair, and preservation of ACBMs;

suggested outline specifications for procuring and contracting intervention services; recommended check lists for intervention planning and implementation; representative unit cost guidelines for estimating intervention costs and preparing intervention budgets; probable monitoring requirements for approval agency compliance and legal protection; and current market conditions and related real estate lending policies that seriously jeopardize the in place preservation of adolescent ACBMs.

Standardized Construction In The Housing Industry 1930-1950

John A. Burns, AIA, Principal Architect

Historic American Building Survey/Historic American Engineering Record, National Park Service

A subtitle for this paper might be, "the effects of the Depression and World War II on the housing industry." Those two events more than anything else had major impacts on residential construction technologies.

During the Depression, materials suppliers were desperate to sell their products. One of the largest markets for materials, even during the Depression, was the housing industry. Companies accordingly targeted their research on how to sell more pounds of their product in that market. If used in every new house, even a few pounds per house was a potentially sizable market. Dominated by tradition, the housing industry was notoriously slow to change, so opportunities for new materials and technologies were few. The upheaval of the Depression presented one such opportunity. The approach most companies took was to industrialize housing by manufacturing components to be assembled at the job site. Steel, wood, and concrete were the most common materials. Composite materials using wood by-products, resins, and plastics were also developed. A major drawback was that while these components were standardized, there was no standardization among the manufacturers and hence, no interchangeability. Bureaucratic resistance from building code and zoning officials, mortgage underwriters, and fire insurance companies was another major problem. Further, trade unions saw industrialized housing as a threat to their members. Despite all the obstacles, products made it to market and enjoyed some success. Unfortunately, the total effect was like a shooting star, interesting, attention-getting, but short-lived.

The mobilization construction to house and train troops for World War II had as its hallmark speed and simplicity. The military tried various techniques and technologies to meet needs of the rapid buildup and ultimately returned to the basics: low-tech, readily available materials and standardized designs. Mobilization buildings were constructed of wood from standardized plans. They were mass produced. They used no exotic materials and, especially after the United States entered the war, fewer and fewer of the "critical materials" needed for war production, notably copper and zinc. Also after the war started, the construction standards were lowered. Wall framing went from 2 x 6s at 16 inches on center to 2 x 4s at 4'-0" on center. While all of the mobilization construction was meant to be temporary, only the latter proved to be truly temporary, barely lasting the duration of the war. The structures built earlier in the mobilization were sturdier and have lasted. They are the ones you still see on military posts today. The manifestation of standardized designs and mass production techniques came in post-war suburbia.

How have these buildings fared over the last fifty years? Interestingly, the manufactured houses have similar logistical problems to more traditional historic buildings. They are constructed in unique ways using, in some instances, unique materials. Their continued maintenance and restoration requires skill in building pathology and materials conservation. Their rarity means that most of the knowledge and expertise gained from a restoration job will have limited applicability in future jobs. The mobilization buildings and their progeny in suburbia, with their simple construction, are much easier to maintain and restore, requiring less sophisticated preservation technologies and craft skills.

**The Fifty Year Fuse: Materials Conservation, Restoration, Repair,
and Diagnostic Projects in the Federal Triangle, Washington, D.C.**

Robert A. Weinstein, AIA and Judith M. Capen, AIA
Architrave P.C. Architects

The buildings of Washington's Federal Triangle were built in the 1930s. Now, more than fifty years later, various of the original materials and assemblies are beginning to fail. Since 1982 our firm has been involved with a series of materials conservation, restoration, repair, and diagnostic projects in the Federal Triangle and its vicinity.

Our projects fall into two general types: relatively routine maintenance and repair projects (including studies, marble cleaning, window repair and replacement, etc.), and what we have dubbed "the sky is falling" projects.

In "the sky is falling" projects substantial, usually heavy, pieces of stone or terra cotta fall from roofs and cornices six or more stories up. We have now had two of these in the Federal Triangle: at the Justice department and the IRS.

In all cases, careful diagnosis of the problem is the first step. In some cases, we do diagnostic studies and prepare reports with recommendations. In other cases, we verify and develop preliminary investigations by others and prepare Contract Documents for the repair work.

Our first diagnostic step is always to secure drawings of the buildings where we are working. Because of the relative recency of the Federal Triangle, drawings are often available from the original construction. We also photograph extensively, interview on-site building managers, and use technical consultants.

We will present four case studies, projects and points of interest noted below:

Antefixae and clay tile, Justice Department. As fastenings holding the clay tile and antefixae failed, the terra cotta antefixae dropped off the roof. Of particular interest was determining the causes for the fastener failure and the process for replacing damaged and missing terra cotta with new molds and glazes to match the originals.

Roofing, 1951 Constitution Avenue. Ludowici was the original manufacturer of the black clay pan tile system for the building, but they were not the low bidder accepted by the Government. The challenge then became defining what it meant for the new tile to match the old in performance. Since there are no standards for roofing tile, we became involved in extensive testing to define standards for water absorption of clay roofing tile.

IRS Modillions. Sixty pound limestone modillions had fallen six stories from the cornice of the IRS building. Some diagnostic work, primarily structural analysis, was done and a repair system developed. The question, however, was: should all 600 modillions be treated or just the ones at risk of failing? Diagnostic procedures investigated for determining modillions at-risk included X-Rays, a form of ultra-sound, and a visual/mechanical target system to monitor movement.

Water leaks study, Ariel Rios Building. Sometimes the water poured in; other times, not related to rainfall, the leaks ceased. The water was fluoridated, indicating city water, but careful study of plumbing and mechanical drawings showed no piping close. Turning on all the plumbing fixtures in the building failed to create the leak. We finally traced the water to a watering system moistening the wood piles supporting the Old Post Office building across Pennsylvania Avenue.

With Heritage So Shiny: America's First All-Aluminum House

H. Ward Jandl

National Park Service, Preservation Assistance Division

The freestanding single family house has been at the center of the American dream since the first European settlers arrived on these shores. Throughout our history Americans have sought to improve the way they live, making use of new materials, technologies, and inventions, to fashion comfortable, efficient dwellings. Nowhere was the pursuit of this dream more intense than in the United States in the thirties.

This presentation will focus on three "houses of the future" designed and built in the 1930s: their builders and promoters, the new technologies and materials utilized, the inventions created for the houses, and their ultimate fates. The presentation will make extensive use of period photographs and original promotional materials. The three houses are:

George Fred Keck's House of Tomorrow, built for the Century of Progress Exhibition in Chicago in 1933. This octagonal, "all-glass" house created a sensation when it was opened to the public. The structure was moved after the exhibition closed and is still standing, although greatly altered.

Albert Frey's Aluminaire House, built in New York in 1931. This all-aluminum structure made extensive use of new materials and technologies was the only American house to be included in Johnson and Hitchcock's book on the international style. Although currently disassembled, there are plans to reconstruct the house in Long Island.

Robert McLaughlin and Foster Gunnison's Motohome, a steel-framed, concrete and asbestos panelled prefabricated house, introduced to an enthusiastic public in 1935. Although only 150 or so of these houses were actually built, the Motohome was fabricated in parts, shipped to the site, and erected in two to three weeks. The house contained a number of technological innovations that became common in later prefab houses.

What Ever Happened to Lustron Homes?

Robert A. Mitchell, AIA, Historical Architect
State Historical Society of North Dakota

Interchangeable parts, broadening uses of steel and ceramic materials, prefabricated structures and assembly-line mass-production have all been significant factors in the historical continuum of industrialization. They seemed to converge in a post-World War II phenomenon called the Lustron Home. Made of porcelain-enameled modular steel panels as both exterior and interior finish, they were viewed by some as THE ANSWER to the immense backlog of low cost housing construction to be filled following World War II. Although only about 2,500 were ultimately produced in the five years before the company's demise (which was brought on by organizational and finance problems in marketing rather than by production deficiencies), they exemplify a holistic technological response which is quite representative of our national industrial ingenuity. While only about 1% of them found their way to North Dakota, most of these are still occupied and provide a small and coherent laboratory for comparative examination in response to demands of economic, geographic and social climate. This paper will discuss their historical significance and their visual, structural and other physical characteristics. Discussion will further focus on quality of manufacture and erection, and the completed product in situ, with particular emphasis on a comparative analysis of design and material deficiencies revealed through aging and deterioration, and owner/occupant remedies exhibited by those remaining in North Dakota. Oral history documentation including dealer/erector/owner/occupant comments will be included in the presentation.

**The First Jacobs House and the Smith Residence:
A Comparative Study of Restoration Techniques
for Two Usonian Homes Less Than 50 Years Old**

John Eifler, AIA
Booth Hansen Associates

The Smith and Jacobs houses are known as "Usonian" Homes and typify the residential work of Wright at the last segment of his career. Frank Lloyd Wright experimented with a number of building principles and construction techniques which are already requiring extensive renovation efforts and replacements. Radiant heating, thin "sandwich" walls, proper solar orientation "zoned" programmatic space allocations, and low cost have created a number of problems for both the current homeowners and architect. The recent attention our society has given these homes has created an inherent problem: How does one preserve a structure which was constructed with materials and building techniques which are essentially short-lived by nature?

Preservation Philosophy and Education

Dennis McFadden, Session Chair
Consultant
Oak Park, Illinois

Preservation Planning

The papers in this session are about looking at big pictures. Each discusses a strategy or strategies for meeting a variety of challenges. In the first it was to develop a support program for the preservation of a twentieth century planned community. In the second it was identifying a methodology for shaping projects of different scopes to insure preservation consistency. In the third the challenge was to coordinate efforts to preserve a venerable but endangered city.

Preservation Education

What should a preservationist know?
How should a preservationist think?
Can preservation be taught?

This panel will discuss different approaches to preservation education. Panel members will recount their experiences trying to teach preservation. Those with ideas about how things ought to be are encouraged to participate.

Alliance with the Private Sector

This panel discussion will delve into the potential for collaboration between preservationists and the private development community. Anticipated growth in renovation activities in the years ahead will offer the preservation profession an opportunity to thrive and to influence the quality of the environment. This panel will discuss how to take advantage of this situation.

Media: Magic to Stir One's Blood

Electronic media can be exciting tools in the hands of the preservationist. This panel discussion will explore how film, video and AV productions can be used to communicate to a broad public the significance of cultural resources and how they should be cared for.

Stabilization and Repair: Long-Term Maintenance Planning

Harry P. Hansen

Restoration and Preservation Consulting for Historic Properties

Maintenance for an individual building, of any proportions, is often neglected or mismanaged for lack of a master plan. For Sunnyside Gardens, a late 1920s planned community of over 600 one, two, and three-family homes in Queens, New York, a coordinated plan was considered essential to the visual and physical integrity of this National Register listed Historic District. The Sunnyside Foundation for Community Planning, since its inception in 1981, has sought to advance community preservation through a wide avenue of out-reach programs. The result of this work is a multi-faceted service of free advice and technical assistance to the homeowners. These services are dispensed by a technical consultant whose role is to go into the community and meet directly with the owners and assess the conditions of these similar homes through a number of innovative, grant funded programs:

1. **The House Doctor**, a free technical assistance program in which homeowners may obtain restoration advice and contractor referrals;
2. **The Restore** program, a New York State-funded program administered jointly with the House Doctor Program providing free emergency home repairs to the neighborhood low-income elderly;
3. **Bulk Contract** assistance, where homeowners with a common problem may join together with one contract and one set of specifications, coordinated by the Foundation to have work done;
4. **The Homeowner Workshop Series**, a series of educational workshops held in the community addressing common problems such as window repair, and repointing so that residents understand how to hire a contractor to do the proper job;
5. **The Homeowner's Manual**, a publication to be distributed this spring, incorporating all of the problems, advice, and restoration techniques that have been covered through the development of the other programs.

The Sunnyside Gardens community presents a unique problem because of the great number of individual homeowners. This presentation will evaluate the role of the technical preservation specialist in the community and the common problems in building maintenance, and the specific issues that apply to all. Each owner must be reached and introduced to the concept of planned community preservation. Only through a coordinated effort to maintain each individual home will the neighborhood as a whole benefit.

Conservation through Strategic Planning

Roger M. Wing, B.A., B.Arch., RIBA, Project Manager
Central London Palaces, Property Services Agency

Buildings start to decay from the moment they are built. They only survive through coordinated maintenance by enthusiastic owners.

Conservation is the business of stretching the life of a building by retarding the inevitable processes of decay, and renewing when no other course is open.

Good conservation is based on three essentials:

1. Economic purpose
2. Continued maintenance
3. Sympathetic restoration

Buildings are preserved for many reasons: historic, sentimental, contextual, intrinsic. Artifacts are kept for similar reasons but buildings in addition are retained by economic use, whether for their original or some new purpose. Only activity and life ensures a building's continued existence.

Yet all uses are abrasive to the building's fabric. Original purposes by developing and changing demand modifications. Change of use requires adaptation. Wear and tear adds to the processes of natural decay. It follows that uses most sympathetic to a building are needed to achieve good conservation.

Continued maintenance is fundamental to upholding a building's condition. It requires the owner's dedication and resources to extend its use. Inadequate provision or abandonment leads to accelerated deterioration and eventually the need to restore or replace.

Restoration exercises choice at the point of redundancy. It is the surgery necessary to retain what is best or recoverable and set an acceptable concept by restoring or replacing the remainder. Frequently new, revised or extended use establishes the restoration. Choice must be sympathetic of both the new and former uses.

Successful conservation balances economic use, maintenance and sympathetic restoration. Problems of achieving such harmony increase with a building's size and complexity. Our work with major national buildings seeks to establish comprehensive development and maintenance strategies. To be successful these must be established through consensus by the building management, particularly the Treasurer, the Occupiers, the Maintenance Manager, Architectural and Building Advisors including Historians.

From agreed strategies, balanced programs of work can be established. A well formulated programme will value the smallest maintenance project and the grandest refurbishment in the total plan. Suitable amalgamations or divisions of projects will become apparent, and jobs advanced or retarded to optimize finances and ensure most preferable use.

Each proposal for use, maintenance, or restoration will be viewed in a total concept for maximizing the building's continued existence and development.

Venice: The Past, the Present, the Future;
What Has Changed and What Has to Be Changed

Mario di Valmarana, Director, Preservation Program
School of Architecture, University of Virginia

The well known problems afflicting the city of Venice and its lagoon are being looked upon with some concrete attitudes and fresh ideas. Water flow, air pollution, tourism, and wear and tear are some of the serious concerns enveloping the city; de-population, decay and real estate speculation are some of the immediate concerns that have recently called for prompt remedial actions.

The role of the conservator is, thus, of paramount importance; the lack of trained labour is serious for the outcome of an acceptable restoration and conservation effort; new inventions for material conservation (stone, brick, wood, metals) are constantly spouting from research laboratories; with unknown results, it may appear that, after all, Venice will be an idea model for research and development for new methods of conservation and application techniques; in-site conferences and symposia suggest just that. This may be the future of the city.

From the time of John Ruskin's efforts to restore the Doges Palace to the urban interventions of the 1920s and 1930s, to the unspeakable new structures of the post-war era, Venice has been constantly subjected to uncoordinated efforts to save her from destruction.

Only recently has a "committee" (Venezia Nuova) undertaken the major task to combine all segments of conservation into an organized system, thus with the result of visible improvements.

The city has about sixty major restoration works going on; not to mention the unaccountable minor alterations. The regional government has installed a "lock" prototype to control high-tide flows; it seems to work. The city government has banned, among other things, all products containing phosphates, in order to control the ecological balance of the lagoon. Main industries are cleaning their air emission policies, for a cleaner atmosphere.

These are some of the major actions in the process of being implemented. However, much has to be done. Tourism continues to inflict serious irreversible wear and tear. The active population is in constant decline (76,000 people on the last count); motor traffic continues to erode foundations; real estate speculation drives the less affluent (shop and people) out of business, thus creating urban voids subjected to decay and dereliction.

Major national and international institutions have now ongoing workshops that deal with conservation issues. The forthcoming unification of Europe in 1992 will bring new inputs and efforts to cope with this seemingly eternal struggle to save Venice.

Education for Preservation: Issues of Awareness, Appropriateness and Ability

David G. Woodcock, AIA, RIBA
Texas A&M University

Panel Members:

Jan C.K. Anderson, Executive Director
RESTORE

Frank Matero, Director
The Center for Preservation Research, Graduate School of Architecture, Planning and Preservation
Columbia University

Larry J. Pearson
Alberta Culture

Michael A. Tomlan
Cornell University

Constrance Ramirez, President
National Preservation Institute

Education for Historic Preservation has adopted several models in the university setting. These range from the availability of one or two introductory courses in an undergraduate or graduate program, to the establishment of a post-professional or professional degree in conservation with the intention of preparing individuals for a specialist role. Outside the universities there is a diversity of programs that range from the development of craft skills to the contributing education of professionals in the field.

While each of these models has its place, there remains an overall need to provide the student in a professional degree program with sufficient awareness, understanding and ability in the field of preservation to recognize the growing need to conserve and adapt our present building stock, and to develop an attitude toward historic structures that will ensure that the future professional will be a part of the solution and not a part of the problem.

Further there is a need to see conservation practice as an interdisciplinary activity, and to establish appropriate understanding and respect between professionals in the educational setting that can be carried naturally into the practice environment.

The panel members will describe several existing or emerging patterns of preservation education, with particular emphasis on their application and transferability. The role of the various bodies that have an interest in education for preservation will be reviewed, and discussion within the panel and from the floor will be encouraged. It is intended that the outcomes of the panel will assist APT and others for focus more clearly on opportunities for action, and to establish and strengthen networks within education.

The Alliance with the Private Sector

Marc Denhez, BCL
Barnes, Sammon, Naftel

Richard Roddewig, Attorney
Clarion Associates

Bryan Patchan
National Association of Home Builders

Lorne Finlay
Canada Mortgage & Housing Corp.

1. Background

At one time, high-quality rehabilitation of buildings was considered a luxury, which could be indulged in only by a) the public sector, or b) a miniscule proportion of private sector buildings of museological interest. The entire subject-matter of APT-type research was viewed as an extension of "curatorial" interests, rather than "urban planning" or "environmental" interests. As a result, proponents of such rehab "made little plans" with relation to the economy as a whole.

That view has been discarded. For several years, the objective has been "how to deal with the built environment." That has resulted from both a change in market forces and a change in philosophy. From the market standpoint, the renovation business has grown geometrically (e.g., a background of paper for the Canadian Home Builders Association estimated that by the year 2000, 85% of construction-related investment would be in renovation, repair and maintenance). From a conceptual standpoint, the Brundtland Commission's objective of "sustainable growth" is being applied not only to nature, but to communities. These developments have led to a new demand for the creation of a "market-driven" climate for quality rehab on a scale which can be considered "environmental" in scope.

2. The Current Challenge

The proponents of quality rehab have therefore found themselves with a mutuality of interest with the major private sector organizations, such as the associations for owners, developers and contractors. Whereas groups like APT had, for many years, complained of being "a solution in search of a problem," they are now faced with organizations expressing a growing demand for techniques which can a) provide complaint-free rehab at more competitive prices, and b) convey that information in a way that is usable by the contractor in a pickup truck. At stake is the prospect of turning quality rehab into a North American economic force bigger than General Motors.

3. Specific Focus

There are two linch-pins to this process: a) coordination, and b) economic motivation. Coordination implies an effective system for cooperation, particularly in the preparation and dissemination of education materials. For far too long, the private sector groups have accused heritage groups of being insensitive to either the bottom line or to less prestigious properties, whereas the heritage groups have accused the private sector of being insensitive to the aesthetics of the product; with coordination, however, there is not immediate reason why both sides cannot be accommodated, even to a level beyond previous expectation. The panel can address some of the measures (particularly in education) now being contemplated to pursue that objective.

The second linch-pin is economic motivation. The panel can address recent developments in the application of American tax rules to various classes of renovation projects (pre-1936 buildings, or alternatively certified historic properties). The panel can also address the recent Canadian jurisprudence which, on the ground of "basic principle," has introduced a dramatically improved tax treatment for certain kinds of rehab.

4. Conclusion

It is these kinds of developments which will allow the entire rehab industry to "make no little plans" in the next decade and beyond.

Using Television and Media: Magic to Stir One's Blood

Wayne Zelmer, Architect
Saskatchewan Parks, Recreation and Culture

Adrian Bateman, Producer
CBC Television

Herb Stovel, Architect
Ottawa, Ontario

Broadcast-ready television shorts plus uncut field footage and audio-visual shows will demonstrate the large role media has to play in preservation communications and education. Cinematography for this presentation documents selected heritage resources in Saskatchewan and was created through a cooperative effort between CBC Television and Saskatchewan's Provincial Heritage Branch. Speakers from Eastern and Western Canada join to provide a perspective on media's universal applicability to communicate preservation principles. The ability of documentary media to entertain, excite interest and influence the future will be discussed using the theme: "Magic to stir one's blood."

Preservation Case Studies

Dennis McFadden, Session Chair
Consultant
Oak Park, Illinois

Preservation Case Studies I: Lessons from Home and Abroad

The three papers in this session discuss work on buildings ranging from a truly regal residence to a territorial penitentiary. The original designers of two of the buildings are seminal figures in the history of western architecture. The current clients range from government entities to the author and his siblings. None of the rest of us may have the opportunity to work on a prison, a house designed by Inigo Jones for the Queen of England, or our own Palladian villa, but the papers in this session promise valuable insights into combining restoration and new uses, building a program of preservation out of a series of discrete projects, and caring responsibly for an architectural icon.

Preservation Case Studies II: Strategies for Public Buildings

Restoration and preservation are challenging enough with a committed, knowledgeable, and well-heeled private client. When the public sector undertakes a project the challenges can be daunting. Bureaucratic by definition, skeptical by preferences, arcane in making decisions and paying bills, the public client requires special handling. The three papers that comprise this session will describe how mere mortals were able to successfully challenge municipal, county, and federal governments in the cause of restoration agendas.

Preservation Case Studies III: Individual Buildings

This session will provide several answers to the questions, "Just what does a preservation architect do?" Work on three buildings, a Chinese-American herbalist's shop, an important Italianate mansion, and the home of a Supreme Court Justice will be described and the scope and range of the preservation architect's roles explained. In all three cases the buildings now house new activities.

Recommended Preservation and Restoration Measures
for the Wyoming Territorial Penitentiary

Dr. Arvid E. Osterberg, Consultant, Associate Professor
Department of Architecture, Iowa State University

William A. Baker and Richard N. Warvie, Project Architects
Banner Associates, Inc., Architects and Engineers

Dr. David Kathka, State Historic Preservation Officer
Thomas Lindmier, Historic Program Development Specialist
Wyoming State Archives, Museums and Historical Department

The authors of the paper each play a different role in regards to the Wyoming Territorial Penitentiary Restoration Project. Dr. Arvid Osterberg is a consultant in regards to historic preservation issues on the project. Dr. David Kathka and Thomas Lindmier of the "Wyoming State Archives, Museums, and Historical Department" are the clients for the project. William A. Baker and Richard N. Warvi are the project architects with Banner Associates, Inc., Architects and Engineers for the project.

The restoration of the penitentiary building into a museum is part of a larger effort involving the creation of a state park and the future restoration of several ancillary structures on the seven acre Wyoming Territorial Penitentiary Historic Site. The ancillary structures include a Warden's quarters, which was built by prisoners in 1875, a broom factory which was built by prisoners in 1892, additions to the broom factory, and a stockade surrounding the penitentiary and broom factory.

The Wyoming penitentiary building was constructed in 1872. The original stockade was added in 1875, and the penitentiary building was tripled in size with an addition in 1889. In 1890 the Wyoming Territory became the State of Wyoming and in 1891 the building was turned over to the state who continued to use it for a state prison until 1902. In 1903 The University of Wyoming adapted the building and grounds for use as a stock farm. At that time portions of the building's exterior and interior were substantially altered for the conversion, and all of the cell blocks in the building were removed. Fortunately, however, enough of the original building fabric remains intact for a successful restoration.

The restoration project has been divided into four phases of work. The first phase, which is currently underway, includes an archeological investigation and various stabilization procedures. The stabilization and restoration of the building's exterior shell includes; 1) substantial work on all of the stone masonry walls, 2) the installation of dampcoursing in those walls, 3) the rebuilding of roof framing and roofing materials, 4) a gutter and down spout system, and 5) the repair, restoration and reconstruction of all of the historic window and door openings. The work also includes the removal of silos, hay structures and inappropriate fill materials which were added over the years. Additionally, the main entrance on the east side of the building will be reconstructed to match the original drawings and photographs.

Phase II will include the reconstruction of several brick and steel cell blocks, cellblock stairs, walkways and railings. Phase III will involve the establishment of an environmentally controlled contemporary museum space to be concealed within each of the two, three story high cellblock structures. Phase III will also include the addition of an elevator within the contemporary museum space and the restoration of the building's interior plaster surfaces. Phase IV will involve site improvements such as parking, driveways, walkways, landscaping, signage and lighting.

The paper will provide an overview of the entire project but will concentrate on work being done in Phase I. The authors will present a slide program to accompany the paper including historic photographs, views of the building as it existed before Phase I work commenced, architect's drawings of the restoration, and Phase I progress photos.

Old Royal Observatory and Queen's House, Greenwich

Roger M. Wing, BA, B.Arch., RIBA, Project Manager
Central London Palaces, Property Services Agency

A conservation project will only be successful if good architectural and technical care is matched with sound funding and a properly paced programme. To illustrate the interaction two major conservation projects, at the Old Royal Observatory and the Queen's House at Greenwich, are described.

At the Old Royal Observatory, four small projects were amalgamated to create one substantial scheme. In the early 1980s a small scheme of modest expenditure to provide draught lobbies and upgrade the galleries, though deemed necessary, never achieved high status and was continually deferred.

In 1984 the National Maritime Museum, under new directorship, generated three additional small projects at the Observatory:

1. Enlargement of the Bookshop and Souvenir Shop in the Great Equatorial Building.
2. The Observatory's greatest hidden asset, the magnificent 28-inch telescope, needed to be made accessible to the public.
3. A kiosk was required to accommodate the experimental introduction of Museum charges.

The combined project became economically viable. It was quickly incorporated into the museum's programme of works and opened officially to the public in June, 1987.

In 1945 the National Maritime Museum, recently established at Greenwich, commenced the restoration of the Queen's House (dated 1635). The deterioration through natural decay and misuse of the building through the previous 200 years was enormous. The restoration thus had to concentrate on the structural repair of the building fabric and the removal of partitions, mezzanines, bathrooms, and other additions which had been added.

The current project is very much a continuation of the work started 50 years ago.

The design team decided at an early stage that the base date for the restoration should be 1662. This decision acknowledges the Inigo Jones plan, but is also accepts significant later alterations particularly the creation of State Apartments by Charles II.

The new designs include the introduction of the numerous modern services necessary for the care and protection of valuable Museum collections including the introduction of discreet, fibreoptic spotlighting.

During 1984 it became clear that the expenditure had to be spread over a number of years and the project programme was divided into two phases. Opening up during the Phase I programme particularly in the roof spaces and behind window linings, revealed many discoveries of seventeenth and early eighteenth century work. The quality of the design for Phase 2 of the restoration has been immeasurably enhanced by the massive wealth of primary evidence that was uncovered. The time which the extended phased programme gave us allowed proper and full consideration of such evidence.

Both examples identify the value of the detailed researching of conservation projects, that time needs to be allowed for contemplation, and that proper pacing of a conservation project is essential. Both projects benefitted financially as a consequence.

Villa Capra, la Rotunda (1560): Conservation and Stewardship

Mario di Valmarana, Director
Preservation Program, School of Architecture, University of Virginia

Andrea Palladio's architecture has been the subject of endless descriptions, interpretations, speculations, plagiarisms, and visitations; since Inigo Jones in 1613, an immense array of literature has invaded our culture, describing the timeless beauty of Palladio's work.

But, very little known literature, or none at all, has ever described the critical physical conditions of such buildings, and their constant danger of destruction. The critical balance between "timeless" beauty and physical reality is the subject of this talk.

The Villa Capra built in 1560, one of the most "original" works by Palladio, and undoubtedly the most well known domestic structure, an universal landmark, has been undergoing for the last 10 years a thorough, scholarly, and unique program of restoration and conservation. The client-owners-architect are one of a kind: three brothers who, owning this masterpiece, are aware of the responsibility that they must carry in order to maintain, protect and use this unique structure.

It is a special stewardship that allows the ongoing maintenance of the building and its site; it is a special event in the conservation field to be able to talk about your own house that is a universal public structure.

The presentation will include a brief history of past conservation of the structure, and what the owners have done so far.

In Spite of the Plans: Preservation at the National Archives

Andrea Mones-O'Hara, Architectural Conservator and Regional Historic Preservation Officer
General Services Administration, National Capital Region

J. Bryan Blundell, President
Dell Corporation

The metropolitan Washington, DC region of the General Services Administration (GSA) and the National Archives have recently completed a sensitive sprinkler installation, and recreated some significant features in the National Archives building as part of the process. A unique working relationship with the restoration subcontractor for the project resulted from this process.

The National Archives Building, completed in 1935, was designed by John Russell Pope. It exhibits an exceptional level of architectural quality, both in materials and design.

Its Central Search Room, the building's monumental reading/research room, is the first stop for all researchers. The room is a highly ornamented two story "gothic oak" paneled space. The building's only area of painted architectural decoration occurs in this room. The oak ceiling, approximately twenty-two feet above the floor, is arranged in five bays, which are separated by boxed beams. Each bay holds twenty-one coffers. This entire ceiling is stenciled and hand shaded to create a trompe l'oeil effect.

Until 1988, this room (Central Search Room) had no fire protection. The sprinkler design, completed in 1987, called for the installation of a wet pipe system above the wooden coffered ceiling with one distribution pipe in each of the five bays. Utilizing extended-coverage sprinkler heads, a minimum number of penetrations would be required. The sprinkler heads were designed to penetrate the centers of the original ornamental ceiling panels within the coffers, to have minimal visual impact.

At the start of the construction phase, it was discovered that the original woodwork was difficult to remove because it was both screwed and glued in its original fabrication. While the Subcontractor was ultimately able to develop a method for removal of panels, concerns of the Subcontractor and GSA regarding potential damage to the ceiling led to revaluation of the design plan.

Under the guidance of Ms. Andrea Mones-O'Hara (Regional Historic Preservation Officer, National Capital Region, GSA) GSA and the National Archives took advantage of damage which had occurred in 1960. At that time, contemporary lighting fixtures were surface mounted to portions of the coffered ceiling. That project had both damaged the wood trim and central ornamentally painted ceiling panels. Based on a revaluation of the project in 1988, it was determined that the light fixtures should be removed, and the new sprinkler system be installed at the already damaged coffered ceiling panels. Therefore, the Subcontractor removed damaged historic fabric and replaced it with replicated panels, giving an overall restored effect to the ceiling. The sprinkler system was redesigned to double the number of sprinkler heads, therefore, allowing for the use of a smaller, standard head, and also to allow for the reduction in pipe sizing of the distribution piping, further lessening the potential of installation difficulty.

The showpiece of the final solution is the truly unique method developed by Mr. Bryan Blundell, of the Dell Corporation. He was asked to reconstruct panels to blend in with the original painted ceiling

panels. They were to appear as original when observed from the floor. However, upon any thorough investigation, they were to be obviously different in technique from the historic panels. This requirement provided Dell Corporation with an opportunity to look into various materials, techniques and technologies to satisfy the aesthetic concerns of the job. The final product used the technology of advertising to create a decal replicating the handpainted surfaces. It was a chance to have craftspeople of modern techniques participate in an area not usually associated with their field.

The conservation decisions addressed during the creation of the panels and the techniques used to accomplish this work provided an unusual opportunity for a cooperative relationship which developed between the Federal Government and the subcontractor, Dell Corporation.

Public-Private Partnership in Restoring the Wayne County Courthouse

Ilene R. Tyler, AIA, and David S. Evans, Principal
Quinn Evans/Architects

The Old County Courthouse, dedicated in 1902, served as the headquarters for Wayne County government until the 1950s. For the next thirty years, the building was occupied by the 36th Circuit Court. Then in November 1984, a development team was selected by the County to restore and rehabilitate the building for use by the County's Executive and Legislative Branch. The project was accomplished under a special sale and lease back arrangement that enables the developers to obtain tax certification of the rehabilitation effort.

The scope of the project was defined on a three zone system: Restoration, Rehabilitation, and New Construction. By creating these three zones, the design team was able to achieve the primary goal of the project, which was to restore the functional vitality of the building without detracting from the beauty of the original design.

Costs for the project were strictly budgeted, and early team meetings focused on the scope of work to be accomplished and documented. After completion of the contract documents, final bidding of the individual subcontracts assured the County that the project would be completed on budget and on time. Near completion of the contracted work, the County began to coordinate the furnishing and designation of their new spaces.

The restoration of the Wayne County Building preserves a significant piece of architectural history in the City of Detroit and the State of Michigan. Through the integration of state-of-the-art mechanical and electrical systems, this building is an excellent example of how historic architecture can be revitalized as a modern office environment by incorporating the best of the new while preserving the best of the old. The approach taken by Wayne County in restoring this building may open new possibilities for economic development and cooperation between the public and private developers.

Pasadena City Hall Restoration: A Big Plan in Little Steps

Cathleen A. Malmstrom
Architectural Resources Group

David D. Charlebois
Charlebois Waterproofing and Restoration

This is a story of flexibility and cooperation on a municipal project, where such attributes often are not found.

City Hall, designed by Bakewell and Brown in 1926, is the centerpiece of Pasadena's Civic Center, one of the great works of the City Beautiful Movement. The impressive Baroque Revival structure, with its 240 foot dome, is "one of the most ambitious works of public architecture in California" and the symbol of a city dedicated to its heritage. It is constructed of reinforced concrete with a plaster finish and extensive cast stone ornamentation, with clay tile roofs and decorative lead-coated copper towers.

Since 1984, Architectural Resources Group has worked with the City Hall Preservation Committee, composed of City staff and of representatives from Pasadena's Cultural Heritage and Design Review Boards, and later with the General Contractor, David Charlebois, and the craftsmen undertaking the work. Our mutual goal has been to deal with the growing problems of deterioration due to years of deferred maintenance and to develop a sensitive and comprehensive plan for restoration and preservation.

The presentation will deal with this notable aspect of the project: the successful involvement of a diverse team of preservation professionals, government, and citizens, and the teamwork which allowed us to change scope and direction when necessary and to solve problems on the spot. The project, which was initially viewed as a single \$8 million undertaking of the complete exterior restoration of the building, evolved as investigations revealed conditions of deterioration for which neither the magnitude nor the method of treatment could be definitively specified. Deviations from normal City bidding procedures allowed development of a first "prototype" phase of work, careful prequalification of the General Contractor, direct negotiation with skilled subcontractors, and significant contingencies for the testing of various treatments and solutions.

Each step along the way the architect, contractor, and craftsmen were given the freedom to experiment. Through this process, solutions were developed for each of the building's significant problems, including:

- Modification of original, poor details, specifically at Arthur Brown's copper-lined gutters, which were the major cause of plaster and cast stone deterioration, and at copper sheathing of domes;
- Adhesive injection for reattachment of delaminated plaster rendering versus plaster replacement, and where each method becomes appropriate;
- Repair/restoration of previously "treated" cast stone elements: cartouches, friezes, etc., which were sandblasted and painted in 1959;

- Cleaning of lead-coated copper, without damaging patina.

These solutions, in turn, have allowed us to prepare Master Specifications for the remaining 90% of the work, which will enable the City itself to specify and award fixed fee contracts for successive phases. The project will be ongoing for some time. The building is in some danger from deterioration and this will be a major consideration over the next ten years. Budget limitations dictate that, although the Master Specifications are nearing completion, the City will continue to phase the project, tailoring each phase to the urgency of the work and the available funds each year.

The Kam Wah Chung Co. Building Restoration:
The Historic Preservation Architect Reconsiders His First
and Most Important Project

Alfred Staehli, AIA
Historic Preservation Architect and Architectural Conservator

The Kam Wah Chung Company Building (c.1880), John Day, Oregon, represents the end of pioneer Chinese history in a remote community in eastern Oregon. The tiny curious building combining early white settlers' and traditional Chinese building technologies is the last remanent of what had been a large community of Chinese in a gold mining and later cattle ranching area. The formerly separate religious, mercantile, residential, banking, post office, medical, social and recreational, employment office, and refuge activities of the John Day-Canyonville Chinatown were coalesced into this one surviving building as the community shrank to just two or three members.

Bequeathed to the city by the last Chinese owner, the building and its contents remained unrecognized for years until plans were being made to expand the City Park and a council member entered the building for the first time. What was found were all the records, goods, and personal effects of the three Chinese owners, Lung On a merchant and businessman, Ing Hay a herbalist, and Bob Wah the successor of Ing Hay as a herbal medicine practitioner. The building contained the largest complete record of Chinese pioneers outside of the San Francisco community, whose records were destroyed in 1906. The store section shelves were stocked with the original goods including packaged foods, liquor, fireworks, and clothing. The dining table was set. There were pans of desiccated food in the oven. And the past occupants' clothes were hanging on pegs awaiting their imminent return. The Kam Wah Chung Company Building is now a museum of Chinese history in early Oregon, the artifacts and records have been inventoried, and the building is preserved and restored.

I was first offered a project to do a historic structure report on the building and to make measured drawings. At the time, I did not know what a historic structure report was and so called it a Restoration Feasibility Study. Later, I was commissioned to prepare construction documents for the preservation and restoration of the building and to observe and report on the satisfactory completion of the work for the State of Oregon. My only guide was Oren Bullock's The Restoration Manual which turned out to provide good directions for a novice restorationist.

The work was done by an Oregon State Parks employed crew under the direction of an architecture trained restoration craftsman who went on to graduate studies in conservation at York. The result is the original building with 90% of its original fabric and construction technology intact, but adapted to conserve and display its history and contents as a museum, strengthened to be stable, centrally heated and ventilated, with the original lighting preserved and modern display lighting added, and made weatherproof.

It is valuable for a preservation professional to reconsider the work done on such an important project done at an early stage in his experience. There is much to be proud of and a little to regret. Overall, the approach based on Oren Bullock's manual was sound. The project remains successful for preserving the building and as an operating museum. In retrospect, the restored rubble stone masonry

walls should have been repointed with the original clay-sand mortar instead of modern masonry cement mortar. The recovered tin roof which attempted to recreate the original roofing of flattened kerosene can sheets with new galvanized sheet metal might better have used salvaged tins as original---it is difficult to get authentic sloppy work done.

The Restoration of Prospect House, Princeton University, Princeton, New Jersey

Michael J. Mills, AIA, Partner
Short and Ford, Architects

The paper will discuss the general renovation plan and specific conservation strategies for the restoration of Prospect House on the Princeton University campus. Short and Ford served as the preservation architects for the project as consultants to Venturi, Rauch, and Scott-Brown, who were responsible for the general renovations including fire code improvements, a modest addition, and new HVAC and electrical systems. The inter-relationships of the architects, construction manager, owner, and decorative arts subcontractors will be explored in the context of this complex project.

Prospect, the Italianate mansion that served for approximately ninety years as the official residence of Princeton's presidents, is a building that is significant on both historical and architectural grounds. Its historical significance for the University speaks for itself. The National Park Service has recognized the building for national historical significance, nominating it as a National Historical Landmark because of its associations with Woodrow Wilson.

Architecturally it ranks as one of the best, if not the best, surviving examples of the first phase of the Victorian Italianate. Major mid-nineteenth century Italianate villas are rare in America. Notman himself was responsible for less than a dozen, of which four survive, one in Trenton and the others in Princeton. Of the three Princeton houses--Guernsey Hall and Lowrie House being the other two -- Prospect is not only the largest and most grand in conception, but also the least altered. Indeed, the only comparable surviving examples of the style in this country are the Morse-Libbey House of 1859 in Portland, Maine, and the King Villa of 1845-47 in Newport, Rhode Island. The building presently serves as a faculty club and conference facility.

The goals of the renovation project were as follows:

1. To completely restore the exterior envelope of the building which involved repointing the coursed ashlar facade, replacing the roof, restoring the existing cornices, and reconstructing the original balcony balustrades.
2. To restore the highly ornamental, decorative painting scheme of the original house in its most public rooms.
3. To provide new mechanical, electrical, and plumbing systems while preserving historic finishes.
4. To make additions or alterations as required to provide a safer building that conforms with current building codes as much as possible.
5. To provide better facilities for visitors and staff.

The role of the preservation architect on this project will be explored in two areas: 1) the restoration of the envelope of the building which was handled directly with the Maintenance Department of Princeton University and 2) the restoration of interior finishes which required much coordination and cooperation among Short and Ford, the architect of record (V.R.S.B.), and Short and Ford's consultants, Heritage Studios and Frank Welsh. Specialized decorative techniques such as bronzing, graining, and glazing will be shown to illustrate various points.

Mechanical Systems of the David Davis Mansion, Bloomington, Illinois

Philip Hamp, Architect
Office of John Vinci, Inc.

An IHPA property, the David Davis Mansion was the subject of an extensive Historic Structures Report between 1986 and 1988. During the course of the project's research, it became evident that the Davis Mansion contained several mechanical systems dating back to the building's construction (1870-72) that were still largely intact. These include:

- Domestic water supply
- Original sanitary system
- Domestic hot water production
- Gas lighting, with electric spark ignition
- Communications system (speaking tube and call bells)
- Kitchen cookstove
- Heating system, incorporating steam with naturally induced ventilation
- Early (ca. 1915) electrical system

The purpose of the paper will be to describe the extant artifacts and explain their original operation, present conditions and plans for conservation.

Craftsmanship and Artisanry

Carl Giegold, Session Chair
Solomon, Cordwell, Buenz

Mary Beth Herr, Session Co-chair
City of Highland Park

Herman Wieland, Co-chair
Wieland and Associates

Preservationists so often encounter the task of preserving detailed characteristics of a building that make it unique. A rare and small breed exists that is dedicated to the recreation of these characteristics. The APT89 conference is pleased to offer the opportunity for attendees to hear case studies in the area of Painting Conservation and Craftsmanship Training as well as view hands-on demonstrations by skilled craftsmen and artisans.

The Painting Conservation session will feature the restoration of the Connecticut State Capitol and the Seventh Regiment Armory in New York City. The conservation of a WPA mural, planning and implementation, will be presented as well. The Craftsman Training session will provide information on architectural artisanry, apprenticeship and the creation of a learning laboratory. A portion of each lecture period will be given to questions related to the topics.

The opportunity to view experts at work will be provided for an entire morning. Conference attendees will be able to visit several on-going demonstrations in a casual atmosphere. Demonstrations in art glass, stone carving and ornamental metals are but a few of the areas covered. The artisans will be able to answer questions and concerns while providing a sampling of their work.

The Craftsmanship and Artisanry track for the APT89 conference is designed to put those in the field of preservation in contact with key resource people. The lectures and demonstrations provided are to aid those in similar situations and encourage all to "Make No Little Plans" when it comes to the details of preservation projects.

The Restoration of Louis Comfort Tiffany's Veteran's Room Relief Mural,
Seventh Regiment Armory, New York City

F.G. Matero, Conservator, Professor of Architecture and Director
The Center for Preservation Research, Graduate School of Architecture, Planning and Preservation
Columbia University

The Veteran's Room of the Seventh Regiment Armory in New York City ranks among the most creative and ambitious interiors to be attempted during the heyday of American interior design of the late nineteenth century. Conceived and executed through the collaboration of Louis Comfort Tiffany with the Associated Artists Studio and architect Stanford White, the room and its furnishings represent one of the period's earliest collective attempts to design and furnish an entire room according to a complex and well-organized decorative program involving strict iconography and a diversity of materials: stained glass, textiles, stencilling, wallpaper, tiles, metal work, wood work, and a multi-media relief mural and painted narrative frieze.

Unique and heralded in its day, the room remains largely intact but in need of serious restoration and interpretation. As part of a phased program of restoration for the Armory, the room's most important element, the Tiffany relief "mural," was studied in 1987 and is now undergoing restoration by a team of conservation students from Columbia University. The presentation will outline not only the historical and technological importance of the interior and its mural, but also a methodology for the examination and conservation treatment.

**The Restoration of the Interior Decorative Painting
of the Connecticut State Capitol**

John Canning
John Canning & Co., Ltd.

The restoration of the interior decorative painting of the Connecticut State Capitol is a complex program involving the conservation and replication of the original 1878 decorative stencilling and polychroming. Designed by Richard M. Upjohn, in collaboration with William J. McPherson, the interiors rank among the finest examples of High Victorian Gothic designs in this country. Because of their superb quality and unique survival, an ambitious program was designed to carefully clean and in-paint surviving decoration, and replicate where necessary, completely damaged areas and overpainted fields, in order to restore the overall visual and to obtain unity of the spaces. Work on this project was completed over a period of three years, working only seven months of each year while the legislatures were in recess.

The varying levels of intervention ranged as follows, from minimum to maximum:

1. The original painted decoration, i.e., stencilling and free hand work, concealed by discolored varnishes, overpaint and surface grime, was cleaned using various solvent mixtures, depending on the nature of the coating, the original pigments, and medium employed.
2. Damaged to surviving original decoration were in-painted with reversible acrylic paint, while large damaged areas and overpainted fields were replicated using stencil designs cut from existing decoration, and executed in commercial alkyd oil house paint, to match the original in color and gloss. For visual uniformity and protection all finished, original, and reproduction decorative painting was varnished with two coats of 8% Acryloid B67, a reversible, non-yellowing synthetic resin.

By creating a restoration program employing these various levels of intervention, and drawing from the skills of conservators and decorative painters, both the visual and historical integrity of these vastly decorated spaces has been restored and enhanced.

Paint analysis was completed by The Center for Preservation Research, Columbia University, New York. Architect for the projects was D.C. Cimino Associates, Hartford, Connecticut.

Conservation of a WPA Mural: Planning and Implementation

Constance S. Silver and Shelley Sass
New York, New York

The 60 Centre Street Supreme Court is one of the most unusual and outstanding buildings from the early twentieth century in New York City; its interior is one of the few designated with city landmark status. Completed by architect Guy Lowell in 1926, this building is among the last to incorporate diverse real and "faux" materials to create an opulent, indeed a fanciful, historiated interior just prior to the wave of austere modernism of the 1930s. Guy Lowell designed both the architecture and the program of the complex interior finishes, including the monumental narrative murals of the principal public spaces, the rotunda and entrance corridor, and the vestibule.

Unfortunately, flaws in structural design, exacerbated by decades of ill-conceived and poorly implemented maintenance, have culminated in the extreme deterioration of the building and its art. An ambitious five-year project will combine structural rehabilitation with conservation and restoration of the interior and its finishes and murals.

This paper focuses on the project to conserve the monumental mural paintings of the dome of the rotunda. Painted in 1936 by WPA artist Pusterlla, these oil on plaster murals show the historic development of the American legal system. This paper will examine specifically:

1. Project Development: Private funding for the mural conservation and the strong continuing involvement of the funders insured a rationally phased conservation treatment over a period of three years.
2. First Phase: Emergency conservation treatments and analyses of the agents of deterioration were carried out. The impact of complex building pathologies on the murals was elucidated. Development of a conservation treatment that has allowed consolidation of arable plaster through the paint, followed by reinstallation of curled and flaking paint, is explained. Extreme changes in original surface and composition of the murals, from undocumented past treatments, are described, along with the analytical methods that were employed. A pilot program for removal of extraneous surface applications and the restoration of extensive lost and overpainted areas, is described.
3. Second Phase: Phase 2, scheduled for 1990, will entail the complete conservation treatment based on the results of the pilot treatment of Phase 1. The measures taken to stabilize the structure of the rotunda and its interior environment are summarized.

Architectural Artisanry: Preservation by Design

Philip C. Marshall, Director
Architectural Artisanry Program, College of Visual and Performing Arts
Southeastern Massachusetts University

The "Architectural Artisanry: Preservation by Design" Symposium was developed partially as a consequence of earlier APT-sponsored conferences on the same subject: the 1986 Swain School of Design Architectural Artisanry Symposium, the 1987 SPNEA-hosted APT/CTC conference, and the 1988 APT/CTC "Theory and Practice: Bridging the Gap" conference held at Columbia University.

"Architectural Artisanry: Preservation by Design" did not simply address the conservation of buildings; it addressed the conservation of the building trades. In doing so, the definition of building trades was expanded to include a diverse groups of professionals who represented their interests at the symposium. These professionals included artists, artisans, craftspeople, and public art administrators and urban planners. Similarly "architecture" was broadly defined to include historic preservation, contemporary construction, public art, landscape architecture and urban planning.

Panelists addressed the professional, economic and - most especially - the educational needs of artisans who work in the field of architecture (both old and new). Speakers ranged from Earle Felber, Master Craftsman, to Saunders Schultz, Artist; from Abbott Sekaquaptewa, Former Chairman, Hopi Tribal Council, to John Walsh, Master of the Works, The Stoneyard Institute; from Lindsay Stabler-Talty, from the New Haven Department of Cultural Affairs, to Douglas Hicks, of the NPS Williamsburg Preservation Training Center.

At the APT Conference the project director will summarize findings of the symposium with particular attention to the role of the Association for Preservation Technology can play in conserving the art, not simply the artifact of artisanry.

Funding for Architectural Artisanry: Preservation by Design was provided, in part, by the National Endowment for the Arts, the Graham Foundation, Eva Gebhard-Gourgau Foundation, and the National Trust for Historic Preservation. The Association for Preservation Technology joined more than twenty other organizations in endorsing the symposium.

Creating a Laboratory for Learning in Thomas Jefferson's Academical Village

James Murray Howard, PhD, AIA, Architect for the Historic Buildings and Grounds
University of Virginia

During the 1980s the historic center of the University of Virginia, designed by Thomas Jefferson and called the "Academical Village," has become the object of an ongoing comprehensive restoration effort. While the site has, from time to time throughout its 170-year lifespan, been the object of philosophical and artistic interest, it has not received serious attention as the object of technical and archaeological research until now.

This new, through belated, appreciation of a major national and international historic site is the logical result of an increasing awareness in this country that preservation and restoration are far more than routine campaigns to beautify or "fix up" old buildings. Along with this awareness comes the realization that a complex of buildings such as this, still in a relatively virginal condition, ought to offer the best possible setting for examination, research and experimentation. In short it ought to be a laboratory for the study of restoration ideas and techniques.

One of the most surprising facts about this site is that little basic research, both documentary and archaeological, has ever been carried out. The first challenge then has been to make proper research sense out of this place. This need to do research begs the question of a laboratory approach, especially in regard to the more archaeological investigative tasks.

Since our studies of building fabric began in 1985, discoveries about interior finishes have substantially altered the conventional wisdom regarding color use in the early years. At the same time, we have developed a more realistic image of skills among the earliest workers. For example, the graining of interior doors was crudely executed in some locations, exquisitely in others. Recent study of roofs shows that Jefferson experimented with both wood and metal roof coverings, sometimes successfully, sometimes not. These investigations have allowed us to establish an on-site "laboratory" situation to study the roofs, to develop strategies for protecting archaeological evidence, and to train roofing craftsmen in restoration and replication of the first roofing. In such working/learning experiences we have also experimented with modifications to the original design when early materials are no longer available or when design weaknesses required modification. In concert with these exercises, we have also attempted to involve graduate students in preservation, from the University's School of Architecture.

Another study made that constitutes a "laboratory" of ideas involves the work of our design committee, which studies the buildings in relation to anticipated changes in the course of restoration. For example: How does one design a bathroom where one never existed, still being sympathetic to the original building? Since such issues may have more than one good solution, we assume that evaluation of these designs will be an ongoing investigative "laboratory" process. This concept of routine reevaluation grows naturally out of the need to reassess each building every time the tenancy changes, or about every ten years.

By such means has the idea of a laboratory for learning begun to develop within the Academical Village. The idea is embellished with the assistance of consulting architects and craftsmen, whom we

invite to participate in research and problem-solving, from time to time. And, in February 1989, we held the first of what we hope will become a series of conferences to study restoration concepts and techniques, using the Academical Village as a reference.

But unresolved difficulties remain. While the need for methodical investigation prior to construction work has now become generally accepted by the University, the pace and surprising nature of such work often thwarts the typical institutional imperative to execute work expeditiously. Similarly, financial support for analysis and consultation, the heart of any laboratory experience, may be difficult to obtain whenever the property in question is viewed more as real estate than an historical artifact. Also, we have observed that study of matters related to the crafts, to working with one's hands, often finds only a small audience in an intellectualized University setting. In all these matters, the idea of a laboratory for learning still has some obstacles to overcome in our particular case.

In summary, the idea of using Jefferson's Academical Village as a laboratory while it is undergoing restoration is an idea that has become reality, at least in part. The reality is not one of scientific laboratory space but, instead, of case-by-case study efforts, as issues present themselves. It is intended that this case study approach will afford beneficial work at the site while it develops into an expanded and stable program for research, analysis, design and craftsman training.

Apprenticeship in Virginia

D. Jameson Gibson, Jr.
Gibson Magerfield General Contractors

- I. Short history of apprenticeship in Virginia
 - A. Past 50 years
 - B. Union vs. Open Shop
 - C. Role of the Department of Labor
- II. Need for non-union training of carpenters recognized by the Associated General Contractors of America
 - A. Virginia chapter of A.G.C. creates Virginia Construction Industry Education Foundation (VCIEF)
 - B. VCIEF has many functions
 - 1. Manpower Resources
 - 2. Education
 - 3. Training
 - 4. Loss Control
 - C. Training proves to be too expensive - \$0.50/man hour
 - D. Other divisions do not support themselves
 - E. Two and half years and \$270,000 later VCIEF stops all programs
- III. Revival of Carpentry Apprenticeship
 - A. Technical Education Schools pick up VCIEF curriculum
 - 1. Supervised by local committee of A.G.C. members and University of Virginia
 - a. Hire instructors
 - b. Discipline students
 - c. Select text
 - d. Maintain quality control
 - e. Bring in outside speakers
 - 2. Greatly reduced cost - \$25/year plus text
- IV. Personal goals for program and as it relates to preservation
 - A. Need to change the attitude in this country towards craftsmen
 - 1. Through school boards
 - 2. Through high school guidance councilors

3. Through competition with college recruiters on career night
 - a. Convince a student that college might be more beneficial after learning a trade and then deciding to move up in management
- B. Recruit more women
 1. Construction site is last bastion of male dominance
 2. Women are particularly well suited for preservation as they tend to be more meticulous
- C. Specialization in preservation should not be encouraged until basic trade skills are mastered, i.e., journeyman
 1. Not enough work
 2. Too much travel
 3. Too expensive

Stone Carving

Walter S. Arnold, Stone Carver
Chicago, Illinois

Carved stone ornamentation was once so prevalent in Chicago as to be an essential mark of quality and durability in architecture. In recent years it has become so rare that most people think it to be extinct.

Walter Arnold is a free-lance carver and sculptor, and Chicago native, who began sculpting in stone at about the age of 12. Trained in Italy in the mid-1970s, he worked on the National Cathedral in Washington for five years. His recent work has included restoration carving for the Chicago Tribune Tower and the U.S. Capitol, letter cutting for the Art Institute of Chicago and the Terra Museum of American Art, and sculptural carvings ranging from fireplaces to the recently installed thirteen foot wide tympanum for the pediment of Stanley Tigerman's Commonwealth Edison substation. In 1988 he carved a memorial stele to Mayor Harold Washington which stands in the Social Security building at 600 West Madison Street.

The process of carving in Indiana limestone will be demonstrated with traditional tools and techniques will be explained.

Nineteenth Century Patterns/Twentieth Century Patternmakers: A Demonstration of
the Materials and Techniques Used to Restore and Reproduce
Original Architectural Ironwork

J. Scott Howell, Vice President/General Manager
Robinson Iron Corporation

The skill and art of patternmaking is of crucial importance to any successful foundry operation. This maxim is as true today as it was during the nineteenth century when architectural ironwork reached its zenith.

Preserving the skills necessary to restore and reproduce original nineteenth century ironwork has been a big part of the work of Robinson Iron Corporation for many years. Fortunately, we have many artisans whose years of experience coupled with a willingness to teach others has enabled us to continue to successfully reproduce and restore original period ironwork.

A hands-on demonstration will be presented by two fully-equipped patternmakers who will perform the following work:

1. Carving of new wood or clay master patterns from shop drawings.
2. Creation of urethane derivative working patterns from master patterns.
3. Utilization of original remnants as working or master patterns.
4. A presentation of the concept of cored or hollow castings through layout and core box productions.

Investigation of Interior Paint Finishes

Robert Furhoff, Restoration of Interiors
Chicago, Illinois

The following topics will be addressed in the demonstration:

Considering objectives of paint analysis in historic structures reports for identifying historic significant treatments and programming restoration.

Review of site investigation and documenting of interior alterations and decoration.

Investigation of painted finishes, including:

- General mythology
- Recording and interpreting a paint chronology
- Color identification
- Examples, descriptions and microscopic viewing of different decorative paint techniques.

Art Glass

E. Christopher Botti
Botti Studio of Architectural Arts, Inc.

Thatching and Hand Hewing of Timbers

Peter Ceron

Ukranian Cultural Heritage Village

Edmonton Department of Cultural and Multi-culturalism, Historic Site Service

Reproduction of Architectural Ornament:
Plaster, Etched Glass, Wood, and Stencils

Douglas C. Ryhn, Associate Professor
Department of Architecture
University of Wisconsin - Milwaukee

The reproduction of architectural ornament is usually thought of as either exact replication through a traditional craft or a more mechanized or industrialized technique for multiple production.

The pure craft method produces one-of-a-kind objects utilizing several of the artisan procedures of carving, sculpting, painting, or forming, which are most appropriate for museum quality restoration projects which also have the budgets and schedules to justify their use.

The production process, on the other hand, utilizes repetitive methods such as molds and casts, stencils, templates, and patterns to arrive at finished objects that are clearly in the manner of the original designer/craftsman or period but represent less costly solutions.

It is these techniques that will be described along with the presentation of ornamental details in plaster, etched glass, wood, and stencils, as well as examples of the use of electronic scanning, computer graphics, and laser etching.

The Restoration and Replication of Architectural Cast Metal Ornamentation

Robert A. Baird, Vice President
Historic Arts & Casting

After 63 years of deterioration, the spire on Chicago's well-known Wrigley Building broke loose from its main structure and plummeted 26 floors to the ground, totally destroying the architectural detail.

Historical Arts & Casting, Inc., a unique corporation combining a wide variety of skilled restoration specialists, was retained by the Wrigley company to replicate the lantern and spire in cast aluminum.

The restoration of the lantern and spire will be used as a case study to discuss and demonstrate the following: approaches to documenting metal ornamentation, procedures for dismantling a cast iron structure, methods of creating foundry patterns and tooling, the use of different metal alloys for casting, the applications and warranties of various coatings, and the installation and weatherproofing of cast metal ornamentation.

In early May of 1988 more than 150 replicated components were delivered to the Wrigley Building ready for installation. A local restoration contractor skillfully lifted the spire by helicopter and positioned it atop the building. The installation and weatherproofing of the lantern was completed soon thereafter.

Decorative Painting

John Canning
John Canning & Co., Ltd.

Landscape Restoration

Julia Sniderman, Sesion Chair
Preservation Planning Supervisor
Chicago Park District

During the past few decades the preservation movement has increasingly moved beyond its traditional emphasis on individual buildings associated with people, places and events important in American history. We are now concerned with retaining and reinforcing those elements which convey a sense of place. As our focus has become more environmental, many have been drawn to the idea of preserving historic landscapes both as contexts and as historic resources themselves. Landscapes are fascinating links with the past. They often have social, cultural, and design significance. In addition, they have great importance as open spaces. Unfortunately, the development of methodologies to evaluate and preserve historic landscapes continues to lag behind those which deal with buildings and structures.

The preservation of historic and cultural landscapes presents difficult philosophical questions. How do we preserve an entity composed of living, constantly changing matter? What should we restore back to? What if there are numerous periods of significance? What should we do when the original plant species have not been hardy, or have been prone to disease? How do we insure that all of the natural elements of a historic landscape will not reach maturity at the same time? There are numerous practical considerations for both public and private landscapes. The exorbitant cost of landscape maintenance, expense in replicating the original craftsmanship, extreme value of land in many locations, security and liability issues and problems with vandalism all compound the difficulties in preserving historic landscapes. Changing trends in society impose additional pressures. Mid-nineteenth century boulevards were intended to be experienced at 10 to 15 miles per hour. Parking lots were rarely necessary, and a game of chess was considered an exertive sport.

The current methodologies and policies in historic preservation are greatly lacking in their ability to address landscapes. The Secretary of the Interior's Standards for Rehabilitation provides only broad and limited language related to sites. Most local preservation ordinances do not mention landscapes. The few that do have language have inadequate mechanisms to triggering the design review process. Historic and architectural surveys rarely include landscapes or landscape features. Those who are interested in conducting historic landscape surveys cannot simply apply the traditional windshield survey technique, as landscapes are more difficult to identify and evaluate than buildings.

Fortunately, much recent attention on this subject is generating tremendous growth in the field. Over the past ten years, the American Society of Landscape Architects has devoted three special issues of its professional journal to historic preservation. Landscape architecture departments in universities throughout the United States and Canada are developing historic preservation curriculum. The National Park Service has published two briefs on nominating landscapes to the National Register of Historic Places. A program called the Catalog of Landscape Records in the United States has been developed at Wave Hill, New York, to assist researchers concerned with landscape history. The Association for Preservation Technology has been actively involved in the advancement of this specialization. In

addition to special issues of the Bulletin, the APT annual conference which was held in Boston last year featured a pre-conference training session on landscape preservation, as well as a conference track on the subject.

It is especially appropriate that APT is again including a landscape track in its annual conference this year in Chicago. While the East coast has been a leader in this specialization, many recent efforts have occurred in the Midwest. The inspiration of the East coast trends, European designs and traditions, and the Midwest's native prairie have provided this area with a legacy of designed as well as cultural landscapes. The Chicago Park District, one of the co-sponsoring agencies for the conference, has been making recent advances. The discovery of thousands of original drawings and photographs relating to the system's numerous historic parks prompted the administration to establish a new Division of Preservation Planning. The track will highlight the Park District's recent preservation efforts as well as the history and design of the Chicago parks. Panelists from locations across the country and Canada will provide further insights on the current state of landscape preservation, with emphasis on recently developed methodologies and future directions for the field.

Planning and Design of the Detroit Zoo (1911-1940)

Miriam E. Rutz, Associate Professor
Landscape Architecture Program, Michigan State University

The Detroit Zoological Society was founded in July of 1911 and was determined to create the most advanced zoo in the world for the display of animals. Therefore, they hired the best known designers in the field of landscape architecture and zoo design in the world at that time. They collaborated over 17 years before opening the zoo to the public in 1928.

Site selection was important and two prior locations were bought for the zoo and then sold before the existing site was developed. Arthur A. Shurtleff, a landscape architect from Boston, who was a president of the American Society of Landscape Architects and a contemporary of Frederick Law Olmsted, was hired to develop the original master plan for the zoo. Previously he had designed the Boston Zoo and written numerous articles on design. He was retained for the first ten years and collaborated with the Society on the concept of a completely barless zoo. Most of his original linen drawings have been located. His basic plan of entry mall and arrangement of displays was implemented and is still in place today.

Also in consultation with the Detroit Zoological Society was the firm of Carl Hagenbeck from Hamburg, Germany. Their zoo, Tierpark at Stellingen, was the first zoo in the world to display animals without visible barriers. In the art of exhibiting wildlife, Carl Hagenbeck was a pioneer, and the Detroit Zoological Society brought his son, Heinrich Hagenbeck to Detroit as an advisor on their zoo. They contracted with the firm to build displays from gunite and create a panoramic vista of several animal displays at a time. Craftsmen were brought over to build the displays.

A better understanding of the design development of the Detroit Zoo gives a better understanding of landscape architecture, landscape architects, recreation design and technology at the beginning of the 20th century.

This paper will use the Detroit Zoo as a case study to explain planning and design of habitats in the United States during this time period.

Lincoln Park Zoo

Maria Whiteman
Chicago Park District

Lincoln Park Zoo is one of the oldest, well established zoos in the United States. It all started in 1864 when New York's Central Park gave a pair of swans to Lincoln Park.

One of its unique features is its location. Located in the midst of a large urban population, the zoo grew out of Lincoln Park, one of Chicago's oldest parks in the city. Although there had been a series of plans for Lincoln Park, the zoo developed without a theme or master plan. The consequence of this lack of planning is a piecemeal aggregation of different animal habitats without an overall concept to follow.

Today, the zoo's commitment to new visions of conservation, education and recreation has resulted in a great effort to revitalize their resources, not only their animal collection but also their gardens.

In the past, as funding has permitted, Lincoln Park Zoo has moved toward a more progressive zoological philosophy of providing a natural environment suited to a particular animal's lifestyle and needs. Now carefully planned and designed habitats are replacing rows of obsolete cells and are providing both the visitors and the animals with a richer experience and stimulating environment.

This presentation focuses on the issues facing the fragmentation of Lincoln Park Zoo's landscape and the need to restore the lost concept of a zoological garden.

Landscape Restoration for Historic Zoos

Jerry M. Johnson
Sasaki/Johnson Design Group

A Model Preservation Planning Project for Chicago's Historic Parks

Julia Sniderman, Preservation Planning Supervisor
Chicago Park District

Between the Depression Era and recent years, the Chicago Park District's extremely rich design heritage became threatened by neglect, changing trends in recreation, shifting patterns in neighborhoods, and insensitive maintenance and alterations. Over the years, these problems led to a downward spiral of crisis management which has undermined the integrity of nationally significant historic resources. Fortunately, recent changes in the Chicago Park District administration has created an opportunity to pursue means of transcending the cycle. Among these a new department of Research and Planning has been established. Preservation Planning is one of six divisions set up under this department.

Initiative from the Chicago Commission on Landmarks helped pave the way for this new division. Shortly after the new Chicago Park District administration was in place, the Commission proposed that the two agencies jointly apply for a planning grant from the Illinois Historic Preservation Agency. The grant was awarded, and the project is now near completion. Entitled "A Model Preservation Plan for Chicago's Parks," the project seeks to establish a comprehensive planning methodology for dealing with all of the city's historic park resources.

The project is two-tiered. Focusing on five case studies, it includes documentation and analyses leading to landmark registration and specific recommendations for restoration and rehabilitation. The registration component includes a Multi-Resource Nomination to the National Register of Historic Places and listing through the Chicago Park District's own internal landmarks program. The recommendations component included survey analyses, mini-historic structures reports for buildings and landscape elements, as well as general planning recommendations for the five parks. The project has sought to develop a methodology which can be employed in any of Chicago's multi-faceted historic landscapes. It is hoped that the tool will also be applicable to other landscape types, in other locations, as well.

The Erosion of the Heritage Character of City Parks

Linda Dicaire Fardin, Senior Landscape Architect, Period Design
Heritage Conservation Program, Architecture and Engineering Branch
Quebec Department of Public Works, A dedicated unit to the Canadian Parks Service

This paper will deal with the gradual erosion of the heritage character of city parks, the issues which must be addressed to arrest it and the available range of design and management solutions sensitive to it.

The heritage character of an historic city park is more than the sum of its parts. While historic features such as lawns, benches, lighting standards, bandstands and mature trees, etc. are important contributing factors, there is also an overall visual and functional interaction between individual elements themselves, and with the environment outside the park boundary. It is this interaction which establishes the overall heritage character.

Preserving heritage character can involve approaches other than restoration. New elements for which there is no site-specific precedent can be designed and integrated in keeping with the original design intent without duplication of period details. Repairs and replacement may involve new design. It is essential that all of these interventions be informed, and part of an overall coherent scheme.

Consistency can only be ensured through a master plan and a management plan, periodically revised. These documents should rest on historic documentation presented in the form of a site history, on a site inventory supported by the appropriate level of heritage recording of all built features, and finally on an historical design analysis supported by the necessary recommendations which outlines priorities.

The historical design analysis will establish if there is heritage character; it will identify its nature and score the importance of individual elements. Subsequent design recommendations will then provide obvious responses to the historic design analysis if it sets as its foremost objective the protection of heritage character. Failure to identify this objective can undermine the usefulness of the best aforementioned studies.

The protection of heritage character then directs all works: new design and repairs or replacement of old. It is paramount that the original ideal be read in the landscape and that the additions of various time periods be consistently applied under the supervision of personnel experienced in matters of conservation.

The Queen Elizabeth Driveway (QED) in Ottawa, Ontario, Canada, provides the focal backdrop for this study. In 1899 the Ottawa Improvement Commission initiated works to ornament the driveway along the Rideau Canal. The original layout was largely gardenesque and complemented by rustic furnishings which have long since disappeared. In 1903, Frederick G. Todd, formerly an employee of the Olmsted firm in Brookline, was commissioned to prepare a plan for the development of parks and driveways through the city. His recommendations were implemented in the 1930s and 1940s. Since then the character of the Driveway has been retained even though there have been numerous changes. Recent proposals or works which ignore the heritage character of the site have caused concern for citizens and conservationists.

Analysis & Planning: Designed Historic Landscapes

Charles Birnbaum, ASLA
Associates, Walmsley & Company, Inc.

A master plan for a designed historic landscape should aim to be long term and comprehensive. It is different from an ordinary master plan in that it must address historic issues, carefully weigh contemporary uses and current maintenance and management capabilities/operations of the owners/administrators against the landscape's historical intent and current physical condition (including both natural and built elements) to formulate a realistic strategy for ultimate restoration.

The master plans and initial projects included in this presentation aim high. They are long term and comprehensive plans addressing all pertinent issues. The plans are meant to guide future actions and to establish the priorities for the execution of initial projects and for the funding of subsequent ones. In the case of larger parks and linear park systems the recommendations encompass both system-wide and site specific projects.

A variety of master planning methodologies will be presented. This will include estate landscapes, public parks, parkways and park systems. The projects will include:

Emerald Necklace Parks, Boston/Brookline, Massachusetts: The four Emerald Necklace Parks, The Back Bay Fens, Riverway, Olmsted Park and Jamaica Pond were designed and constructed in the 1880s and 1890s under the direction of Frederick Law Olmsted, Sr., John Charles Olmsted and Charles Eliot.

The Massachusetts Department of Environmental Management Olmsted Historic Landscape Preservation Program (DEM) initiative toward a master plan for historic landscape preservation and management aimed to develop a restoration, management and maintenance strategy for guiding the future of these parks.

Springside, Poughkeepsie, New York: This National Historic Landmark was designed from 1850-1852 by Andrew Jackson Downing for Matthew Vassar, as a combination country estate and farm. As the only fully documented extant work of Downing, the greatest American landscape theorist before Olmsted, the site has national significance.

Druid Hill Park, Baltimore, Maryland: This nearly seven hundred and fifty acre park was commissioned in 1860 and is the third oldest in the country. Howard Daniels was employed as the Landscape Architect and George A. Frederick was the Architect for the various park structures.

The winning master plan was a product of an invitational competition in 1985 that addressed the Victorian urban park suffering all the familiar pressures of neglect, crime and social changes. The first phase project for a new conservatory expansion and gardens to the one hundred year old Palm House started construction in Fall, 1989.

Lake Washington Boulevard, Seattle, Washington: This nine-mile scenic parkway is a key feature in a fifty mile system of "Parks, Boulevard and Playgrounds" proposed by the Olmsted Brothers in 1903-1908.

The objectives of the project are to understand the historic intent of the boulevard as a pleasure drive and recreational resource and to regain historic integrity and imagery, to enhance scenic views and vistas, to provide for a range of recreational opportunities and to resolve encroachment problems while improving function, maintenance and management capabilities.

Fairmount Waterworks Interpretive Esplanade, Philadelphia, Pennsylvania: A series of "Wayside Exhibit Stations" were designed for a 400 foot long esplanade acting as the southern anchor to the Fairmount Water Works with its great turbine, public gardens and classical buildings at the southern end of Fairmount Park on the banks of the Schuylkill River.

Prospect Park Historic Landscape Projects, Brooklyn, New York: The 575-acre park designed by Olmsted, Vaux & Company has had historic landscape reports prepared for its Ravine, Perimeter, Lake, Long Meadow and Grace Hill Districts. For the initial study of the Ravine District, a model was established following a comprehensive HLR process. This award-winning prototype established the basic methodology for the inventory and analysis of historic parks which has been adapted and augmented since.

Urban Pressures--Rural Landscapes: Strategies and Tools for Guiding Change

Steve McNiel, Assistant Professor of Landscape Architecture
University of California, Davis

The impact of urban growth on historic resources is often more severe in rural areas than in urban or suburban areas. This is especially true in California where the rate of growth exceeds that of the rest of the nation. In Northern California, the rural landscapes absorbing rapid change are often historic landscapes of National significance such as the Mother Lode area in the foothills above Sacramento, the state capital. The Mother Lode produced the greatest amount of gold during the great California gold rush of 1849, an event that was responsible for the beginning of a mass westerly migration that continues into the present. Today this historic landscape retains the majority of its 19th century character and historic architecture, but rapid urban growth in the Sacramento area is threatening to change all of this as new employment centers locate within easy commuting distance.

Unfortunately, the combination of underfunded county and small town planning agencies and the speed and efficiency of sophisticated urban developers spells potential disaster for historic landscapes. Local planning agencies not only lack the tools and resources to protect their most important assets, they often lack leaders who perceive unguided growth as a threat. By the time local preservation interests can generate a response, the important landscapes have been irreversibly impacted.

In an effort to address this situation the author has explored the development of planning tools that provide a high level of sophistication at low cost. Working with innovative geographic information software and personal computers, an integrated package of data base and analysis templates have been developed and tested. These templates offer local planners and preservation groups the ability to inventory, analyze and plan for the protection of important historical landscape and architectural resources. Emphasis has been placed on managing resources over time, not just in the performance of one-time inventories and assessments. In order to maintain vigilance as development threats arise, historic inventories must be able to grow and change, responding to the particular threat of the moment. New analyses of significance and historical context must be possible at the moment the developer submits plans for new subdivisions or shopping center, and not be dependent on months of analysis cycles.

The system is based on an inventory technique that uses video to capture images of historic resources and a hyper graphics interface to link images, text and numerical data in an integrated data base and planning environment. The system accepts information at regional, community, and individual resource scale and provides an easy way to access and aggregate information at any or all of these scales, addressing the links between historical context and the significance of the individual historic feature. The system has been tested in the development of protective planning policy and specific guidelines.

A No-Tech Cultural Landscape Conservation Project

Wendy Joy Darby

Landscape Conservation & Interpretation

This paper focusses on an historical study made on an upland valley and its hamlets in the Lake District National Park, England.

Man's intervention with the natural vegetation and landscape is traced through a fine-grain inventory of managed natural and man-made features encompassing neolithic settlements; Roman roads; proto-industrial mineral extraction; early field patterns and their boundary walls and hedges; and 17th century stone habitations.

Regional archival research not only places those surviving features in their socio-historical context, but also reveals information on the men, women and children who laboured on the land.

The rationale for designating landscape conservation areas within the Valley is discussed, as well as the actual boundaries of those areas. Stresses on the landscape are pinpointed and means whereby they can be most simply alleviated are described.

A Model Project for Identification and Retention of Community Character:
Master Plan for Preservation and Scenic Conservation,
Guilford, Connecticut

Patricia M. O'Donnell, ASLA, APA, Principal
LANDSCAPES Landscape Architecture, Planning, Historic Preservation

Throughout North America there is growing awareness of the value and fragility of the unique qualities of communities. A period of growth and expansion, often causing loss of loved natural or cultural resources, has shocked local interests into action. The reactionary approach, often focused on singular resources, is a valuable but limited way of addressing the problem. This presentation will focus on a model project that comprehensively addressed a community's special character and developed a multi-faceted plan to conserve and preserve the character.

In 1985 LANDSCAPES and Frederick P. Clark Associates undertook a project for the Guilford Preservation Alliance, a non-profit community preservation group, working in collaboration with Town of Guilford, Planning Office and Connecticut Trust for Historic Preservation. The project entitled "Master Plan for Preservation and Scenic Conservation" addressed the entire range historic, prehistoric, scenic and ecological resources that contribute to special character of Guilford, Connecticut. Over three hundred historic buildings dating from 1659 to the 1930s, and prehistoric and historic sites had been identified as important resources to the Town.

A plan was needed that would allow for growth while assuring the Guilford's rich, fragile, cultural and natural resources would remain intact. The starting point and guiding principle of this planning process was a recognition that the entire built, natural, historic and contemporary fabric of Guilford comprised the Town. The unity of these elements and their interdependence led to a complex, integrated planning process.

Patricia O'Donnell led a team of landscape architects, environmental and traffic planners and preservationists. The planning process included five phases: 1. field research, data collection and examination summarized in Working Paper #1; 2. analysis of existing legal and advisory mechanisms and problem identification summarized in Working Paper #2; 3. preservation and scenic conservation strategy research and application summarized in Working paper #3; 4. finalization of the Master Plan; 5. development of an Action Plan to define first steps. The published Master Plan for Preservation and Scenic Conservation incorporates each phase and delineates the ways that interested residents, organized groups and Town government, as the vehicles of action, can work together and separately toward the stewardship of Guilford's character. A varied set of preservation and conservation tools as developed in four groups: education and community involvement, financial, advisory, and regulatory, function as a kit of parts to be used independently and in conjunction with each other for targeted results. Action will be based on several factors: timing, economics, commitment and relationship to other resources and other actions.

The unique aspects of the project include initiation and spearheading of the project by a local preservation organization; participation of a diverse steering committee representative of the entire

community throughout the process; beneficial collaboration with the Town in a private/public partnership; development of a useful regional and national model for community planning in integrated preservation and conservation realms. The product is also unique, a dynamic plan, each preservation and scenic conservation victory or defeat changes future agendas. The elements of the plan can be tailored, used and reused to address these dynamics. Progress is being made in Guilford in a variety of directions. Several other communities have participated in workshops and special presentations on this plan and its application to their towns. The document is functioning as a state-wide model. The project received an American Society of Landscape Architects Merit Award in 1987 and a Connecticut Public Spaces Citation Award in 1989.

The following illustration is a matrix summarizing the Resources, Vehicles and Tools of the Master Plan for Preservation and Scenic Conservation. The value of the matrix lies in the clarity of presentation and the recognition that all elements of the community, citizens, private groups and town government can all reach in varied ways on behalf of the town's resources.

Final report: Master Plan for Preservation and Scenic Conservation. Copyright 1986, Patricia O'Donnell, Jim Donovan and the Guilford Preservation Alliance.

VEHICLES

- CITIZENS, NEIGHBORS AND NEIGHBORHOOD GROUPS
- ◆ PRIVATE, NOT-FOR-PROFIT AND CHARITABLE ORGANIZATIONS
Guilford Preservation Alliance, Guilford Land Trust,
Community Land Bank and Others
- GUILFORD TOWN GOVERNMENT, Elected & Appointed Officials
Advisory Boards & Commissions, Employees

TOOLS

RESOURCES AND OBJECTIVES

	Historic Structures	Historic Districts	Historic & Prehistoric Sites	Scenic Vistas	Scenic Areas	Scenic Roads	Ecologically Valuable Areas	Rivers, Streams & Inland Wetlands	Coastal Wetlands	Coastline	Large Canopy Trees	Forests	Parks & Open Space	Agricultural Lands	Controlled Residential Growth	Controlled Commercial Growth	Sense of Community
A. EDUCATIONAL AND COMMUNITY INVOLVEMENT TOOLS																	
1. Publicity	•••	•••	•••	•••	•••	•••	•••	•••	•••	•••	•••	•••	•••	•••	•••	•••	•••
2. Neighborhood & Community Projects	•••	•••	•••	•••	•••	•••	•••	•••	•••	•••	•••	•••	•••	•••	•••	•••	•••
3. Peer Pressure	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••
4. Information Meetings & Exhibitions	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
5. Private Building & Property Maintenance	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••
6. Skill Development Workshops & Seminars	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
B. FINANCIAL TOOLS																	
1. Preservation & Conservation Easements	•••	•••	••	••	••	••	•	•	•	•	•	•	•	•	•	•	•
2. Right of First Refusal	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••
3. Gifts & Donations	•••	••	•••	•••	•••	••	•••	•••	•••	••	•••	•••	•••	•••	••	••	••
4. Public Capital Improvements	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
5. Purchase & Resale	•••	••	•••	•••	•••	••	•••	•••	•••	••	••	••	••	••	••	••	••
6. Transfer/Purchase of Development Rights	•••	•••	•••	•••	•••	••	•••	••	••	••	••	••	••	••	•	•	•
7. Revolving Loan Fund	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••
8. Purchase of Key Properties	•••	••	•••	•••	••	••	••	••	••	••	••	••	••	••	••	••	••
9. Long Term Lease	•••	••	•••	•••	••	••	•••	•••	•••	••	•••	•••	•••	•••	••	••	••
10. Mutual Covenants	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
C. ADVISORY TOOLS																	
1. Master Plan for Preservation & Scenic Conservation	•••	•••	•••	•••	•••	•••	•••	•••	•••	•••	•••	•••	•••	•••	•••	•••	•••
2. Public Streets Management Plan	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••
3. Public Facilities Management Plan	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••
4. Park & Open Space Plan	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••
5. Natural & Historic Resource Inventories	•••	•••	•••	•••	•••	•••	•••	•••	•••	•••	•••	•••	•••	•••	•••	•••	•••
6. Tree & Forest Management Plan	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••
7. Traffic Plan	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••
8. Town Plan Revision	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
D. REGULATORY TOOLS																	
1. Visual Overlay Zoning District	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
2. Design Review Board	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
3. Historic District & Properties Commission	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
4. Tree Preservation & Planting Ordinance	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
5. Easement Law	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
6. Zoning Ordinance Revision	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

ASLA National Historic Landscape Survey:
Recent Projects from Several States and Municipalities

Patricia M. O'Donnell, ASLA, Chair
Historic Preservation Committee, American Society of Landscape Architects (ASLA)

In 1984 the ASLA Historic Preservation Committee initiated the National Historic Landscape Survey by developing and widely distributing a survey form to encourage local and regional survey efforts. America's vast legacy of historic landscapes had received limited attention in historic resource inventories. As in all historic resource initiatives the first step in preservation action is to identify historically valuable landscapes. The survey was intended to promote research and provide a vehicle for gathering information about historic designed and cultural landscapes. The survey form, enclosed for reference, was developed to mirror the National Register form while addressing topics relevant to historic landscapes. The ideal is to eventually compile a national data file of extant historic landscapes.

Through the ASLA Committee on Historic Preservation and the network of ASLA Chapter Historic Preservation Liaisons several collaborations with interested groups and State Historic Preservation Offices (SHPO) have been undertaken. Four recent survey projects will be highlighted in this presentation. The first, a project in Dayton, Ohio, to explore the landscape architectural legacy of the Olmsted firm and Patterson/National Cash Register projects for a large number of public and private commissions, was a collaboration of ASLA Ohio Chapter, Dayton Garden Club and Ohio SHPO. Second, a recently completed investigation of the Kessler legacy in Kansas City dating from the 1890s, has addressed the significance and integrity of the public park and boulevard system through an ASLA/SHPO grant. Third, a statewide survey of Oklahoma's historic designed landscapes, addressing 45 sites, undertaken by the ASLA Oklahoma Chapter, Historic Preservation Committee. Fourth, a model project funded through the Certified Local Governments program, to inventory and assess ten historic parks, plazas, and cemeteries for the City of Syracuse, New York. This project recently received a Preservation League of New York State Public Trust Award and is increasing state-wide recognition of historic landscape resources. The processes undertaken, formation of collaborations and survey products created in each of these efforts will be presented. The applicability of these efforts to future local and regional landscape surveys highlighted.

The following illustration ASLA Historic Landscapes Survey Form.

**AMERICAN SOCIETY OF LANDSCAPE ARCHITECTS : HISTORIC LANDSCAPES SURVEY
NATIONAL SURVEY FORM**

Form Number _____

1 LANDSCAPE NAME

Historic _____
Common/Current _____

2 LOCATION

USGS Quadrangle _____ Acreage _____
City/Town _____ County _____
Zip Code _____ State _____
Congressional District _____ UTM Coordinates _____

3 OWNER OF PROPERTY If group or government agency give contact person.

Name/Contact Person _____ Phone _____
Street Address _____
City/Town _____ State _____ Zip Code _____

4 LANDSCAPE TYPE Check all that apply.

☐ Urban Landscape	☐ Rural Landscape
☐ Residence	☐ Garden
☐ Estate	☐ Botanical Garden
☐ Park	☐ Parkway
☐ Battlefield	☐ Cemetery
☐ Fort	☐ Monument Grounds
☐ Ceremonial	☐ Commemorative
☐ Public Building	☐ Institution
☐ Square/Commons	☐ Streetscape
☐ Park System	☐ City/Town
☐ Water Feature	☐ Settlement
☐ Farm	☐ Enclave
☐ Other _____	

Brief Description of Type _____

5 LANDSCAPE STATUS Check and describe as required.

Ownership: ☐ Public ☐ Private ☐ Other, Please Explain
Public Acquisition: ☐ Considered ☐ In Progress ☐ Not Considered
Access: ☐ Unrestricted ☐ Restricted ☐ No Access
Status: ☐ Safe ☐ Endangered ☐ Action Needed, Please Explain
☐ Preservation Undertaken, Please Explain

Further Information _____

6 LANDSCAPE ADDRESS AND BOUNDARY INFORMATION

Specific location, streets and features comprising the boundary. _____

Repository of Legal Description, Courthouse/Registry of Deeds _____

Contact Person _____

Street Address _____ City/Town _____

State _____ Zip Code _____ Phone _____

7 REPRESENTATION IN OTHER SURVEYS Check and Give Details.

☐ National Register ☐ National Landmark ☐ State Designation

☐ Local Designation ☐ Other _____

Title of Survey _____

Depository of Survey Records _____

8 HISTORIC INFORMATION Check, circle and complete. Give details wherever possible.

☐ Original Landscape Architect/Designer/Planner/Creator Name(s) _____

☐ Alteration or Addition Landscape Arch/Designer/Planner/Creator Name(s) _____

☐ Gardener/Horticulturist Name(s) _____

☐ Builder/Engineer Name(s) _____

☐ Client/Community Leader Name(s) _____

☐ Date(s) of Construction _____

BRIEF CHRONOLOGY: Indicate pertinent facts about construction, subsequent changes, events, notable occurrences include social and cultural factors. _____

CONDITION Excellent CHANGES Unaltered
 Good Altered
 Fair Added to
 Deteriorated Loss or Removal of Features
 Severely Deteriorated Boundaries or Features Encroached Upon

EXISTING CONDITIONS: Begin with overall description, then note specifics. Emphasize landscape features. Attach plan at 1" = 20', 1" = 100 or as appropriate. Include photographs of significant views and features with location and direction of view noted on plan.

☐ Design/Plan ☐ Design Intent ☐ Property Boundary ☐ Scenic Qualities
☐ Spatial Relationships ☐ Topography/Grading ☐ Architectural Features ☐ Adjacent Factors
☐ Vegetation ☐ Site Furnishings ☐ Circulation System ☐ Other, Explain

STATEMENT OF INTEGRITY Describe the degree to which the overall historic landscape and its significant features are present today in their historic form. Explain the categories of integrity noted above and any others that apply.

☐ Association with Person/Group/Event	☐ Historic Significance in Landscape Design	
☐ Work of Recognized Master	☐ Cultural Significance	☐ Important Landmark
☐ Important Artistic Statement	☐ Particular Style	☐ Particular Type
☐ Unique Regional Expression	☐ Fine Craftmanship	☐ Particular Time
☐ Unique Materials	☐ Time Sequence	☐ Other Verifiable Quality

12 SOURCES FOR INFORMATION Note the sources used in this survey. Cite source, address, type of material.

Non-Local Sources of Documents

Bibliography of Major Sources

Name(s) _____ Street Address _____
City/Town _____ State _____ Zip Code _____ Phone _____

For additional comments add separate page, use category numbers as key.
Include photographs, plans and maps for full information. Thank You!

Return Completed Form To: Patricia M. O'Donnell, Chair, ASLA Historic Preservation Committee
Box 2425 Saugatuck Station, Westport CT 06890 (203) 227-3310

Highland Park Landscape Survey

Jo Ann Nathan
Highland Park Preservation Commission

The Highland Park, Illinois, Historic Preservation Commission (HPC) is chartered by local ordinance to identify, protect, and enhance Highland Park's historic, cultural, and architectural resources. The nine-member HPC has been active for five years. Initially, only a limited amount of HPC research and activity was devoted to landscapes, but it became increasingly evident that this aesthetically rich community had a unique landscape heritage worthy of consideration and protection.

In response to some threats to significant landscapes in the area, the HPC took several steps. It developed public awareness programs on Highland Park's landscape history, created design guidelines for city projects, and entered into intergovernmental agreements with the local park district. While these activities have been meaningful, they occurred on a project by project basis. It is especially difficult to protect a community's significant landscapes without having an assessment of all of the local landscape resources. Consequently, a survey of historic landscapes was undertaken to provide that assessment.

A literature review was conducted in order to develop a new survey methodology for significant landscape resources. The commission learned that only a few landscape surveys had been previously conducted, and, of those that do exist, the majority were surveys of the work of just one important landscape architect. It was decided that the Highland Park landscape survey would be a comprehensive one which would cover historic (designed at least 35 years ago) and designed landscapes. The survey process included: generating a list of potentially significant landscapes; conducting historical research; requesting permission from property owners to make on-site evaluations; and evaluating the landscape with the use of the survey form. In many instances the four steps occurred simultaneously.

The project began with a special meeting to develop an initial list of potentially significant landscapes. They were defined as those which: are important as works of art; are associated with a designer, landscape architect, or gardener of note; have historical association with a significant person, event, or trend in landscape architecture or gardening; or were designed in a recognized style or tradition by owners or other amateurs. A variety of sources was used in the historical research including original drawings and plans, historic photographs, oral interviews, primary literature, and secondary literature. A survey form was developed for the evaluation phase of the methodology. Those forms studied in the literature review provided a basis for the Highland Park survey form. The National Register Bulletin on how to evaluate and nominate designed historic landscapes was extremely useful in developing the survey form, and the Commission was aware that ultimately the information generated by the survey would be evaluated for eligibility for nomination to the National Register.

Funded in part by a planning grant from the Illinois Historic Preservation Agency, the Highland Park Historic Landscape Survey began in August of 1986. The research and fieldwork were conducted by the staff and members of the HPC, graduate students in landscape architecture, and various volunteers. The survey covered a total of approximately 370 acres of both public and private land. The final report was completed in July, 1988.

Louisville's Olmsted Legacy

Ronald D. Facktor, ASLA

Facktor & Associates, Landscape Architects/Planning Consultants

"Preface," Louisville's Olmsted Legacy, reprinted by permission only, Louisville Friends of Olmsted Parks, P.O. Box 4983, Louisville, Kentucky 40204.

Organized in May of 1987, the Louisville Friends of Olmsted Parks is a local advocacy group. The Friends association was formed with the specific goals of developing a commitment to the preservation and protection of Louisville's Olmsted parks and parkways, and to foster pride in Louisville's Olmsted legacy. As a young group, the association felt its first step in advocating for Olmsted-designed landscapes (both public and private) should be to identify and document what was done here in the Louisville area. Louisville's Olmstedian Legacy represents the initial efforts in identifying and documenting the accomplishments of Frederick Law Olmsted and his firm.

Louisville's Olmstedian Legacy was initiated both to identify Olmsted-designed landscapes, and to highlight the contribution of Louisville's historic landscapes to the fabric of the city. It is Louisville's wonderful parks, parkways and scenic open spaces that leave a lasting impression on the City's residents and visitors. And it is by plan that these parks, parkways, schools, estates and institutions touch almost every part of the city. From the large regional parks - Shawnee, Iroquois and Cherokee - to the parkways, to the neighborhoods and community parks, to the educational and religious institutions, Louisville's historic landscapes are integrated into the body of Louisville. It is these landscapes that provide the natural open space that Frederick Law Olmsted, Sr. - nearly a hundred years ago - saw as indispensable to a healthy urban environment. Louisville is fortunate to have preserved a fair portion of this important urban amenity.

When the United States Congress passed the National Historic Preservation Act of 1966, the federal government through the establishment of the National Register of Historic Places - began formally to recognize the wealth and beauty that this country holds in its historic architecture. With the 1970s and early 1980s, the U.S. entered a new era in historic preservation; it was at this time that historic landscape began to be recognized for their contribution to the built environment. Identifying the accomplishments of the Olmsted firm was extremely important in the movement to recognize the contributions of landscape architecture to American design. In looking at major cities - from Boston to Chicago to Seattle - it becomes more than evident that the work of Frederick Law Olmsted and his successor firms represents an enormous contribution to the heritage of American landscape design.

In 1987 the National Association for Olmsted Parks, in conjunction with the Massachusetts Association for Olmsted published The Master List of Design Projects of the Olmsted Firm 1857-1950. From this comprehensive listing, the Louisville inventory project team learned of the extent of the Olmsted firm's work in this area. Within the Master List there are 189 separate listings for Louisville area projects, a far greater number than the project team originally anticipated. These 189 listings cover twelve different types of design commissions, from parks, parkways and recreation areas to arboreta and gardens.

From the start, the inventory project team set out to identify information that is in the hands of local individuals, government agencies, business and institutions. Information on Olmsted design

projects basically can be obtained from three sources: the information held locally; information held at the Frederick Law Olmsted National Historic Site in Brookline, Massachusetts (originally, the Olmsted offices); and the firm's papers and correspondence, held at the Library of Congress in Washington, D.C. The project team viewed the identification of local plans and documents as the first step in the inventory process. In addition, the site and scope of the grants supporting this phase of the inventory did not allow for long-distance research.

As the project team began its work, it became increasingly obvious that the task involved not only finding information, but identifying information types, from contracts and correspondence to plans and surveys, along with the possible locations of such information. As an example, the information on public design commissions was accessible, but was located throughout all divisions of government, within the archives of educational institutions, and in the files of local surveyors, as well as in the hands of a local historical society. In addition, although these repositories broadly knew what they had in their possession, they had never had occasion to complete a thorough inventory of their "Olmsted" holdings.

Identifying and documenting private Olmsted-designed estates held an entirely different set of problems. Because of the sheer number of private estate and homestead projects with which the Olmsted firm was at least nominally involved (an actual design was not necessarily produced, nor accepted for every client), private estates immediately presented the greatest research hurdle. Locating plans for private estates is by its nature a difficult undertaking. Private homes and estates often change owners, with the original plans not always staying with the estate. Also, even if the estate stayed in the hands of the original family, the plans for the estate may have been lost or destroyed.

The issue of privacy is also a concern when attempting to identify private estates. For many valid reasons, owners of private estates may not want the location of their property published. Most owners are not averse to plan reproduction or photographs of their landscape, if proper assurances are made for privacy. Of course, the primary obstacle here was locating the estates and plans in the first place. Although progress was made, it is the project team's hope that the initial efforts of this inventory will draw the attention needed to alert private property owners of the ongoing research in this area.

Another important factor in identifying Olmsted-designed estates is that higher-density residential development and expressway expansion have substantially altered, or even destroyed, a number of the large private estates developed in the first quarter of this century. Historic landscapes, especially in eastern Jefferson County, are under considerable development pressure.

The condition of the documents - especially the plans - was of great concern. At times, the only available plan for a project site was a single blueprint, making reading and reproduction difficult. Many original plans, because of their age, were often in poor condition. Depending on the materials used to produce an original plan and the way the plan was stored (either rolled or folded), the plan could be in any condition from mint to literally falling apart when handled. Plans that are in very poor condition are difficult or impossible to reproduce, much less read.

Louisville's Olmstedian Legacy is a first step in locating and documenting our local Olmsted legacy. From this important endeavor, a number of future research and policy directions can be identified. An obvious next step in the research process will be a thorough inventory of the plans and documents at the Frederick Law Olmsted National Historic Site in Brookline, Massachusetts, and at the Library of Congress in Washington, D.C.

Expansion of our knowledge of the documents identified in this inventory is another research avenue that should be pursued. In completing the Inventory, the project team met with Arleyn Levee, a

Massachusetts landscape historian and designer. Ms. Levee, a veteran in the Olmsted inventory field, pointed out a number of technical points which were omitted from our inventory form. Information such as the type of paper or fabric of the original plans, the plan delineator(s) and Olmsted plan number (which differs from the project number) are example of such omissions. Some perceptive researchers however, did identify a few of these points on their inventory form and it was included in the document. Although this was not consistent throughout the research, information can easily be added to the data base created under this research effort.

In addition to expanding our knowledge of the already identified plans and documents, future research should concentrate on locating additional plans. Locating plans for private estates is a difficult and time consuming process, but it can be done. In order to get a true picture of what was accomplished by the Olmsted firm, these plans are essential. A subsequent research phase should include time and resources to track down additional plans. Also, repositories that were unable for one reason or another to participate in this phase of the research - such as H.E. Rudy Engineering, the successor firm to Stonestreet and Ford, the local surveyor used by the Olmsteds, should be added in future research.

An important finding of this project was the recognition of the need for immediate conservation and restoration of existing plans and documents. Plans that have been located and identified through this inventory now need to be carefully restored and skillfully reproduced to arrest their deterioration and to reveal their information. It is anticipated that this phase of the research will be an expensive undertaking and will require a high level of technical expertise.

In terms of policy directions suggested by the findings of this inventory, the logical step forward from identification and documentation is evaluation and preservation - two interrelated activities that must be embraced and supported by the local community. This inventory did not attempt to thoroughly analyze or assess the design and condition of individual Olmsted landscapes. A chronological assessment - a study of a landscape's history and its changing form and condition - can offer a more reliable means by which to evaluate the significance of a landscape, as well as indicate changes in use or local climate. Such an undertaking has been started in New England by the Massachusetts Association for Olmsted Parks, but is was not included within the scope of this effort.

The work of the Olmsted firm, as evidenced in Dr. Kramer's essay, embodied principles that have become the core of modern landscape architecture. Louisville's Olmsted-designed landscapes have in many instances withstood the test of time and echoed the cliché that good design is timeless. Without planned preservation, restoration and sound management, our historic landscapes will show the stress of time.

Preservation of Chicago's Parks

William W. Tippens, Architectural Historian

Julia Sniderman, Preservation Planner

John W. Smith, Curator of Special Collections

Barbara Wood, Landscape Designer

Peg Decker, Landscape Designer

Ruth Ann Buckley, Landscape Designer

Bill Latoza, Architectural Designer

Chicago Park District

Chicago, Illinois

In 1986 the Chicago Park District made a discovery of thousands of historic drawings, photographs, books and other significant materials relating to the history of the city's park system. This was particularly exciting because of the system's rich legacy of the work of important designers, including Frederick Law Olmsted, Sr., D. H. Burnham, William LeBaron Jenny, Ossian Simmonds, Edward Bennett, the Olmsted brothers, Jens Jensen and Hugh Garden.

The availability of these materials in conjunction with a growing awareness of the significance of the remaining historic resources brought about the development of a new preservation planning division in the Chicago Park District. Composed of a preservation planner, architectural historian and curator, the division works closely with the architectural and landscape designers. An internal landmarks program has been established and design review is conducted for work in eligible parks. Advocacy and educational programs are being conducted to heighten an internal and public awareness of the Chicago Park District's historic resources. In addition, projects are under way which are specifically geared towards rehab and restoration of historic art, monuments, buildings and landscapes.

A large panel of Park District staff members will present several preservation projects and the multi-disciplinary approach to their solutions.

Historic Plants for Historic Landscapes: Documentation and Sources

Scott G. Kunst
Old House Gardens

Plants are a basic building material of designed landscapes, and modern plants in a historic garden, park, or cemetery are as inappropriate as Formica in a Victorian kitchen. Unfortunately, documenting and then locating authentic plants--be they 1720s tulips or 1920s elms--can be quite a challenge. Names have changed, period descriptions can be ambiguous, modern data is scant, and many plants have been lost to the march of fashion, science, and time.

There is no need, however, to settle for modern or vaguely "old-fashion" plants. This session will help professionals answer the questions: "How do we best determine what specific cultivars are historically appropriate for this site?" and "Where can we get these plants today?" It will outline techniques for investigating surviving plants on-site and near by, avoiding generic or subjective plantings through site-centered research, identifying period-appropriate cultivars with origination lists, and obtaining (and verifying) historic plants from commercial and other sources.

This session will incorporate information from "Historic Seeds and Plants Source List" which the author has developed for the Association for Living History Farms and Agricultural Museums, and "Origination Lists--A Preliminary Search" which the author co-authored with Dr. Arthur O. Tucker and which appeared in the Spring of 1989 in the APT Bulletin.

Plants for Restoring Midwest Historic Landscapes

Anthony Tyznik
The Morton Arboretum

The wonders of nature have always intrigued me. Its beauty, its subtlety, its power, its constant change and overall grandeur have filled many hearts with satisfaction. Words fail to convey the rapture of swaying grasses, the rustling leaves, the sound of rain, the songs of birds, the majesty of a forest, the light-reflecting ripples of a stream and the miracle of growth.

Today we see shrinking environments that impoverish that diversity and charm. The landscape has been wounded and scarred by plow and blade, stripped of diversity, and simplified to respond to a foreign aesthetic of mowed lawns, brutally pruned shrubs and trees regimented to accommodate lawn mowers, cars and trucks. The land lost its unique personality. Native species yielded to plants from other lands. Even the contour of the land is manipulated to suit man's distorted desires. Hills are flattened, wetlands filled and drained, and rivers diked and dammed. Berms, detention basins and pools artificially cover the land like frightening, ghost-like masks.

Natural landscapes that inspire and lift our spirits are slipping into the bleakness of sterile and somber urban landscapes. Soils have hardened and become lifeless through compaction, erosion and herbicides. Earthworms no longer permeate and aerate this domain. Insect and bird populations dwindle to a few survival species. The healthy sounds of wind blowing through the trees is smothered by automobile and other mechanical noise. The beauty of the night sky is washed away with light pollution.

The anxious soul cries for relief from the enslavement to bleak, monotonous and near mono-culture landscapes. There lurks a need to rescue humanity from such calamity. Society is ready but lacks the understanding of what makes a healthy environment.

The whole land is a garden with harmony among all things. The specific systems are beautiful while linked to other systems for support.

We need to examine carefully the uniqueness of each region with its ecological beauty in its contour, climate, plant and animal life. Such examination should encourage us to use plants to enhance deteriorating landscapes, to reduce soil erosion and pollution through the unwise use of fertilizers, herbicides and fossil fuels.

Everyone has the capacity to make a difference in establishing the integrity of our regional landscape. Each can choose and plant a native tree, a wildflower, a grass, and reduce the indiscriminate use of pesticides. Small as this effort may be, it can change attitudes, landscapes and the appreciation of indigenous vegetation.

Diffusion of Nineteenth Century Plant Material

Daryl Watson

Galena/Jo Daviess County Historical Society

The nineteenth century witnessed many developments affecting the selection and use of plant material for lawns and gardens. Not the least of these was the rise of the modern plant nursery and the increasingly significant part they played in the evolution of our cultural landscapes.

Advances in transportation, communication, and the plant sciences permitted the rapid diffusion of new plants for a new nation. As America's middle class grew, so too did their interest in horticultural and gardening matters. A new introduction, properly nurtured in the new magazines and exhibition gardens of the day, could become an overnight sensation. The nurseryman was able to make many of these available to larger segments of the population through reduced prices and increased advertising. No longer were new or improved acquisitions strictly the domain of the wealthy.

One of the earliest examples of this process was the Lombardy Poplar, a tree which became fashionable in Europe--and subsequently in America--by 1800. Easily propagated, transported, and of quick growth, the Lombardy gave permanence and culture to America's cities and towns. It was often the first ornamental tree planted in the new settlements of the Middle West.

The process continued throughout the century as Americans sampled new trees, shrubs and flowers for their grounds. The identification of these plants and the process by which they became popular can do much to aid landscape preservation and education efforts.

The Fragile Balance between Historic Structure and Historic Landscape

Joseph R. Orfant, Senior Planner
Boston Metropolitan District Commission, Planning Office

Boston's 15,000 acre Metropolitan Park System, nearing its Centennial, is largely the design and inspiration of Charles Eliot. The selection of sites, their access and management represent his design principles and the value he placed on natural scenery and his belief in its importance to the late 19th Century city. Early structures, built for the management of sites and the use and convenience of visitors, are the design work of the firm of Stickney and Austin but their design and location fit neatly within Eliot's grand scheme.

Changing fashions in recreation have made some structures redundant and resulted in the introduction of other structures sometimes at odds with the original design scheme. Deferred maintenance, neglect and badly conceived renovations have imperilled original structures, while evolving park management has resulted in continued but inappropriate use of others. The ill consequences of change are often most observed in the relationship between the structure and its setting.

Understanding initial design principles and the effects of changing management is the first step to rescuing historic park structures and their settings. Simple design and managerial solutions that recapture the relationship between the structure and its surroundings will be explored.

Boston Common: The Future of America's Oldest Public Open Space

Ellen J. Lipsey, Preservation Planner
Boston Parks and Recreation Department

For 355 years Boston Common has been a green oasis in an expanding city and a mirror reflecting the broad range of events unfolding in Boston and the nation. The evolution of the Common has included informal pastures and beaten paths, British encampment for eight years, and transformation into a Victorian pleasure ground. Civil War recruiting tents, World War I and World War II Victory Gardens and Liberty Bond buildings have occupied it along with enormous celebrations such as Pope John Paul II's first North American mass.

By the early 1980s repeating up-swings and down-swings in park maintenance seemed to accelerate. Property tax rollbacks and diminished city resources challenged public park stewardship dramatically. Physically neglected, the Common attracted gambling and drug activities, the homeless, and litter. Organizers of summer concerts erected a stockade fence, charged high admissions, and created disturbing sound levels.

Citizen indignation eventually spurred Mayor Flynn into action. In a symbolic gesture he moved his office to the Common for a week in the summer of 1986. Since then, fountains again have flowed, grass and trees have thrived, new signs have been installed. Abusive use is diminished and the concerts are gone.

Ironically in 1989, the success of positive initiatives threatens Boston Common. A new downtown revitalization plan, embracing the park on two sides, proposes \$2 billion in development. Even with safeguards in place, shadows and winds from new buildings and overuse of the Common are feared. Bostonians want assurances that the Common will still be a resource for all, not just window dressing for a few.

With the physical care of the Common under control for the time being, long term protection is being addressed. The Boston Parks and Recreation Department calls this guide to future directions the Boston Common Management Plan. It focuses on:

- Interpretation, to physically access and protect the legacy of Boston Common
- Maintenance
- Administration
- A capital improvement master plan

Major issues have raised questions which the Management Plan must resolve. They include:

- Where does democracy need to be restricted in order to prevent overuse of the Common and infringement on the rights of others?
- What constitutes privatization of public space and how can it be prohibited?
- To what standard of landscape practice should Boston's most used park be maintained?
- What design guidelines apply to an ever-evolving and layered landscape? How should structures be treated?

- How can the ratio of soft-to-hard surfaces be enhanced?

The real success of the Boston Common Management Plan will be measured by how well the vitality of the Common can be assured into the next century and beyond. The ultimate skills of the preservation planner are being challenged: to retain the long-term view, to guide the protection and evolution of a historic but dynamic landscape, and to convey to public and private sectors of the community the vulnerability and venerability of a 45-acre open space in the heart of a city.

Olmsted's Emerald Necklace: Today's Preservation Challenge

Shary Page Berg
Landscape Preservation, Planning and Design

One hundred years ago, the creation of a system of parks and parkways for the City of Boston was heralded as a major accomplishment of design, engineering and political process. The challenges were many, and yet the project was an immediate success, due in large measure to the vision of its creator, Frederick Law Olmsted. The park system has suffered in the intervening century. Some of the problems are caused by the natural aging of a landscape, others are due to changing urban context.

The Massachusetts Olmsted Historic Landscape Preservation Program has been the catalyst for development of new approaches to the preservation of historic parks. It provides a master plan for each park in the program and \$32 million for rehabilitation, \$10 million of which was designated for the Emerald Necklace. This presentation will address some of the preservation issues facing the Necklace today and described approaches to solving specific problems.

Olmsted used vegetation to define and enclose spaces and to shape the character of the Emerald Necklace. Thus, its deterioration seriously impairs the landscape and contributes to a sense of decay. Specific problems are:

- Overmature plantings, including many decayed and diseased trees
- Loss of species diversity
- Loss of understory and shrub plantings, simplification of the landscape into primarily grass and trees
- Large areas of overgrown parkland, perceived as threatening and little used
- Invasive species crowding out desired species

These problems must be addressed through an ongoing, aggressive commitment to vegetation management. A literal planting restoration is neither technically nor financially feasible. Small high visibility areas will be replanted based on the original plan but most of the vegetation work will be accomplished through forestry techniques encouraging species diversity and regeneration; selective clearing of overgrown areas; and multi-faceted attempts to deal with invasive species. A special horticultural crew, developed in cooperation with the local community college, is being trained to accomplish much of this work.

Water plays an important role in each of the parks and is central to the design of the four smaller parks. The problems are numerous:

- Sedimentation of ponds, several of which are filling in rapidly.
- Erosion, contributing to sedimentation and increased siltation.
- Poor water quality, limiting recreational use and causing environmental damage.
- Low rate of flow, high potential for flooding.
- Water edges crumbling and unstable.

Water related issues have been particularly difficult because the solution lie largely outside the jurisdiction and expertise of the parks department. Many of the water related issues must be solved in the context of the city's overall sewage and drainage system. Dredging of selected areas is being explored, but the high levels of toxins in the sediments may make disposal prohibitively expensive. Bank stabilization and replanting will yield substantial benefits, yet these are only stop gap measures if oil spills can't be stopped and water quality improved.

The Emerald Necklace was designed as a linear system of parks and parkways with parallel circulation networks including parkways and adjacent bridle and pedestrian paths. The outline of the system is intact but there are many problems:

- Parkway designed for carriages are now major commuter routes.
- Sections of parkland have been given over to non-park uses, breaking the connection between the parks in several locations.
- Some paths are overused with conflicts between pedestrians, bicyclists and joggers.
- Other paths, largely in overgrown and remote areas, are virtually unused.

Traffic problems are difficult to solve because any solution will impact on an already stressed city circulation system. Summer Sunday closing of selected parkways is being explored. The old bridle path is finding new use as a bike-jog path.

Many of the original structures and facilities have been lost or badly damaged over time. Active recreation facilities have been added and are incompatible with the original design but heavily used.

- Buildings are virtually all boarded up and unused, with serious vandalism problems.
- Bridges nearly all require major repair work.
- Infrastructure, especially drainage systems, is badly deteriorated.

Structural issues are technically better understood and fit more logically into the city budget process than purely landscape restoration. Buildings within the park system which are open for use are an important focus for park activities. Yet, operational funds must be available before additional buildings are restored.

The key to the success of the Emerald Necklace over the next one hundred years is strong and creative management. The master plan is an important first step, but it is only an outline for the future. Many of the problems do not lend themselves to the typical capital improvement process; other problems require a powerful political voice to assure that park concerns are taken into account in the overall development of the city infrastructure. Perhaps the greatest lesson to be learned from Olmsted is a need for advocacy. His vision carried the parks through their first 100 years. The challenge for today is to provide the framework of design, technical and political solutions to guide the parks for the next century.

Olmsted and Richardson: A Renaissance of Interest
in their Massachusetts Collaborative Projects, 1881-1882

Anne Hoover Henderson, ASLA
Landscape Architecture Program, Auburn University

The landscape architecture of Frederick Law Olmsted, Sr., and the architecture of Henry Hobson Richardson represent an extraordinarily successful nineteenth century collaboration between the two giants of their time. Currently, their work is having a national renaissance in recognition of the significance and quality of the legacies of these great designers. In Massachusetts, the State's Olmsted Program has master planned and implemented the first phase of restoration projects of a dozen Olmsted firm projects, 1871-1930s. In 1988, the Program entered its second phase, inviting five landscapes into the Program for preservation planning which were collaborative efforts between Olmsted and Richardson: the Memorial Cairn in North Easton (1882), the Converse Memorial Library Garden, Malden (1882), the grounds of the Crane Memorial Library in Quincy (1881), the grounds of the Robert Treat Paine Estate, Waltham (1883), and the park associated with the Wellesley Farms Train Station, Wellesley (1884). Of these projects, the four in North Easton, Malden, Quincy, and Waltham have been designated as National Historic Landmarks, part of the NHL Program's nationwide thematic nomination of Richardson's work. Because of both the statewide and national attention these projects are receiving, it is appropriate to assess Olmsted's contributions to Richardson's architectural achievements.

This paper will describe and evaluate the original design intent for two of these important Massachusetts collaborations: the Memorial Cairn in North Easton and the grounds of the Crane Library in Quincy. The design concepts as well as Olmsted's ideas for the context of the projects will be presented using slides of historic plans, photographs, planting plans, and other archival materials. The extent to which the original design concepts were implemented will be illustrated and the potential of each landscape for restoration as significant designed landscapes will be assessed.

The Memorial Cairn, North Easton was commissioned by the Oakes Ames family as part of a Public Square and of their vision--shared by Olmsted and Richardson--of the physical form for a village plan in a small industrial community. Richardson designed the buildings of the Square, the Oakes Ames Memorial Hall (1879-1881), the Oliver Ames Free Library (1877-1883), and, the nearby Old Colony Train Station (1881-1884). The massive Public Hall, a memorial to Oakes Ames by his children, is an imposing gift to the community standing on an enormous natural ledge. In front of the Hall is a triangular site which Olmsted envisioned as an extensive cairn or rockwork to commemorate the Civil War dead. In execution, the project fell far short of Olmsted's ideal. The Olmsted firm was called back in 1902 and again in 1947 to prepare plans to implement Olmsted, Sr.'s original intentions, but they were not accepted by the Ames family.

The grounds of the Crane Memorial Library, Quincy, were designed by Olmsted for the 2.3 acre site in 1881. The paths were laid out quite simply, in keeping with the architecture. The Crane Memorial Library, commissioned by Albert Crane in 1880 and dedicated to his father in 1882 (Thomas Crane, 1803-1875) is considered the best of Richardson's five libraries. In 1913, John Charles Olmsted prepared a planting plan for the site, suggesting "attractive simplicity and dignity."

Management of Jens Jensen's Landscape Designs
on Two Ford Estates in Michigan

Robert E. Grese

School of Natural Resources, University of Michigan

From approximately 1914 to the mid 1930s the Ford family commissioned numerous landscape design projects in Michigan by the Chicago landscape architect Jens Jensen. Two of the more elaborate were the estate designs for Henry and Clara Ford in Dearborn and for Edsel and Eleanor Ford in Grosse Pointe Shores. Both properties exemplify the best of Jensen's work and the difficulties of managing his designs over time. This paper examines on-going efforts to develop interpretative, restoration and management programs for both properties to preserve the unique qualities of each site and to effectively communicate the history associated with them.

Jens Jensen's design work often has served as a particular enigma for groundskeepers. Although the formal gardens that he created have been relatively easy for grounds-keepers to understand and maintain, the wilder character at the heart of his work has been much more elusive. On the Ford properties as elsewhere, this lack of understanding has meant that management of the spatial quality, native plant communities, and conscious play with sunlight and shadow have been largely ignored.

The Henry and Clara Ford property (Fair Lane) is now part of the University of Michigan-Dearborn. Despite its status as a national historic landmark and recognition as one of the best of Jensen's works, the landscape has suffered greatly in the past because of neglect, uneven funding, and disregard for its value as a cultural resource. The Edsel and Eleanor Ford property has also suffered changes, but more from a gradual aging and disappearance of plant material.

The management questions posed by these two properties and Jensen's design work in general, are important for those of us working in landscape preservation to consider. The strength of Jensen's design work often centered on subtle qualities of the landscape that change markedly through the seasons and over time. He often intended natural succession and other changes to happen, but could not possibly have foreseen the general degradation and invasion by weedy species that is prevalent today. Effective management calls for a clear understanding of the dynamics of natural succession and the biology of weedy species, an appreciation of the aesthetic framework established by Jensen, and a documentation of the history of the property as associated with the Ford family. The management program explored in this paper suggests an approach for addressing these issues and maintaining the subtle character of these landscape designs over time. While attention is directed to both Ford properties, particular emphasis is given to the program developed for the grounds of the Edsel and Eleanor Ford House.

Interpreting the Spirit of Unrealized Dreams
Marktown Historic District: East Chicago, Indiana
Buttonwood Park: Bedford, Massachusetts

Victor J. Walker, ASLA, Principal
Walker.Kluesing Design Group

These two projects represent an evolution in thought in approaching the challenge presented by historic sites where a formidable disparity exists between the idealized dream and the reality of current condition.

Marktown, a study we completed in 1980s, was our first attempt at resolving this disparity. Marktown was conceived as a model town to house industrial workers for the Mark Manufacturing Company steel mill, part of the then burgeoning steel industry just south of Chicago. Noted architect Howard Van Doren Shaw prepared the plan for this 190-acre community where construction began in 1917. After completion of the 40-acre first phase, development of the town ceased. Adjacent industry gradually expanded into the area envisioned for the remainder of this village, isolating residents and magnifying differences between the immense mills and playful English country style homes.

Buttonwood Park, a master plan we completed in 1988, is a more recent attempt to resolve the contradictions between original intent and reality. The park was conceived as the largest of three major city wide parks by the Olmsted, Olmsted and Eliot firm. In 1895 a preliminary plan was prepared, but it was never formally adopted and few of its principles were followed. Over the ensuing 90 some years, a multitude of interest groups staked claims on various portions of the park.

Historic sites of this type present abundant opportunities for intellectual exploration and creative interjection. Our approach has been to capture the spirit or essence of the original design intent through an understanding of the designer, his or her background, interests and clientele, and general attitudes of the time in which the original design was created. All of this is brought into focus in combination with an understanding of current context and societal needs. Through this approach we have attempted to clarify and utilize historic and contemporary messages to inform and detail landscape improvements. We have sought to create and develop amenities from the particular realities of each site and approach new interventions with historic sensitivity.

in memoriam

Cherie L. Kluesing, Principal
Walker.Kluesing Design Group
Artist, Landscape Architect, Student, Educator
1946-1989

Cherie's devotion to landscape restoration and development spanned a very influential, albeit brief, period for many of us. Even in our practice, she was first of foremost and educator, searching for the best solution. Both students and clients received the substantial benefits of her untiring curiosity. All were graced by her warmth and eloquence. A dear colleague recently said "Cherie influenced my life in ways I am just beginning to understand. She taught me so much about the art of landscape architecture and its deepest connections with humane and spiritual values - she had a way of talking about things with a lucidity unlike any I have experienced."

Although modest in many respects, her overall achievements were substantial. A few of her accomplishments in landscape restoration included: a Management Plan for the Boston Common (America's oldest public open space), Larz Anderson Park in Brookline (the former estate of an American diplomat), McLean Hospital in Belmont (a pre-eminent psychiatric institution created in the 1890s), and Hazelwood Park (a turn of the century estate park adjacent to sea) and Buttonwood Park in New Bedford, Massachusetts as well as a Site Preservation Plan for Marktown Historic District in East Chicago, Indiana, a Historic Preservation Plan for Bishop Hill, Illinois (a nineteenth century Utopian village), and a Planning and Management Guide for Robert Allerton Park (a 5,000-acre turn of the century estate and sculpture garden) in Monticello, Illinois.

We in this community, as well as many others, will miss her vitality and insights in our search for quality in solutions to the opportunities presented to us. My meager words cannot begin to broach the magnitude of her presence.

vw

Garfield Farm: Restoration Techniques
of a Surviving 1840s Farmstead, Inn and Farmscape

Jerome Johnson
Garfield Farm Museum

This exceptionally intact 250-acre northern Illinois 1840s farm and teamster inn is being restored and developed as a living history farm museum. As 1840s buildings, hedgerows, historic archaeological evidence, documentary evidence and remnant prairie and savanna survive, unique challenges face the restoration philosophy and techniques employed to recreate a faithful rendition of a past long since faded from living memory. Slides of the restoration of the 1849 teamster horse barn, the interior structural and spatial restoration of the 1846 brick tavern, the roof restoration and stabilization of the 1842 hay and grain barn, restoration of the roof and floor of the 1890s granary, and construction of an 1847 designed poultry house using Eagle Scout volunteers deal with the built environment. Additional research using historic maps for determining the physical environment highlight the location of prairie, savanna, field arrangements, fencelines, roads, orchards, former building sites, and cemetery. Work has also begun on this landscape restoration with the re-establishment of kitchen and field gardens.

APT conference attendees are encouraged to visit the farm, just 40 miles from downtown. Jerome Johnson has given talks before the Chicago Map Society at the Newberry Library, the Edward G. Ayers Lecture Series of the Field Museum of Natural History, Patterns on the Prairie Lecture Series of the Newberry Library and the West Chicago Historical Museum, the Chicago International Flower Show, Illinois Math and Science Academy, Elgin Academy, numerous historical, preservation, genealogical, environmental, gardening, business and social societies. He is a graduate (B.S. and M.A.) of the College of William and Mary in Virginia. He has been the executive director of Garfield Farm Museum since December of 1981.

Restoration of Mahoney Park: A Case Study

Gunta Cepuritis, AIA
Kenilworth, Illinois

Community involvement and financial support have been instrumental in the restoration of Mahoney Park in Kenilworth, IL. Mahoney Park is the only surviving example of a small park designed by Jens Jensen, noted "Prairie Style" landscape architect. The park was listed in the National Register of Historic Places in 1985. Jens Jensen designed the park in 1933, it was completed in 1934, but fell into disrepair after World War II. In 1983 the combined efforts of the Kenilworth Beautification Committee and the four local garden clubs culminated in a restoration plan that has been implemented.

Replanting Promontory Point

Kevin Uliassi
Chicago Heights, Illinois

The Chicago Park District recently began the restoration of the planting at the 55th Street Promontory. This project is unique because the original landscape architect also participated in the new work.

Early in his life, Alfred Caldwell worked for both Jens Jensen and Frank Lloyd Wright. He served as superintendent of parks at Dubuque, Iowa before coming back to Chicago in 1936. He worked for the Chicago Park District from 1936 to 1938 and, in those two years, laid out more than ten percent of the park land in Chicago. Today he teaches architecture at the Illinois Institute of Technology.

A true restoration must remain faithful to the originator's vision. For various reasons, the original planting could not be duplicated in this project, and Mr. Caldwell's involvement insures that changes are made in the original spirit of the park.

When Mr. Caldwell planned the planting at Promontory Point, the area consisted of a building and paths on about fifty acres of landfill, surrounded on three sides by Lake Michigan. His theme for the park became "Where the Prairie meets the Sea" and, with the exception of the enormous central meadow, the entire promontory was planted with dense groups of trees, shrubs, and wildflowers native to the region. Vistas were carefully controlled so that walking through the park became a series of discoveries.

By 1988, much of the original planting was gone. The low planting had been completely removed in the interest of security and most of the shade trees had died or had been removed.

The first step was to make a survey of the existing trees and shrubs. This was then compared with the original and a new plan made. Many of the original shade trees were elms. For shade trees, Mr. Caldwell decided to use Sugar Maples exclusively in the new plan. He expects the bright autumn color of so many sugar maples to become a spectacular addition to the park.

The rest of the planting consists mostly of Hawthornes and Crabapples, with some Redbud and Juneberry. According to the plan, wildflowers will be planted throughout the park, once shade is established. Also, the original plans called for four large stone council rings which were never built.

The new plan is more open than the original, with no completely sheltered areas. The trees planted are relatively small, and it will be about twenty years before the results of the restoration can be fully appreciated.

Preservation Practice

Susan M. Tindall, CCS
Historic Restoration Services

The dull necessity of project administration seems to pale in comparison to the exhilaration of research, the excitement of drawings, and the thrill of realization. But none of these events can occur if a practice isn't profitable and well run. This track addresses the nuts and bolts of project administration from soliciting bids, to selecting consultants, to preparing contract documents and coordinating with the owner. It uses both case studies and models to develop practical methods of improving professional practice.

Using the Secretary of the Interior's Standards
for Large Restoration/Renovation Projects

Dr. George C. Skarmear
Associates, Project Director
Vitetta Group/Studio Four

The following abstract covers issues under the general topic of Project Coordination and Cooperation, with an emphasis on how the Secretary of the Interior's Standards should be used for large scale restoration and/or renovation projects.

Three major projects have been selected, the last two of which have/are being directed by the author of this paper.

1. The 1977-1979 renovation of the Bellevue-Stratford.
2. The 1986 renovation of the Bellevue.
3. The 1989 renovation of the Reading Terminal Train Shed.

There are several common elements in the scope of work of all three projects:

1. The restoration/renovation work of the historic fabric was of high standards. (The 1979 renovation of the Bellevue-Stratford received several preservation awards.)
2. The construction budget of each project, when adjusted for inflation and estimated in 1989 dollars, exceeds \$50,000,000.
3. All buildings were outstanding examples of their building types, were listed on the National Register, and were focal points of their respective communities. (The Reading Terminal Train Shed is also a National Historic Landmark, as the world's largest nineteenth century span surviving today.)
4. All parties involved in the project had the understanding that the Secretary of the Interior's Standards would be the minimum acceptable standard for the proposed work.

The presentation will draw from the experience gained through the planning phase, design development, construction documentation, resolution of field problems and overall construction management of these projects. The following issues will be presented:

1. Structuring the project team:
Criteria for selecting the team members. Educating the client in the selection process. Strategies for avoiding problems if the team has already been selected. Contractor vs. Construction Manager.
2. Contractual agreements and project responsibilities:
Defining the scope of work for the team members. Inserting the term historic in all contracts. The consultants' responsibility to oversee their respective trades. Loosely defined areas of responsibility and their impact on historic buildings.
3. Historic research:
Using historic data for the development of design ideas. Developing an Historic Areas

Drawing Set. Identification of historic spaces to be protected. Establishing a hierarchy of spaces and/or elements. Use of layering techniques. The preparation of a preliminary restoration agenda.

4. The SHPO/NPS as a team member.
Involving the SHPO/NPS early in the process. Establishing a single source of contact with each agency. The historic preservation review as your best ally for a better preservation process. Establishing an agenda for preservation. Continuous communication solves problems in the field.
5. Developing your design development set:
From historic data to design and development opportunities. "Listening" to the building for design opportunities. Doing less is more. The budget or lack of budget as a preservation aid. Review of design development under the Secretary of the Interior's Standards.
6. Minimizing demolition or loss of historic fabric:
Impact of new design on the historic fabric. Develop preliminary demolition drawings. Dealing with unpredictable factors: asbestos removal and other carcinogenic/toxic substances.
7. Preliminary approval of the project:
Submit both design development and demolition drawings for preliminary approval. Seek approval with clear list of conditions. The list of conditions as a guideline for further design development.
8. From preliminary approval to Construction Documents:
The process of receiving final Part II approval. Using the construction documents in the field. Coping with changes. Let the SHPO/NPS know first about all changes. Seeking approval before the task is executed in the field. The significance of up-to-date correspondence.
9. Punchlisting the project:
The process of punchlisting as a tool of checking restoration quality. When to do it. Advantages of early walk-throughs. Punchlisting as a step towards completing Part III application.

Preservation Technology in Diagram

Kate Burns Ottavino
Ehrenkrantz, Eckstut and Whitelaw

Recently I received a call from an architect in Michigan regarding sandstone restoration and the removal of a coating on the stone. I practice as both an architectural conservator and preservation architect and his first statement to me was "I don't know if I should be calling you or a chemist." What this person's statement made clear to me was that he was unclear about the scope of his restoration problem and the realm of possible solutions. What this person needed and what would be useful for all preservation practitioners is a diagram depicting the modes of preservation technology available, how they are accessed, when and where such technology should be incorporated into their project.

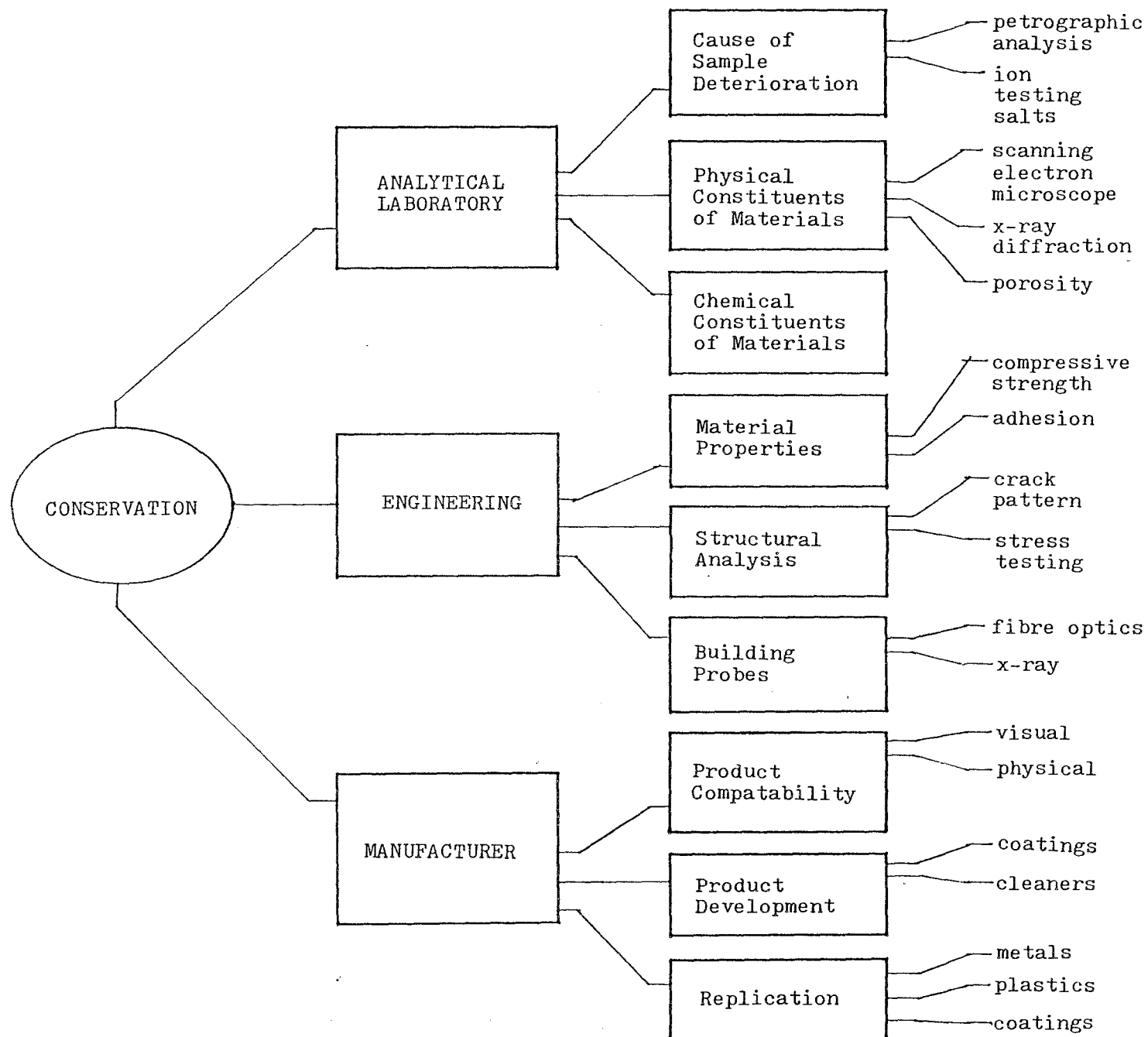
It is the intent of this paper, along with its graphic and photographic elaboration, to provide a diagram(s) which will address the technical practice of preservation today. The multi-disciplinary nature of the preservation profession was initially identified in this country by Dr. James Marston Fitch. Dr. Fitch did this, notably, in the program for historic preservation study at Columbia University which he founded in the late 1960s. In this program a broad range of specialists from state and local authorities to museum curators were brought together in the evolution of a preservation process. The result was a clear categorization of the areas of concentration which produce and shape current preservation practice: history, planning, design and conservation. It is within these areas of concentration that we find a myriad of disciplines that are called upon to address the issues raised by historic preservation. Identification of these disciplines, their individual contribution, interaction with one another and the final restoration product will be graphically depicted. A flow chart of the technical disciplines involved, the issues addressed by each of these disciplines, the information they provide and the synthesis of that information into final design documents, administration, construction and maintenance procedures will be shown.

Elaborated in the diagrams will be those subjects relevant to the four areas of concentration cited above as they relate to technical preservation. For example, in the area of conservation the subject of materials testing and its components would be identified (see sample section of diagram attached). The disciplines associated with the four concentrations will be correlated to their subjects, their subject components, component tasks, and the task information produced will be tracked in a series of diagrams depicting the process by which a coherent preservation project is formulated.

The graphic diagrams produced will be verbally elaborated upon during the presentation with case specific examples illustrated by slides. The examples given will draw upon many of the session topics, i.e., stabilization and repair of a clay and Guastavino tile dome, roofs, gutters and leads, laboratory and field testing methods for design and quality control, stone conservation, terra cotta glazing failure and restoration, specifications, the bidding and contracting process, prequalification of contractors, maintenance manuals, etc.

The intent of developing and presenting these diagrams is for their use by established preservation practitioners to improve their personal practice and the overall practice of preservation by the profession. They should also serve to initiate newcomers to the practice so that they may better

understand what is expected of them, how they fit into the overall preservation picture, the extent of that picture and the resources at their disposal. These diagrams could be used during the conference for discussion, criticism and the identification of areas for future development.



Project Coordination: An Owner's Perspective

Robert C. Schoen, PE
Amoco Properties, Inc.

Mr. Schoen will discuss, from an owner's perspective, coordination of a parapet wall restoration project. The specific project referred to was initiated and completed during the third and fourth quarters of 1987. Building management became aware of deteriorating roof parapet walls on the fourteen story brick and terra cotta structure located in Tulsa, Oklahoma. The decision was made to begin work immediately to prevent further deterioration and correct potential safety hazards. A search was conducted to find the best available consultants and contractors to complete the job in a timely and highly professional manner. Proper restoration of terra cotta was a primary focus of building owners.

The project was completed on time and within budgetary constraints. One of the project craftsmen received local and regional CSI Craftsmanship awards for his outstanding terra cotta restoration efforts. The end results were structurally sound, aesthetically pleasing parapet walls.

Legal Aspects of Negotiating Contracts

Werner Sabo, Esq., AIA, CSI
Law Office of Werner Sabo

A. Consultant Contracts

1. Owner-Architect; Owner-Consultant
2. Architect-Consultant; Consultant-Subconsultant
3. Multiple primes

B. Contractor Contracts

1. Traditional
 - a. bid vs. negotiated
2. Design-Build
 - a. Advantages and disadvantages
 - b. Application to preservation work

C. Coordination of Contracts

1. All contracts must be coordinated
2. Architect/Consultants involved in negotiations

D. Responsibility

1. "Gaps" in responsibility
2. Special problems with multiple consultants
 - a. Who is doing what field supervision
 - b. Responsibility for shop drawings
 - c. Who is doing what testing and inspecting
3. Lines of authority

E. Assignment of Risks

1. Indemnification agreements
2. Loss of tax credits
3. Other risks in rehabilitation

Division One for Preservation Projects

Gary Betts
Hansen, Lind, Meyer

According to the CSI Manual of Practice, Division 1 is the keystone to the organization of the contract documents. Division 1 expands on the broad provisions of the Conditions of the Contract and governs the execution of all sections of the specifications. It includes administrative requirements, procedural requirements, and temporary facilities. This information is essential for any construction project and takes on added importance due to the special requirements of renovation and restoration projects. This session will identify the relationship of Division 1 with the rest of the construction documents, their organization and the coordination required to draft General Requirements that reflect the special requirements of renovation and restoration projects.

Unit Price Contracts for Restoration Work

J. Henry Chambers, FAIA
Chambers & Chambers Architects

A. History and Custom

1. North America has a Lump Sum Bidding tradition which probably works better for new construction than restoration.
2. Many other parts of the world rely on Unit Price Bidding with estimated quantities, which the writer prefers for exterior maintenance and restoration.

B. Exterior Fabric Conservation (2 case studies)

1. A 60-year old, 32-story steel frame high rise required maintenance and restoration due to rust jacking and cladding failure. I will describe the methods of quantity estimation, unit price bidding, close-up survey, condition recording, work order decision forms. Cost control and comparisons.
2. A 75-year old highly decorative copper rainwater system on an English Tudor Reproduction Manor House has been failing for 35 years and has been unsympathetically treated. Contained over 600 feet of gutter, 25 different kinds of parts, many variations of each part and almost 40 gutter/downspout gutter units. I will discuss our experience with the inventory, quantity determination, inspection and unit price sign-off methods.

J. Henry Chambers, FAIA, intended to present this paper at the Association for Preservation Technology 1989 Conference. Mr. Chambers, who was a Director of APT and a respected leader in the field of preservation technology, passed away after a brief illness in August, 1989. This Handbook of Abstracts is respectfully dedicated to him.

Computer-Aided Resource Management:
A Case Study of the Development of a Computer-Aided Resource Management System

John J. Cullinane, AIA
Advisory Council on Historic Preservation

The advent of personal computers and workable CADD programs in the traditional pencil, pen and ink architectural office has been seen as an opportunity for the modernization of many architectural practices, both large and small. This new technology, now within the economic reach of almost every office, is transforming the historically well lit drafting rooms into spaces darkened to accommodate the glow of color monitors. However, in a majority of offices, the new computer technology has only been used as one tool to replace another. The traditional pencil point on paper has been replaced by a cursor on a screen; the old fashion pads for adding dimensions replaced by automatic dimensioning programs; the laborious task of drafting working drawings, replaced by ink plotters. Although these time and labor saving devices have greatly improved the productivity of many offices, and promise to provide vast opportunities to explore design and technical solutions previously inaccessible, the potential for the improvement and expansion of private practice in the field of historic preservation, offered architectural offices through the use of personal computers, has mainly gone untapped. One reason for this may be the assumption on the part of most architects and other design professionals that they do not have the ability to "program" a computer, or the time to learn how to become a programmer.

The Army Resource Management & Support System (ARMSS), which was created by an architect on a Macintosh personal computer for the United States Military Academy, West Point, New York, provides the user with a comprehensive data base on the architectural, archaeological and traditional cultural properties at a facility, institution or within a community or historic district. Through the use of the system's intuitive retrieval capabilities, the user can obtain information on recommended treatment, cost, design and construction standards and guidelines, local and national code restrictions, etc. This provides a user with the information necessary to select the "best" course of action when treating a historic resource, considering the impact on the fabric of the resource, as well as the economic ramifications of the undertaking. The system includes built-in CADD capabilities, allowing a user to develop and test alternative designs and treatment of historic resources, as well as explore the effects of new construction on existing buildings and sites. An integral part of the system is a detailed program for meeting a community's or agency's responsibilities under Federal, local or State preservation law, or agency regulations.

Designed to be used by individuals not versed in computers or computer language, the computer-aided resource management system is menu driven, from its initial directory through each category of information. It is also designed to be expandable and easily adjusted to include new or changed guidelines, modifications to individual resources, or changes to entire districts.

Preservation Construction: A Contractor's Perspective

Robert Segner, Jr.
Department of Construction Science, College of Architecture
Texas A&M University

The preservation contractor comprises one element of a team composed of owner, architect (and/or engineer), and construction contractor. Each party has his/her own project obligations, yet their roles are closely interrelated.

Preservation construction is performed within one of two contracting systems: competitive bid contracting or negotiated contracting. Most preservation projects are performed by competitive bid contracting, with lump sum competitive bid contracts being most commonly used. This method has proven itself over time; is a method which all parties in the construction process are familiar with; is often a requirement by legislation or funding source mandate in preservation construction.

Three important aspects of lump sum competitive bid contracting are contract documents; contractor consulting input; contractor selection. Contract documents are an indispensable component in competitive bid contracting. They form the basis for contract price and constitute the expectations in the work. Contractors prefer contract documents which are complete, detailed, clear, precise, and demanding.

A contractor recommends six components for satisfying these requirements. Use the complete Conditions of the Contract to convey all administrative expectations. Make Drawings and Specifications precise and clear, and the more demanding the better. Avoid phrases such as "replace as needed;" eliminate risk which the contractor sees or perceives in the documents. Accommodate the nature of preservation work by mechanisms such as allowances and unit prices. Know what is available; design and specify within what it is possible to obtain. Do not be a slave to the old; recognize and preserve that which is old and beautiful, but do not become a slave to it.

Owners, architects, and projects benefit when contractor consulting input is obtained during the design phase. Several benefits are cited.

Regarding contractor selection the ideal situation, always sought, is to do business with a contractor who will enter the spirit of the project and of the contract document, not merely comply with contract requirements. Other practical elements to consider: prequalify contractors; beware "change order low bidders;" avoid "broker contractors;" check references.

While it is often assumed that negotiated contracts cannot be utilized on preservation projects, frequent investigation discloses that such is not the case. While competitive bid contracting offers certain advantages, various forms of negotiated contracts offer advantages also. Among these are: mutual trust and openness; expediency of obtaining contractor input; greater flexibility; perhaps lower cost; the concept that a contractor who performs negotiated contracting considers a satisfied client his greatest asset.

Working with the System: Shaping Contract Documents to the Public Bid

Misia Leonard R.A.
New York, New York

The Public Bid system in New York City is not geared towards the sensitive nature of Historic Conservation or Rehabilitation projects. It automatically awards the job to the lowest bidder; it restricts the use of unique (proprietary) materials and methods; it forces the division of the project into separate contracts for each of the four major trades (GC, Electrical, Plumbing and HVAC). Above all it is not kind to unknown conditions. The length of negotiations over a contractor's T&M proposal for additional work can cause delays of many months.

For projects which require unique skills, special procedures, and which often hide many unknowns conditions until construction, this can be disastrous.

During nine years with the New York City Parks, I have learned to use, with success, many ways of building additional controls into the contract documents, which eliminate or diminish the dangers described above. In this paper, I propose to explain in detail several methods which have worked, and to illustrate with actual, built examples. These methods will include:

1. Controls over the choice of Contractors and Subcontractors
2. Controls over substitute materials
3. Controls over coordination of multiple contracts
4. Ways to limit or anticipate unknown conditions

The focal projects I will use as illustration will be two of Vaux' Arches in Prospect Park. Other landmarked structures will be cited.

Qualifying Contractors for Large Historic Preservation Projects:
The Blair House and Ontario County Court House Experiences

John G. Waite and William G. Foulks
Mesick Cohen Waite Architects

For the past dozen years, Mesick Cohen Waite Architects has been developing experience and qualification requirements for contractors and craftsmen on large preservation projects located in urban areas. As the restoration of large historic public buildings has become more prevalent, the need for qualifying contractors and craftsmen has become increasingly more important. With restoration projects, contracts should be awarded on the basis of ability to perform specialized tasks rather than on the basis of lowest bid. Too often the contractor with the poorest public agencies are more comfortable with awarding contracts to the lowest bidder than with evaluating the experience and qualifications of a number of contractors.

In some cases, such as the Federal government, it is possible to prequalify contractors for historic preservation work under a new procurement law. In 1985, our firm established an extensive contractor evaluation procedure for the restoration Blair House, the President's Guest House Complex. It is our understanding that this was the first such procedure established for a major restoration project under the new law and is the basis for all future preservation projects. Using an elaborate evaluation process, contractors with teams of subcontractors were required to demonstrate their experience and qualifications in restoration work. Eventually four contractors were selected and negotiations were held with each for the award of the contract. Construction was completed in 1988.

In New York State by law, it is not possible to prequalify contractors for public work. Anyone is permitted to submit a bid. However, before awarding a contract, the public agency can determine whether a contractor is experienced and qualified. Our firm recently participated in a "landmark" case in New York State Supreme Court which for the first time specifically established that public agencies, both local and state, could qualify contractors for restoration work. Our office had previously used these procedures for courthouses, city halls, and state buildings, but it was not until the Ontario County Court House was bid with a \$5.5 million construction budget that the stakes were high enough that contractors and their state-wide association challenged them in court. As the article indicates, the decision was a complete victory for historic preservation and will affect many other projects in the state.

The slide talk will discuss the basis for establishing the qualifications for the various types of contractors needed for the work and what the requirements should contain in order not be considered arbitrary and capricious. Also the process for actually carrying out the evaluation will be discussed including the establishment of review panels, need for participation of lawyers, etc. Both the Blair House and Ontario County Court House projects will be reviewed in some detail to show how the various classifications of qualified contractors contributed to the completed project and why major damage to historic building fabric may have resulted had these procedures not been established.

Preservation Practice Round Tables

Susan M. Tindall, CCS, Session Chair
Historic Restoration Services

There never seems to be enough time at the end of sessions to ask all the questions that come to mind. Often an alternate point of view is lacking simply because there isn't time for dialogue. In the past this has resulted in frustration or, alternatively, a sojourn to the nearest watering hole to carry on a lively debate to which few attendees end up being privy. The round tables are an attempt to correct this situation.

Each round table is set up with two or three facilitators who will present a specific topic, point of view, or document for discussion. Registrants will have the time to dialogue, thrash out a thorny question or just share ideas. Facilitators will generate a record of these discussions for publication in the Bulletin or Communique. A limited number of seats will be available at each round table but observers are welcome.

Stone Consolidants

James Connolly
Erlin Hime Associates

David Boyer
ProSoCo, Inc.

James Lucas
J.N. Lucas & Associates

Specifications for Stained Glass Restoration

Julie L. Sloan
McKernan Satterlee Associates, Inc.

Rawls C. Melotte
Melotte-Morse Stained Glass Inc.

In most restoration projects, it is assumed that in order to get the job done, specifications are required. However, in stained glass restoration, it is unusual to actually find specifications in use.

As the majority of American stained glass windows reach their centennial and are in increasing need of restoration, the number of projects done without specifications is very troubling. Windows by Tiffany, La Farge, and Frank Lloyd Wright, for example, are "restored" without benefit of thorough specifications. Coupled with most architects' inability to judge the quality of stained glass craftsmanship or the experience of the contractor, this is creating a body of so-called restoration which is done without direction, discarding original material, and actually harming many windows.

There is no need for this to occur. Specifications for stained glass can and should be drawn up as contract documents for any restoration project, no matter how small. The materials and techniques are not mysterious, lost, or unknown. In reality, the craft has changed little since the eleventh century, and has never really been lost. There are no secret processes, but there are state-of-the-art restoration procedures for use on stained glass which will preserve original glass and paint. The majority of stained glass contractors working on some of the largest projects in the country today are not proficient in these techniques. These procedures should be spelled out in specifications.

Specifications are necessary for all parties involved. The benefits to owners and architects are well known. Without specifications, there is in essence no contract. Stained glass windows, as works of art, have a market or replacement value separate from that of the building; this value can be severely compromised by poor restoration, with no recourse to the owner if no contract documents or specifications exist.

Contractors need specifications in order to bid responsibly and competitively. Typically in stained glass restoration projects in which no specifications are provided, each contractor will provide a proposal and bid which is completely different from every other one, making review and comparison of bids difficult. Neither the contractor nor the owner is protected from cost increases due to increased scope of work, because the scope is undefined. Materials used in the restoration cannot be reviewed for appropriateness, longevity, or reversibility.

Mechanical and Electrical Systems Retrofit

Gersil N. Kay
Preservation Techniques

John T. McGuire, Engr.
Consultant

The questions being examined deal with the installation of new or the revision of existing mechanical and/or electrical systems for historic type structures. The obvious intent of these tasks is to maintain and operate the finished building in a safe and reasonable manner and often, add systems to the facility to accommodate comforts of modern living or preservation of the interior. The degree of difficulty of accomplishing these tasks are dependent on the restoration or preservation objectives. We offer the following outline.

- A. A historic type structure where the intent is to preserve and restore the exterior or shell of the facility and materially upgrade the interior for improved or, perhaps, different use.
 - 1. The mechanical and electrical designers have great latitude in spaces to conceal new systems and utilities.
 - 2. In most cases great care must be taken when introducing utilities and air related details into the exterior shell.
- B. The case of historic structures, because of their nature, that require accurate preservation of the entire or at least part of the interior becomes a difficult choice in many cases.
 - 1. The installation of hot water heating systems in a building that had only wood burning stoves and/or fireplaces.
 - 2. The installation of air conditioning in a building that had only steam heating and no access for outdoor air.
 - 3. The installation of electrical devices for the protection of the facility and persons who may be in the building from time to time.

"Workmen and the Holes They Make"
copyright by Gersil N. Kay, 1989

- Creating the team to do the job.
- Making the design professional and craftsmen AWARE.
- Types of instruction for workmen.
- Advance research to prepare construction documents.
- Choice of the qualified low bidder.
- Where to look for existing available space already there.
- How to create additional space sensitive to the architecture.
- Investigative demolition vs. destruction.
- How to make the hole.
- Who should fill it up.
- How to make a neat hole in original fabric.
- How to police hole-making.
- The one source to find practical and complicated information on methods, tools, equipment, materials to do the job from roof to foundation, both inside and out: Preservation Techniques.

Historic Structure Reports

Deborah Slaton
Wiss, Janney, Elstner Associates, Inc.

F. Neale Quenzel
John Milner Associates

The concept of the "historic structure report" (HSR) was begun in 1935 when Charles E. Peterson, FAIA, then Deputy Chief Architect of the National Park Service, prepared a report entitled The Physical History of the Moore House. Since that time the Park Service has continued to undertake HSR's and develop service Standards for this document. W. Morton Brown, III, as Chief, Technical Preservation Services Division, National Park Service, described the HSR in the preface to Fort Johnson, Amsterdam, New York, A Historic Structure Report, 1974-1975:

"The purpose of a Historic Structure Report is to (1) document and analyze the building's initial construction and subsequent alterations through historical, physical and pictorial evidence; (2) document the current state of the building's architectural materials and overall structural stability; (3) select an appropriate historic preservation treatment (protection, stabilization, preservation, rehabilitation, and restoration or reconstruction); (4) establish priorities for project work items; and (5) make an estimate of project costs. When completed, the report becomes the planning document which is the basis for developing the working drawings and specifications...prior to commencement of project work."

Several Federal and State agencies and many private organizations undertake, or contract professionals to undertake, an HSR as part of the scope of services performed for the stewardship of historic properties. Federal agencies include the National Park Service, Department of Defense, and General Services Administration. Each employs differing Guidelines and Standards for HSR's and employs HSR's for different purposes.

ASTM Subcommittee E06.24 has formed a Task Group to develop an ASTM Guideline or Standard for Historic Structure Reports. This document will complement existing and developing ASTM documents. The chairs of the ASTM Task Group will lead the Round Table at the 1989 APT Conference to provide an opportunity for conference attendees to discuss the methodology and applications of Historic Structure Reports and the efforts of the task group.

Reference: Spiers, T.H., Jr., AIA "Historic Structure Reports, An Introduction and Overview", APT Bulletin Vol. XIV, No. 4, 1982, pp. 3-6. Biallas, R.J., AIA "Evolution of the Historic Structure Reports and Historic Structure Preservation Guides of the U.S. National Park Service", APT Bulletin Vol. XIV, No. 4, pp. 7-18.

Plaster by the Pound
or
Performance Specifying for Decorative Plaster

Gary A. Betts, CSI, CCS
Hansen Lind Meyer Inc.

Kevin Lee Sarring
Harry Weese & Associates

Page Ayres Cowley, AIA, RIBA
Beyer, Blinder, Belle

A. Contract Alternatives:

1. Separate contract with Owner.
2. Separate contract assigned to Contractor.
3. Part of General Contract.
4. Negotiated or bid contracts apply to any of the above.

B. Specifying Alternatives for design of new ornamental plaster and replication and repair of existing ornamental plaster.

1. Identifying scope of work is very important.
2. Performance specification: Plaster restoration contractor is responsible for design of decoration.
3. Descriptive specification: Design of decoration and amount is adequately documented so contractor can accurately bid and construct decoration from drawings.
4. Means for determining when the existing plaster is sound and can remain or should be replaced.MECHANICAL/ELECTRICAL HERE....

Heritage Building Code for British Columbia

Robert G. Lemon, MAIBC
Robert Lemon Architecture & Preservation

Jacquie Murfitt, Heritage Planner
City of Vancouver

The Heritage Conservation Branch and the Building Standards Branch of the Province of British Columbia have initiated a report on special code provisions for heritage buildings in the province that will become part of the B.C. Building Code. This firm, working closely with Protection Engineering (fire and life-safety experts) has completed a proposed annotated code that addresses specific articles for all building types that conflict with current building code requirements. Compliance alternatives and the conditions under which they are permitted to achieve an acceptable level of life safety and property protection are described.

Of particular importance is the degree of seismic upgrading for heritage buildings. A method to determine the amount of upgrading related to the value of rehabilitation work on a building and the percentage of compliance with current codes (considering the amount of seismic risk) is outlined. This is an alternative to the common method that bases the upgrading on the assessed value of the building.

The work acknowledges the experience of the Ontario Building Code (Part II: Residential Rehabilitation) and the State Historic Building Code of California.

Comments and suggestions on this material is welcomed and may contribute to the ongoing work that is needed to create a new code for Heritage Buildings in B.C. and other jurisdictions.

Substitute Materials

Sharon C. Park, AIA
Preservation Assistance Division, National Park Service

Dick Jameson
Western Waterproofing Company

Sharon C. Park, AIA, author of the recent National Park Service Preservation Brief #16: The Use of Substitute Materials on Historic Building Exteriors, and Dick Jameson, craftsman/contractor with Western Waterproofing Company of Chicago, will co-moderate the Round Table focusing on the use of substitute materials in historic preservation projects.

The Round Table will cover the state-of-the-art of substitute materials such as GFRC, polymer concrete, cast aluminum, and fiberglass. Specific projects will be featured with a discussion of installation difficulties and critical design details.

Participants are invited to bring questions, insights, and a few slides of pending or completed projects.

Atmospheric Pollution and Historic Preservation

Susan I. Sherwood, Session Chair
Preservation Assistance Division, National Park Service

Martin Weaver
Martin Weaver Preservation Consultant

Air pollution in its several forms can accelerate the decay of historic buildings and monuments. This session deals with the two classes of material most susceptible to pollution effects: carbonate stone and metals.

The papers focus on case studies of pollutant damage observed in buildings and monuments. In addition these observations are placed in the context of a theoretical understanding of weathering mechanisms, specifically the chemical interaction of materials exposed to pollutant species.

Degradation of Monumental Bronzes

John D. Meakin
Department of Mechanical Engineering
University of Delaware

David L. Ames
Center for Historic Architecture and Engineering
University of Delaware

Under the National Acid Precipitation Assessment Program an environmental and metallurgical study has been made of bronze replicas of the Hiker statue. The Hiker was sculpted by Theo Alice Kitson and 50 replicas were cast by the Gorham Foundry, Providence, Rhode Island, between 1906 and 1966. Most of the statues are located in the North East United States and 25 statues have been examined in this study. In an initial phase of the program all the statues were located and detailed photographs taken of 25 Hikers. A subsequent more detailed study was then carried out on 10 statues in the Greater Boston area and the relatively recently erected Hiker in Washington, D.C.

The composition of seven statues cast over a period of 15 years has been determined from bronze shavings, determined to be closely similar and show that the statues were made of ounce metal or leaded red brass, 5% Zn, 5% Sn, 5% Pb and the balance Cu.

The corrosion behavior of the statues has been studied at both the macroscopic and microscopic scale. A corrosion taxonomy was constructed based on color transparencies and mapped using a computer-assisted-design program, AUTOCAD. This technique allows a quantitative estimate to be made of the area of each corrosion category based only on visual appearance.

In situ studies of corrosion damage and making precise measurement on irregular shapes such as the hiker statue are extremely difficult. To study corrosion damage a technique was developed to take molds of selected features on the statue. A vinyl polysiloxane was found to be a satisfactory molding agent and molds were taken from the rifle barrel under the front sight and on the panier. The molds were lightly gold-coated and examined by optical and scanning electron microscopy. It is planned to make depth and area measurements of the corrosion pitting observed on the molds of the rifle barrel. This technique has the potential for quantitatively monitoring the local corrosion at selected sites over a period of years and also characterizing the impact of conservation procedures. To provide information on metal loss, an attempt was made to measure the diameter of the rifle barrel in the region of the front sight and these measurements will be reported.

Scrapings of corrosion products were taken from a number of the Boston statues and X-ray diffraction analysis carried out. The samples were of necessity very small and limited the sensitivity of the analysis.

In a related study, Donald A. Dolske has been monitoring the runoff from selected Brigade Markers in the series of bronze tablets in the Gettysburg National Military Park. The data generated is currently being analyzed and is expected to yield information on the total rate of corrosion as a function of dry and wet precipitation. The significance of these measurement on the estimation of long term bronze

degradation will be discussed.

A review of the literature reveals that the rate of metal loss from unprotected copper based materials, including bronze, due to uniform corrosion in the outdoor environment, covers a relatively narrow range and is of the order of 1-3 $\mu\text{m}/\text{year}$. While this represents a modest loss in material the accompanying aesthetic effects from the associated corrosion products may well be considered to be major, unacceptable and cause for application of conservation techniques. The pitting observed on the Hiker shows localized metal loss that far exceeds that expected from uniform corrosion and presents a potential for degradation that may be far less susceptible to reversal by standard conservation techniques.

This research has been supported by the National Park Service, Cooperative Agreement CA 0424-6-8003. The support and encouragement of Susan I. Sherwood of the National Park Service is gratefully acknowledged.

Deterioration of Limestone and Marble Buildings in Urban Exposures

Elaine S. McGee
U.S. Geological Survey, National Center

Limestone from an 80-year old building in Washington, D.C., marble from a 20-year old building in Albany, New York, and marble from a 150-year-old building in Philadelphia, Pennsylvania, show deterioration related to amount to exposure to rain and to length of time in the urban environment. Amount and type of urban pollutants and stone characteristics also influence deterioration.

Stone that is fully exposed to rainfall shows loss of material. Limestone on skyward surfaces of carved trim on the Washington building are roughened from loss of material. Exposed portions of marble capitals on the Philadelphia building have lost most carved detail, some parts of the capitals are completely gone. Fully exposed antefixes on the Philadelphia building have lost detail and are grooved along areas of noncarbonate inclusions.

Partially exposed stone (e.g., vertical surfaces protected by overhangs) shows minor buildup of alteration crusts and minor loss of material. Marble on the Albany building is slightly yellow from incipient gypsum; noncarbonate inclusions stand slightly above the surrounding calcite because of preferential removal of calcite along the edges of noncarbonate grains. Marble on partially sheltered vertical surfaces of the Philadelphia building has patches of pale-yellow to orange gypsum crusts; original tooling marks are muted by erosion and the crusts. Tooling marks on vertical surfaces of the limestone building in Washington are still distinct; minor gypsum has formed in the valleys of the tooled grooves but is not yet readily visible.

Completely sheltered areas on the limestone building in Washington and on the marble building in Philadelphia are coated by black crusts. Portions of the egg and dart trim and sides of dentils on the limestone building have black crusts of gypsum mixed with dirt and pollutant particles. Protected portions of marble capitals on the Philadelphia building are completely covered by similar black crusts that preserve carved details; however, underneath the crusts, the marble is disintegrated. In places, pieces of the blackened capitals have cracked or spalled off, probably because of the action of freeze-thaw processes on the weakened stone.

Atmospheric pollutants such as sulfur dioxide and nitrogen oxides form acids that roughen, preferentially remove material around inclusions, and dissolve carved details on carbonate stone that is exposed to direct rain. Reactions among atmospheric pollutants, water, and carbonate stone surfaces form crusts that disfigure and eventually lead to catastrophic loss of stone in areas sheltered from rain.

Microclimates and Metallic Corrosion on a Building

J.-J. Hechler, J. Boulanger, D. Noel

Institut de Genie des Materiaux, Conseil National de Recherche du Canada

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The study of the degradation of materials exposed to the atmosphere has nearly always been done using samples located on standard racks (ASTM, ISO, others...) The environment around such samples being very different from the environment around a building, it is nearly impossible to predict the behaviour of materials when used on real buildings from such standard tests. A research program on the degradation of materials on real structures has therefore been undertaken. This paper presents some of the first results.

During seven months at around forty locations on the walls of the Ecole Polytechnique in Montreal, the corrosion rates of copper and mild steel, the time-of-wetness, and the deposition rate of sulfur oxides have been measured. During the same time, on the roof, the same measurements were made on an ASTM rack which was used as a well-characterized reference for the other locations on the building. The time-of-wetness was determined using the Sereda sensors (ASTM G-84) with a specially designed measuring system. The sulfur oxides deposition rates were measured using the sulfation plate technique (absorbing surfaces containing PbO_2).

The corrosion corresponding to a vertical position can be very different from one point to another leading to very different corrosion rates within short distances over the building for a given metallic material. The same conditions on one location lead to very different corrosion behaviour for two different metallic materials: copper corrodes less in autumn than in winter while steel corrodes more. During the period of testing the corrosion rates varied by a factor of 5 for copper and by a factor of 3 for steel over the building.

For the chosen locations, the time-of-wetness changed by more than two orders of magnitude and the dry sulfur deposition by a factor of almost 3. At every location, the corrosion rates, the time-of-wetness and the dry sulfur deposition are lower than the rates measured on the ASTM rack.

Other results on the corrosion of copper and steel and on the time-of-wetness changes with time will also be presented.

Weathering of Crystalline Marble: The Field Museum of Natural History, Chicago

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The surficial dissolution is nearly the same for all pure carbonate rocks, near 5 to 6 $\mu\text{m}/1000\text{mm}$ of rain at a $\text{pH}=4.3$, the average for Chicago rain. The surface reduction on the coarse-grained Georgia marble between the ribs averages 0.84mm in 70 years, recorded on the side exposed to rain. Solution attack starts at the grain boundaries initiating cracking; the cracks propagate along the grain boundaries inward into the stone, generated by internal stresses dilating the stone fabric in often less than 100 years. Acid rain and thermal cracking in the presence of moisture combine with the release of locked-in stresses toward rapid disintegration.

With the help of close-up stereo-photos taken at different heights on the column, the direction of the cracks on the column ribs was plotted into a stereographic projection. Differences of the crack patterns were observed at eye level, mid-height and at the top of the columns, suggesting that 93% of the existing stresses on the columns are caused by the static load of the building, but only 7% by the relief of locked-in stresses.

Corners and thin ledges in the upper elevations of the Field Museum show deep cracking and dilation. Possibilities for the consolidation of the marble will be discussed.