PROJECT TEAM

OWNER
UTP, LLC

ORGANIZATIONAL PARTNERS
Unity Temple Restoration Foundation
Unity Temple Unitarian Universalist Congregation

PROJECT MANAGER
Project Management Advisors, Inc.

ARCHITECT
Harboe Architects

STRUCTURAL ENGINEER
CTL Group

MEP ENGINEER
Architectural Consulting Engineer

GENERAL CONTRACTOR
Berglund Construction

CONCRETE CONTRACTOR
Zera Construction

SHOTCRETE RESTORATION
R.H. Ward & Associates

ADDITIONAL CONSULTANTS

LANDSCAPE ARCHITECT
CYLA Design Associates Inc.

ART GLASS CONSERVATOR
Julie L. Sloan, LLC

MATERIALS CONSERVATOR
Building Conservation Associates, Inc.

LIGHTING CONSULTANT
Charter Sills & Associates

A/V & ACOUSTICAL CONSULTANT
Talaske
UNITY TEMPLE FACTS

ARCHITECT | Frank Lloyd Wright (1867–1959)

LOCATION | Oak Park, Illinois

DESIGNED | 1905

CONSTRUCTED | 1906-08

BUILDER | Paul F.P. Mueller & Co.

HERITAGE DESIGNATIONS
• National Historic Landmark
• State of Illinois Landmark
• Village of Oak Park Landmark
• World Heritage Serial Nomination
  Key Works of Modern Architecture by Frank Lloyd Wright

KEY STAKEHOLDERS
• UTP (Owner)
• Unity Temple Restoration Foundation
• Unity Temple Unitarian Universalist Congregation
• Alphawood Foundation
• Landmarks Illinois (NGO Easement Holder)
• Village of Oak Park
• Frank Lloyd Wright Trust

Construction photo of the Temple (Cement World, 1907)
Scope of the Exterior Restoration

• Restoration / repair of all exterior shotcrete.
• Repair of delaminated concrete roof slab (requiring the following scope items:)
  – Documentation, removal and salvage of all interior wood trim at the ceilings below roof slabs.
  – Documentation and removal of all plaster at the ceilings below roof slabs, to allow for the sounding of structural slabs.
• Replacement of Unity House skylight and restoration to original configuration.
• New skylight installed over existing deglazed skylight framing at the Temple.
• Replacement of 4 skylights over minister’s office to reduce visibility from public way.
• Replacement of all roofing and roof drain systems.
• Removal, restoration and reinstallation of all art glass windows and their associated steel frames.
• Removal and reinstallation of non-original wood windows at South end of Unity House.
• Restoration of existing original wood windows at closets of Unity House.
• Replacement of two non-original exterior doors and frames at Unity House with replica wood doors and frames.
• Restoration of existing wood entry doors at foyer.
• Restoration of site paving and landscaping.
• Replacement of the existing exterior accessibility ramp.
• Installation of nine new geothermal wells in North lawn for new ground source heating and cooling system.
Interior Scope of the Restoration

- Restoration of interior finishes including:
  - Replication of original plaster and paint finishes.
  - Restoration and reinstallation of all wood trim.
  - Stripping and cleaning of all concrete and magnesite floors.
  - Restoration of all wood doors and hardware.

- Renovation of secondary significant interior spaces, including minister’s office, kitchen and basement.

- Removal, restoration and reinstallation of all art glass associated with interior light fixtures.

- Restoration and reinstallation of all light fixtures.

- Supplemental lighting and lighting controls.

- MEP upgrades, including:
  - New heating and cooling systems.
  - Upgrades to plumbing, electrical, fire alarm, emergency lighting and exit signage.

- Removal and replacement of Unity House balcony classroom walls with glass.

- Accessibility accommodation for the main level of the sanctuary in the Temple.
Restoration and Repair of Exterior Façade

BACKGROUND

• The building’s façade of exposed, poured-in-place concrete (used at that time primarily for industrial structures) established Unity Temple as an early experiment, and masterpiece, of modern architecture.

• As a result of new materials and unprecedented design elements, structural problems including problems with Unity Temple’s concrete walls, appeared almost immediately.

• Years of hidden water infiltration caused extensive damage to the concrete structure. Because Wright’s experimental concrete design did not include expansion joints, there was extensive surface cracking.

• By 1973 the original concrete was in poor condition.

• The decision was made to repair the concrete surface by applying a layer of shotcrete – pneumatically applied concrete – known as “Gunite.” The Gunite closely matched the original material.

RESTORATION

• The 1973 application of shotcrete (at the time a radical intervention) likely saved the building.

• Since then, there had been additional deterioration of the concrete resulting in spalls, cracks, and corrosion.

• The current restoration project included repairing, or replacing, the existing shotcrete in damaged areas.
• Cleaning mock-ups were conducted to identify the gentlest means for cleaning the existing shotcrete.

• Soda blasting was identified as the most effective cleaning method that did not etch the existing shotcrete aggregate, allowing the new shotcrete repairs to visually blend with the adjacent existing material.

• Soda blasting is a process in which sodium bicarbonate is applied against a surface using compressed air. It is a very mild form of abrasive blasting, much milder than sandblasting. An early use of soda blasting was in the restoration of the Statue of Liberty in the 1980s.
Shotcrete Restoration

Shotcrete Repairs

- Delaminated (or failing) areas of shotcrete were cut out to a depth of approximately 1-1/2 inches and repaired with new shotcrete that closely matched the existing shotcrete.
- Repaired areas were reinforced with stainless steel mesh and pins to minimize shrinkage and cracking.

Shotcrete Restoration

Crack Repairs

- Cracks in sound areas of shotcrete were repaired with sealant repairs.
- Repair methods were mocked-up with urethane sealant impregnated with sand and aggregate that matched the shotcrete so that the repairs visually blended with the adjacent shotcrete.
- New shotcrete repairs will be inspected 1 year after construction and new shrinkage cracks will be repaired with additional sealant repairs.

Many mix designs were evaluated to identify aggregate, sand and cement that closely matched the appearance of the existing shotcrete.

In-place repairs were mocked-up to refine the repair techniques that provided a close match to the existing shotcrete.

Cracks are routed out for sealant repairs.

The repairs visually blend with the adjacent shotcrete.

Urethane sealant is applied and impregnated with aggregate.
Restoration and Repair of Exterior Façade

1. Original Concrete Columns
2. Sounding Concrete Surfaces
3. Chipping
4. Reinforcing Installation
5. Mockups
6. Sand and Aggregates
7. Shotcrete Application
8. Troweling
9. Crack Repairs
Geothermal Heating and Cooling

BACKGROUND

• Wright’s plans for heating Unity Temple included a forced air system.
• The system never functioned properly.
• Within a year after the building was completed, a radiant heating system was installed, which has been the building’s main source of heat for the past century.
• Cooling the building has depended solely on natural ventilation.
• This lack of climate control during summer weather has caused damage to the concrete structure and interior finishes, as well as discomfort for those inside.
• Rising energy costs have made it very expensive to heat the building.

The entire North lawn was excavated to install 9 new wells for the new ground source heating and cooling system.  

Geothermal piping in the basement of Unity Temple

RESTORATION

• The restoration equipped the building with a state-of-the-art geothermal ground source heat pump. This is an electrically powered system that taps stored energy from the earth, using the earth’s relatively constant temperature to provide heating and cooling.
• For the first time, Unity Temple will be cooled during warm summer months.
• The system is simple to operate and maintain, requiring no exterior equipment or noise.
• It will aid in preventing future structural and surface deterioration, and protect the exterior concrete structure and interior finishes of Unity Temple.
Interior Finishes: Plaster and Paint Restoration

BACKGROUND

- The original textured plaster and surface finishes were designed to have a subtle, luminous appearance, embodying the quality of sacred space.
- Original specifications indicated that the plaster interior was to be composed of a lime cement plaster, with crushed flint or torpedo sand aggregate, and hair fibers, “[g]oat or long cattle hair or Vanilla fibre to be well beaten, soaked and thoroughly mixed into lime paste…”
- The plaster was to receive a “rough finish floated evenly with a soft felt or cork faced trowel.”
- Tests in 1984 and 1987 showed the majority of the painted finishes were washes or lightly applied coatings, appearing ephemeral, revealing the color and texture of the plaster.

RESTORATION

A series of in situ mockups were conducted to determine if the overpainting could be removed and to demonstrate possible new treatments options:

Option 1 Strip overpainting and repaint with authentic paint treatments.

Option 2 Apply new skim coat of authentic plaster with authentic paint treatments.

Option 3 Replicate with overpainting using modern paints only.

Option 2 was the best choice because:

- The stripping of the overpainting was less than 100% successful and the resulting repainting had a very "muddy" appearance.
- Much of the original plaster had been previously patched in many places.
- All of the plaster on the undersides of the roof slabs had to be removed to allow for the proper sounding and repairs of the concrete.
- It allowed for the authentic replication of all of the interior surfaces, which were such an important part of the spatial experience in both Unity Temple and Unity House.
Interior Finishes:
Wood Trim Restoration

- The original finish was a pine resin and linseed oil finish. Due to the tendency of this finish to yellow and darken over time, a rubbed Tung oil finish was used for the restoration.
- The wood in the Temple still retains its original finish and was simply cleaned to remove soiling.
- The wood in Unity House was previously refinished and is lighter than it was originally. It was refinished to match the original finish in the Temple.
- In order to restore the plaster and paint finishes, all of the wood trim was documented, removed, restored and reinstalled as part of the project.

Wood Trim Removal

- Each piece of wood trim was removed and labeled.
- The pulpit as it looked with all wood trim removed and the wall sections labeled.
Art Glass Restoration

BACKGROUND

- The original art glass was made by the Temple Art Glass Company of Chicago, a company that created art glass for other Wright works of this period.
- The original process entailed fusing chromatic material into the molten glass (rather than applying color to the glass by enameling or other modes of painting) which ensured a richer, saturated coloration.
- This technique replicated the method of medieval glassmakers, advocated by William Morris, whose ideas influenced Wright.

The steel frames of the art glass windows were replaced.

All art glass windows were documented, removed, restored and reinstalled.

RESTORATION

- All of the windows in Unity Temple and Unity House that were original were in excellent condition. A priority of the restoration was to preserve the original materials whenever possible.
- Glass was replaced only if it was not possible to salvage the original came, and only when original broken pieces were missing or damaged beyond repair.
- Reglazed panels were created to precisely match the original panels, including the color, design of the matrix, and method of soldering.

All of the art glass elements of the light fixtures were documented, removed, and restored.
New Skylights Over Existing Skylights

- The existing skylight over the Temple was believed to be original or an early replacement.
- It was in poor condition with broken glazing, corroded framing and multiple sources of leakage.
- The existing skylight framing was maintained in place. The glazing was removed and a new skylight with insulated frosted glazing and a thermally-broken aluminum frame was installed over the existing.
- The new skylight peak is approximately 1 foot higher than the existing one resulting in minimal visual change to the building.

The skylight over Unity House had been replaced and raised at least twice.

- The skylight over Unity House had been replaced at least twice and had been changed from being originally concealed to being visible from the street.
- This skylight was replaced with a new one that has insulated frosted glazing and a thermally-broken aluminum frame.
- The new skylight in Unity House was lowered to its original location, restoring its concealed condition.