

LEED® Project Case Study

Texas Governor's Mansion



The restored Governor's Mansion, July 2012

Overview

- Location: Austin, Texas
- Building Type: Residential/Mixed
- Urban setting
- Preservation, Restoration, and New Construction
- Square footage:
 - Mansion: 10,700
 - Accessory spaces and outbuildings: 8,768
- Project Scope:
 - Restoration of fire-damaged main house
 - Addition to main house
 - Adaptive re-use of storage building as office space
 - Renovation of carriage house
 - Construction of two new security structures
 - Renovation of grounds and parking
- Construction dates:
 - Original Mansion built in 1856, with an addition constructed in 1914
 - Restoration and new addition complete, Mansion occupied August 2012
- LEED Rating: Gold
- Austin Green Building Program Rating: *Two Stars*

Introduction

The Texas Governor's Mansion is a unique historic property in the State Capitol Complex in the heart of Austin, Texas. As the oldest continuously occupied state executive residence west of the Mississippi and a registered State and National Archeological and Architectural Landmark, the Mansion is considered to be the most historic home in Texas.

After an arson attack in June 2008 and the subsequent deluge of water from the firefighting effort, this treasure was in danger of ending its long and significant history. Thanks to the support of State elected officials and private citizens, the Mansion was saved and restored to its pre-fire condition, so that it may continue to serve its purpose for many years to come.

Out of the tragedy, the opportunity arose to improve the Mansion to ensure its continued role as the residence of the First Family of Texas into the future. Part of these efforts included incorporation of sustainability as one of the guiding design directives.

Owner & Occupancy

The Governor's Mansion is the home of the First Family of Texas. The Office of the Governor maintains administrative staff on site, and the Texas Department of Public Safety provides security personnel on site. The State Preservation Board provides facilities management services for the Mansion.

Financing Mechanisms

The Texas Governor's Mansion Restoration (the Restoration) was paid for with a \$21.5 million appropriation from the Texas Legislature, and \$3.5 million from the Texas Governor's Mansion Restoration Fund, a non-profit organization founded by First Lady Anita Perry which raised funds from the citizens of Texas, ranging from middle school students to philanthropists, all interested in maintaining the architectural heritage of the state.

Challenges & Opportunities

The program for this project was to provide the highest quality restoration of the Mansion as a functional, safe, historic, and sustainable home, and to do so on time and within budget. The current building code standards were incorporated throughout. Balancing the needs of each of these priorities was a challenge, but often presented mutually-enhancing opportunities. In the end, the discussions that arose from the balance of these needs enhanced the design process and improved the overall result.

For example, the Secretary of the Interior's Standards for the Treatment of Historic Properties defining the preservation of the historic integrity of the building precluded the ability to install insulated double-pane windows and the option of adding any insulation to the monolithic load bearing masonry walls in the historic building. These limitations were balanced with the selection of a highly efficient ground source heat pump system for heating and cooling, and the maximization of insulation where the opportunity provided itself, as it did with the new roof. As a side benefit of these design choices, there is no noisy exterior HVAC equipment, which contributes to the preservation of the grounds in their traditionally natural, quiet condition; the heavily insulated roof insulates the building from sound in this urban environment as well as heat and cold; and the system and added insulation will provide financial returns to the State in energy savings into the future. In this instance, preservation, energy efficiency, comfort, and financial considerations were all addressed with a unified design solution.

Every opportunity was taken for sustainable features, with close examination of appropriateness, feasibility, reliability, and economic payback. The resulting historic Mansion is properly restored to its pre-fire condition and enhanced by the sustainable design features due to an integrated team approach to the Restoration, from the earliest days after the fire.

Preservation and Sustainability

A recurring theme that developed throughout the design process was that the original historic construction of this historic home, which was built at a time when gas-powered transportation, a public water supply, electricity, piped natural gas, and artificial cooling were not available, contributed to the sustainability of the house today. The large, graceful windows in every room continue to provide natural lighting to every space inside the home. The exterior coat of white paint, added in 1914, helped cool the home by reflecting the sun's rays and continues to contribute a cooling effect today. The location of this home adjacent to the Governor's workplace, once a necessity, continues to provide benefits as State officials and staff walk to and from the Mansion for meetings. The home is linked to modern public transportation and conveniences. A history of materials re-use throughout the home's history of renovations and upgrades was evident as hidden spaces were uncovered – nothing usable was thrown away, as a matter of economy. The Project continued this re-use of materials, with an eye towards sustainability in addition to economy. Above all, the Restoration is a testament to the value of retaining existing construction, constantly bringing to mind the edict that "the greenest building is the one already built."

Sustainable Sites



The Governor's Mansion, seen at the lower left corner of the Capitol grounds, shown in the 1930's as the City rose around it.

Strategies:

Site Selection, Development Density, Community Connectivity and Public Transportation:

Due to its site selection and construction so early in the history of Austin, and the wise early decision to locate the Governor's home next to their workplace in the State Capitol, the Mansion was already on a site centrally located--today amongst dense development. The Mansion was built next to the Governor's workplace before cars were available for easy commutes, one example of sustainable design by necessity that continues to provide benefits today. The LEED system recognizes those benefits with points for development density, access to public transportation for employees and guests, and for its easy access to downtown stores, restaurants, and entertainment by foot.

The newly-formed pedestrian area created by converting the section of Colorado Street fronting the Mansion transformed the former vehicle path and parking lanes into an urban amenity. The public can now walk in this area and appreciate the Mansion in

new ways. Bike racks will be provided, a welcome feature for the large population of bicyclists in central Austin.

Maximizing open space with beneficial landscaping:

The Mansion grounds were an integral part of the home from the days of its first construction. The grounds have historically been used for landscape gardens, respite from the summer heat, livestock, vegetable gardens and greenhouses, as well as providing space for entertaining. Today a kitchen garden is still active, providing a source of fresh/local food for the First Family, supported by compost generated in the Mansion's kitchen and diverted from the waste stream by on-site composting. The grounds are still used regularly for entertaining, with events such as the Easter egg hunt and other events hosted by the First Family supporting non-profits and charitable organizations. Some of the benefits of the grounds recognized by LEED are the reduction of stormwater runoff, and the respite and interest provided by having an open, park-like space in the city center.

Mitigating the urban heat island effect

While the Mansion benefits from its central location, the vegetation on the grounds and light colored paving chosen for the site also help mitigate heat buildup found in urban areas, which, along with the white-painted structures and deep shade of the mature oak trees, maintain a relative coolness on the site. In addition to the cooling effect of the grounds, a light-colored, reflective galvanized aluminum was used on the sloped portion of the roof and a white coating was used on the flat portions of the roof.

Energy & Atmosphere



One of 45 wells being drilled on the Mansion grounds, to provide a heat sink and heat source for the home's new HVAC system

Energy Performance is at the heart of most sustainable efforts in the design industry. After analysis of multiple options for heating and cooling the Mansion, an energy efficient ground source heat pump system (GSHP) was selected. 45 wells were drilled on the property and tied into a loop which passes water through the AC units and back into the ground. In the summer, the water deposits heat from the building into the ground. In the winter, the system pulls heat back out to provide heat the house. GSHP technology has advanced beyond its early years, and the design team benefitted from the experience of GSHP consultants that ensured the system was designed to work for many decades into the future. Wells were spaced 20 feet apart to mitigate any potential problems with “well burnout.” To minimize the required number of wells and to deal with Austin’s imbalance between the heating and cooling system, a fluid cooler was added to provide evaporative cooling to the water in the winter, after it has delivered most of its heat to the units in the house. This helps additionally cool the water returning to the ground, to cool the wells down sufficiently throughout the winter so that they are prepared to accept the greater amounts of heat that are returned to the ground each summer.

Every opportunity was taken to maximize insulation in the building envelope of the historic portions of the Project, while maintaining the historic interior and exterior solid brick wall construction and historic windows as required for a registered historic property:

- Removable inserts were added to windows in bedroom spaces to reduce noise and increase the insulating properties of the openings, while not impacting the appearance and function of the existing windows.
- Historically appropriate bronze weatherstripping was added to every door and window to seal the openings from air intrusion while allowing them full functionality.
- UV film was added to window to maximize their heat-rejecting ability
- The home's shutters, once its most efficient cooling mechanism, we re-installed to be fully functional, if desired.
- The basement was sealed and conditioned, and the attic insulated at the roof deck, to keep supply ducts in conditioned space, minimizing energy loss through ducts leakage.

Although preservation requirements precluded the ability to add additional R value to the historic walls, their original function of mitigating heat build-up in the house through the use of thermal mass makes them very effective in their own right. With all HVAC systems shut down throughout all the daylight hours on one 100 degree day in mid-summer, the interior temperatures of the house only rose 6 degrees, from 70 to 76, still very comfortable; this is a testament to the power of thermal mass and benefits of good design before modern mechanical cooling.

All new construction maximized insulation potential, with the modern addition and less historically important outbuildings received upgrades such as spray foam insulation and double-paned windows. This contributes to the energy efficiency of the site as a whole.

A solar hot water collector also contributes to the energy efficiency of the building. It was sized to carry the load of the house on clear, sunny days. A vacuum tube collector was chosen to maximize contribution in the winter as well as the summer.

Commissioning was part of the project delivery process. The complexity of the design with the constrained spaces of an historic structure made design and construction of systems uniquely challenging, and commissioning was fundamental to the success of timely completion of the Project under these circumstances.

Water Efficiency

The home originally contained no running water; rainwater was collected from the roof in cisterns for daily use. Today, the house has been piped to allow for future rainwater collection for use on the grounds, and drought-tolerant plantings were used in the landscaping where possible. Deep mulching and efficient irrigation in planting beds reduces water use over conventional methods. Water-efficient fixtures were used

throughout the house, and historic fixtures were fitted with flow regulators to adjust them to modern water flow limits.

Materials & Resources



Worker cleaning salvaged bricks for re-use in the Mansion

The Restoration itself was a testament to the environmental benefits of historic preservation, in the re-use of as much existing material as possible. The saying “the greenest building is the one already built” is well displayed here. All the energy it took dig, form, and fire the bricks, to cut and mill the wood, and deliver it all to the site 156 years ago is still valued today as these materials were carefully preserved.

The philosophies of “reduce, reuse, and recycle” were integrated into the design and construction process of the Restoration.

Reduce

In addition to the reduction of water and energy use, the Restoration in itself reduced the amount of materials required to re-build the home of the Governor. While there was some discussion that the Mansion could be razed and a new home built on the site or

elsewhere, that approach was never considered. The decision was made to not only save the heritage of the State embodied in the Mansion, but also the embodied energy in its historic construction. The restoration of the existing structure as opposed to demolition and construction of a new Governor's Mansion limited the need for new construction materials and the energy required to produce them.

After the fire, a massive salvage effort led by the Texas Historical Commission ensured that every usable piece of material could be put back into place. This includes the original window weights, which not only saved dollars and energy in the re-production of the solid metal pieces, but were also properly weighted for their particular window so the windows could function. Many salvaged pieces of the building's historic entablature were de-nailed, cleaned, and re-used in the reconstructed entablature. (The historic elements of the entablature were moved to the iconic east façade, so that the primary view of the Mansion contained largely original material.) All these efforts not only exhibited good preservation, but also reduced the need to re-create these items from new material.



Original window weights awaiting re-placement with their respective windows



Salvaged wood being installed on the east entablature, along with wood milled from re-claimed beams, for pieces lost in the fire.

Re-use

Surveys of previously-hidden areas in the Mansion unveiled many examples of materials re-use throughout the Mansion's history of renovations.



Former adjustable kitchen shelf brackets re-purposed as furring



Old door jamb used as framing around an AC floor register



Old floor boards re-purposed as wall framing



Old door trim re-purposed as formwork for basement walls

Re-purposing of older material continued into the Restoration. Beams from a demolished warehouse were reclaimed and milled for new flooring, replacing the damaged wood floor placed in the 80's that has itself been retained for re-sale or re-use. This reclaimed wood was used for all other historic wood repairs and reconstruction, such as the entablature, patching of the columns, and the historic front entry. Doors to passages that were being replaced for code accessibility were re-used as closet doors. Even some of the wood from trees that were removed due to fire damage and drought stress were saved to be repurposed, currently being milled into decorative items to be sold in the Capitol Giftshop to raise funds for continued preservation of the Mansion. What once was typically done as a matter of good economy has been done today in the interest of good preservation and reducing the wasted energy required to throw away old items, and to procure new.

Recycle

Recycling was a priority in the design and construction as well as the operation of the Mansion. Materials were specified that allowed for a high quantity—more than 25% by value—of the materials to be made of recycled material.

In the process of construction, more than 80% of construction waste to date has been recycled, saving valuable landfill space and putting the material back into use in another form.

Operationally, the household has integrated recycling into their daily operations, including diverting organic waste to on-site recycling in the form of composting, which

provides nutrient-rich soil to the kitchen garden, where vegetables are grown for household use.

Regional materials

Just as in 1854-1856 when the Bastrop pine used in the Mansion was sourced as closely as possible and the bricks were made of mud from the nearby Colorado River, this project minimized transportation costs and environmental impact by sourcing materials as many materials as possible within a 500 mile radius. Before, this was done out of necessity; today it is done out of good stewardship.

Certified wood

As noted above, historic wood repairs and reconstruction requiring first-growth quality was sourced from wood reclaimed from demolition of older structures. In the interest of preserving the world's forests, such as the nearby Lost Pines of Bastrop which contributed the strong and enduring wood that built the Mansion, wood certified as coming from sustainably managed forests was used for all other wood needs in the Restoration.

Indoor Environmental Quality

The historic materials used in the Restoration used historic methods and natural materials such as brick, gypsum plaster, bronze weatherstripping, and solid wood windows and doors that did not contain VOC's. The same materials were used in the historic areas of the Restoration, preventing the off-gassing seen in some modern building materials that can foul the indoor air for years after construction. Modern millwork containing manufactured wood products such as kitchen cabinets were specified without urea-formaldehyde. As for finishes, extremely low VOC paint was used for all interior finishes. Wool carpet was chosen for its longevity and value, and as a side benefit, doesn't have VOC's. As a result, this historic home was not delivered with a "new house smell."



Artisan repairing plaster cornice

A healthy building is a pleasant building, and the Project earned points for original Mansion architect Abner Cook's design which included many tall windows for daylighting and views for every space in the Mansion. It was done originally to maximize natural lighting and ventilation before the era of electricity and air conditioning. Today, the residents continue to benefit from the beautiful views and natural light. In addition to light and views, each of the Mansion's historic windows--many of which had been painted closed--were restored with functioning weatherstripping and their original weights, so that they could be opened freely to allow fresh air into the building in good weather.

Modern additions to the building allow for user control to maximize comfort. Lighting design includes dimmers and lamps to provide a full range of control of lighting for occupants, to allow them to conserve electricity. HVAC systems have 14 zones across the house, so that only the occupied rooms need to be heated and cooled for comfort.



Natural light fills the 1914 Family Dining Room. Lamps provide localized controllability of lighting to minimize electricity use at night.

Summary

The Restoration Project embraced the concept of sustainability with the practical application of the best technologies available to restore this historic, comfortable, safe home to ensure it will be used for generations to come – itself an exercise in sustainability: sustaining the environment, sustaining minimal operational costs, and sustaining the state's heritage. Some categories, such as re-use of materials, are expected to be awarded points for exceeding the thresholds LEED has already designated as exemplary. Texas' highly visible, most historic and beloved home, will stand as a testament to wise application of resources and the values that Texas was built on: strength, wisdom, and progress within a framework of tradition.