

# Mid-Century Frank Lloyd Wright: Preserving the Price Tower and Gordon House Interiors

*Pamela Kirschner, Conservator, Fine Art Conservation, Waterford, New York*

## ABSTRACT

Funding provided by grants through the National Trust for Historic Preservation's Cynthia Woods Mitchell Fund for Historic Interiors has allowed in-depth study of the interior finishes, color scheme, fabrics and furniture of the Frank Lloyd Wright-designed Price Tower and Gordon House.

Price Tower opened in 1956, the same year that Frank Lloyd Wright signed the designs of Gordon House, and the sites incorporate similar materials and design. This study includes the information gathered as well as preservation issues and conservation treatment methods determined to preserve the original interiors. Price Tower was built in 1956 in Bartlesville, Oklahoma for H. C. Price, an oil pipeline manufacturer. It is a nineteen-story skyscraper and was originally designed as offices and apartments. It now includes a hotel and restaurant and holds the offices of the Price Tower Arts Center along with period rooms and exhibition space.

Gordon House, although designed by Wright in 1956, was not built until 1964 and is one of the few remaining concrete block Usonian houses. It was originally built on the south bank of the Willamette River on a farm near Portland, Oregon for the Gordons and was moved to Silverton, Oregon in 2001. It is now open to the public. Wright designed both freestanding and built-in furniture for each site and also suggested colors and fabrics.

Written documentation and original photographs found in the Price Tower, Gordon House and the Frank Lloyd Wright Archives at Taliesin West have been used to determine the colors, materials and furniture original to the buildings. Physical evidence has also provided information about construction, finishes and show cover fabrics. Scientific analysis was performed on finish samples from the interior wood paneling and furniture to determine the original coating materials. The results of this analysis have been compared to historic methods and materials from the period along with the physical evidence. This information was then used to determine appropriate conservation treatment methods and will be discussed.

The technical and historical information provided in this study is helpful for conservators, historians and curators to better understand the materials and construction used in Frank Lloyd Wright designs during this time period. It also promotes the proper care and conservation treatment of these objects while preserving original finishes and the historic intent of the sites.



Figure 1. Price Tower in Bartlesville, Oklahoma.

## Introduction

This study compares the materials and construction of interiors and furniture found at Frank Lloyd Wright's 1956 Price Tower (fig. 1) and the 1964 Gordon House (fig. 2) residence. The Price Tower Arts Center collection includes over 100 pieces of original built-in and free standing furniture as well as built-in wall paneling in Philippine mahogany. In 2003, Price Tower Arts Center began plans to restore Harold C. Price, Sr.'s office and his secretary's office on the 19th floor, the Price apartment on the 17th and 18th floors, the conference room, one general office space on the fifth floor, the lobby, and the waiting area off the lobby. Gordon House retains most of the original western red cedar wall paneling, shelves and built-in furniture with clear finishes. In addition,

the Gordon House collection includes four free-standing pieces of furniture. The Gordon House plans to preserve the interior finishes. Although the house was not built until 1964, it appears that many of the materials suggested in the original specifications were used. Other items in the collection related to the furniture include upholstered cushions found on the built-in sofa along with metal hardware.

Information is included that assisted with the completion of treatment along with preservation of the Price Tower's historic interior. It will assist with treatment of the Gordon House interior. Information is provided about the furniture, wall paneling, clear finishes and upholstery and was obtained from oral histories, correspondence, historic references, specifications and photographs as well as physical and scientific evidence regarding the materials.

## Background Information

### Price Tower

The concept of the design used for the Price Tower was first developed in 1928. Frank Lloyd Wright's friend William Norman Guthrie, rector of Saint Mark's Church-in-the-Bowery in New York, asked him to design an apartment complex adjacent to the church. The complex was never built likely due to the Depression and its resulting impact upon construction costs and real estate values. When Harold C. Price requested a design from Wright in 1952 for an office building in Bartlesville, Oklahoma, Wright found his opportunity to adapt his 1928 design. Although Price had originally envisioned a three-story building low to the ground, Wright convinced him to build a nineteen-story skyscraper. This would include rental apartments and shops as well as offices.<sup>1</sup>

The nineteen-story tower rises 186 feet, with a television antenna (originally used only for lighting effect) extending another 35 feet. The design of the tower and its furnishings is based on a diamond parallelogram modular of four 30° and 60° triangles. All floors and walls project from four in-



Figure 2. Gordon House in Silverton, Oregon.

terior vertical shafts of reinforced concrete, allowing for cantilevered floors and dramatic expanses of glass windows. The interior is 42,000 square feet. On the exterior of the building, copper panels and louvers are attached. Vertical louvers are used on the exterior of the apartment quadrant and horizontal louvers on the exterior of the three office quadrants. These copper panels and louvers were originally sprayed to form copper salts, as specified by Frank Lloyd Wright, causing the copper to turn various shades of green. In the February 1956 *Architectural Forum*, this result is described as “pre-oxidized” chemically. In an interview with Haskell Culwell, the contractor<sup>2</sup> for the Price Tower, he mentions that they used acid and water. Depending on the weather, the differing humidity levels would cause different effects.

Price asked Wright to design furnishings for the interior along with suggestions for fabrics and colors. Wright designed all the built-in furniture at the Price Tower as well as some freestanding pieces for the offices, apartments, and the employee commissary. Materials used in the interior included copper, brass and aluminum furniture and trim along with Philippine ribbon mahogany wall paneling and furniture. Wright also designed and painted the “Blue Moon” mural for the company’s corporate apartment and assisted with the design

of a glass abstract mural in Price’s office, executed by his secretary and one of his chief apprentices, Gene Masselink. The Price Tower was officially opened in 1956. In the mid 1960s, several of the apartments were converted into offices. Drawings of these designs by Taliesin Fellow William Wesley Peters are in Price Tower Arts Center archives and are dated 1960.

The Price Tower was placed on the National Register for Historic Places in 1974, and was recently designated a National Historic Landmark. In 1981, the H.C. Price Company relocated to Dallas, Texas and the Phillips Petroleum Company purchased the Price Tower, retaining ownership until it was donated to Price Tower Arts Center in 2001. Price Tower Arts Center was founded in 1985 as a non-profit organization, and continues the philosophy of Frank Lloyd Wright in its approach to representing art, architecture, and design as cohesive areas of study. Phillips Petroleum Company painted the walls, floors and exterior of the building in 2000–2001. Several offices and apartment spaces were converted in 2002–2003 into a 21-room hotel with a restaurant and lounge. This was designed by Wendy Evans Joseph Architects of New York City, using similar materials to Wright’s but in a contemporary aesthetic.<sup>3</sup>

## Gordon House

In 1956, Evelyn and Conrad Gordon took a vacation in Arizona. They went to Taliesin West for a tour and made plans with Frank Lloyd Wright to have a house designed for them on their 550-acre farm on the Willamette River across from Wilsonville, Oregon. The Gordon House design is similar to a T-shaped plan Wright created in 1938 after he was approached by *Life* magazine to be one of eight architects to propose house designs for “typical American families.” The Schwartz house was built from the early design in 1939 using a seven-foot square module also found in the Gordon House. Evelyn Gordon was a weaver and she specifically requested a space for a loom in the house.

Presentation drawings for the Gordon House were signed by Wright in 1956. The house has two stories and is approximately 2100 square feet. It is made of wood and concrete block with a wood and asphalt composition roof. The master bedroom is on the main floor along with a den, kitchen and a 1 1/2-story “great room” living and dining area. The main floor also has a laundry area and a kitchen with a two-story tower with skylight. Water and heating systems are in a small basement under the kitchen. The two upstairs bedrooms each have cantilevered balconies. The bedrooms share a bathroom and are connected by a long hallway with built-in storage cabinets.

There are narrow windows with plywood fretwork in the living area and on the second floor. Concrete block was the basic building material. The vertical joints were “struck flush” and horizontal joints raked 3/8” deep to emphasize the horizontal line. The masonry was painted a soft rose/tan color to complement the red floor and the brown and red hues of the cedar. Local western red cedar was used for the soffits, balconies and window sashes. Western red cedar was also used for doors, trim, cabinets, furniture, and the stepped board construction of balcony walls. Built-in seating, cabinets and shelves were designed by Wright for the house.

Construction of the house started in 1963 and was completed in 1964. *The Oregonian* ran a two-page article on the house and the Gordons graciously opened their home for five days. At this time, 1500 people and 300 students visited the open house. Conrad Gordon died in 1979 and Evelyn lived there until her death in 1997. It is now on the National Register of Historic Places.

When Evelyn died, her son put the house on the market. The new owners planned to demolish the house. The Frank Lloyd Wright Building Conservancy heard of this and took on the challenge of saving the house. The new owners agreed to donate the house with a time limit for removal. The Oregon Garden Foundation in Silverton, a non-profit organization started in 1997, was selected as the winning bidder for the house. It provided an opportunity to display the house with the same exact solar orientation in an oak grove and a view of the garden. The interior furniture, windows, woodwork and cabinets were all carefully removed, documented, wrapped and transported to the garden. New masonry was erected for the first-floor piers. The three roof sections and the wooden second story were all transported whole. The radiant heat system designed by Wright was reinstalled with upgraded piping. The red concrete floor was reconstructed to match the seven-foot module. Seismic reinforcement was added to meet current code and does not interfere with the original design. When the upper portion was lowered, it was one sixteenth of an inch true to line. The Gordon House Conservancy is committed to raising funds to complete the restoration of the house and preserve all the doors, exterior woodwork, balcony and interior finishes, along with landscaping and visitor amenities.

## Drawings

There are numerous Price Tower and Gordon House interior layout and furniture drawings in the Frank Lloyd Wright Foundation Archives collection. As well, there are white prints in the Gordon House collection. These are copies of the original drawings by Frank Lloyd Wright. They include

the interior layout and side elevations of built-in furniture. These drawings assist with determining how the furniture was constructed and what pieces were originally designed for the sites.

## Frank Lloyd Wright Furniture

### Construction and Materials History

#### Wooden Furniture

##### Construction

The wooden built-in and free standing furniture at the Price Tower is made of solid and veneered Philippine ribbon mahogany. Most desks and table tops appear to be made of plywood. This allows better stabilization to prevent warping and allows a decorative veneer to be used as a top surface. The wall paneling and furniture at both the Price Tower and Gordon House have decorative veneer that appears to have been cut with a rotary lathe. In the process of using a rotary lathe, logs were usually steamed or soaked to make the wood easy to cut, then rotated against a cutting knife. This produced pliable veneers free from brittleness.<sup>4</sup> The wood figure forms even straight lines and iridescent ribbon figure in some areas. Pine was also found in some drawer interiors and on the end of desks designed to be against walls and not viewed. In the 1991 interview with Price Tower contractor Haskell Culwell, he states that they built the furniture in place along with the wall paneling in mahogany based on Wright's designs.<sup>5</sup> In an interview that same year with a former employee, Bill Creel, he mentions that Bill Novak, a carpenter on the Price Tower project, was capable of building anything.<sup>6</sup> Shutters were suggested for the upper balcony of the apartments. Wright agreed to this and they were built in place, also in Philippine mahogany.

Wright also designed freestanding furniture in 1955 that was manufactured by Heritage-Henredon. This included chairs, end tables, coffee tables, dressers, beds, ottomans and chests. Two upholstered armchairs, one in Price Tower Arts Center collection and one owned by former daughter-in-law Carolyn Price, are part of the Heritage-

Henredon collection. They have wooden legs with a carved geometric decorative trim known colloquially as the "Taliesin tooth."<sup>7</sup> These two chairs are on display in the recently restored interior of the Price Company corporate apartment at Price Tower Arts Center.

Although the Gordon House specifications originally suggested using Philippine mahogany, western red cedar was used. The treads for the stairs are oak for durability. Western red cedar is a soft wood and dents easily. The specifications suggested ¾" Douglas fir plywood for non-exposed areas; all finish woodwork including sash frames, casings, fascias were "clear western red cedar veneer, and finish veneer on plywood of western red cedar ribbon sliced faces."<sup>8</sup>

##### Wood Coatings

The wood used for the wall paneling, shelves, built-in and free standing furniture at both sites was finished with a satin clear coating. Clear coatings were applied to the wood to develop the full decorative values of color, luster, and grain structure. As well, they provided a film of protection to prolong the useful life of the finished wood product. Joe Price and Carolyn Price stated that the finish at the Price Tower was a clear satin finish without any stain.<sup>9</sup> In a discussion with Carolyn Price she remembers "Satinlac," likely a lacquer, was used at Hillside, the home Wright designed for her and Harold Price, Jr. during the same time Price Tower was being built.<sup>10</sup> A lacquer refers to a finish that dries through solvent evaporation.<sup>11</sup> Lacquers used from 1927 through the 1950s often contained cellulose nitrate as one of the components. Further research was conducted to determine what finishes would have been used during the 1950s.

Cellulose nitrate was made from pure cellulose in the form of cotton linters or wood pulp treated with nitric acid and sulfuric acid. By itself, cellulose-nitrate has poor durability, poor gloss and poor adhesion. Resins, plasticizers and softeners were added to correct these problems. The resins, such as shellac and dammar, improved gloss and

adhesion while reducing the number of coats required. Oils such as linseed and castor were added as plasticizers and lubricants. Plasticizers add flexibility, elongation and tensile strength and aid in solvent release by keeping the film “open” to allow proper volatilization of the solvents.<sup>12</sup>

Natural products were not as easily available during and after World War II, and the coatings industry started experimenting with more synthetics as a less expensive substitute for natural resins such as shellac. These include thermoplastic resins used in lacquers. Acrylic resins, copolymers of the esters of acrylic and methacrylic acids, were in common use. These resins have excellent resistance to discoloration from aging; they are water white and have excellent chemical resistance. Methyl methacrylate, more expensive and more durable, was often used in exterior coatings. A reference for methacrylate<sup>13</sup> was found to be in use as early as 1941. Oils were also substituted for other types of plasticizers including solvent, chemical and polymeric types.<sup>14</sup> Application by spray became the most practical application because brushing caused tacking up on the bristles, ropiness and poor flow. A two-component system, polyurethane coatings were not widely used in 1956 and there were hazards associated with handling the isocyanate component.<sup>15</sup>

The clear finish found in the Price office has faded and cracked, with lifting in some areas. It appears that there have been attempts at consolidation and some areas have been refinished. Ultraviolet light is the leading cause of degradation for modern plastic materials.<sup>16</sup> Thermal degradation will occur from exposure to visible and long-wave ultraviolet light causing nitrate groups to break off.<sup>17</sup> Photochemical absorption of UV light reduces the viscosity and length of the molecules causing yellowing, embrittlement and softening. Humidity changes can also cause degradation. The cellulose nitrate absorbs moisture readily, causing hydrolysis. The finish shrinks and cracks and is unable to expand and contract as the wood changes dimensionally in response to fluctuations in relative humidity.<sup>18</sup> In the office, the finish and the wood itself have

bleached due to light exposure. Low humidity, low temperature and continual air exchange as well as UV filters are recommended to preserve cellulose nitrate finishes and natural colorants in wood. Other areas of the interior, as well as freestanding furniture, appear darker. This may be due to refinishing or from the oils used as plasticizers in the finish that can darken with age and exposure to humidity changes. In the dark, cellulose nitrate can decompose releasing acidic nitrogen dioxide. This accelerates as acidic products accumulate and aids in further hydrolysis of nitrate as well as the cellulose chains themselves.<sup>19</sup> Desks from Price Tower that were kept in a barn at Starview Farm, the property where Carolyn and Harold Price Jr.'s home was located as well as residences for the Price Srs.' and their son Joe, had been exposed to extreme environmental changes. They are quite dark, but they appear to have their original finish.

The western red cedar used for the wall paneling, shelves, built-in and free-standing furniture at the Gordon House is finished with a satin clear coating. Documentation of the exact materials used for coatings are included in the specifications for the house. This includes “Satinlac” for most of the interior surfaces and “Bar-Top” and spar varnish for the shower areas in the bathrooms. Paste wax was applied over all clear finishes.

The following are excerpts taken from the Gordon House specifications:

#3 All interior wood surfaces shall be filled with clear paste filler and stain two coats of “Satin-Lac” as mfd. by Breinig Bros. rub with steel wool after each coat follow by one coat of good quality paste wax (Johnson's or equal) and buff to finish.

#4 wood surfaces in bathrooms treated with approved clear filler given two coats approved 100% Bakelite “Bar-Top” varnish plus one coat flat (dull gloss) spar varnish waxed with approved waterproof, non-whitening paste wax and buffed to a dull gloss.



Figure 3. Price Tower secretary's office, 19th floor, before treatment.

The flaking, powdery finish found in areas in the Gordon house is typical of the degradation of cellulose nitrate.<sup>20</sup> The finish and the wood itself have bleached in areas due to light exposure as well.

### Scientific Analysis Price Tower Samples

Samples were removed from various locations in the Price office and the secretary's workstation on the 19th floor. Fourier Transform Infrared Spectroscopy was conducted by Conservation Scientist Kate Duffy at the Williamstown Art Conserva-

tion Center.<sup>21</sup> A variety of samples were taken from areas that appear to be original as well as areas that appear to be refinished.

Three samples taken are described below:

1. A sample was removed from the desk in the secretary's workstation on the 19th floor (fig. 3). This was identified as a urethane alkyd. This was an area that did not appear to be original. Dark scratches are evident under the clear finish and as stated above, polyurethane was not used widely as a coating in 1956.

2. A sample was removed from the seat of the sofa under the cushion in H. C. Price's office. This finish was more intact. This coating was identified as a synthetic resin and found to be a mixture of oil and a vinyl toluene/butadiene copolymer. Pliolite thermoplastic resin is a trademark name for a similar type of copolymer.

3. A sample was removed from the top of the door of the corner cabinet under the glass mural. This appears to be an area of original finish. The materials were identified as cellulose nitrate, an acrylic (similar to ethyl acrylate) and a wax.



Figure 4. Gordon House filing cabinet showing worn area where finish sample was taken.

### Gordon House Samples

Four samples were removed in 2005 from various locations in the office, the kitchen and from free-standing furniture. Fourier Transform Infrared Spectroscopy was conducted at the Williamstown Art Conservation Center.<sup>22</sup> A variety of samples were taken from areas that appear to be original. The Gordon House appears to retain the original finish on most of the surfaces with the exception of some panels replaced due to moisture damage.

1. A finish sample was removed from the filing cabinet (fig. 4). The results of the analysis reveal the presence of cellulose nitrate modified with an acrylic.
2. A finish sample was removed from the office door. The results are similar to the filing cabinet; cellulose nitrate and acrylic.
3. A finish sample was removed from the office shelves. The results also include cellulose nitrate and acrylic along with the presence of a wax.
4. A finish sample was removed from the refrigerator paneling. The results from this sample include cellulose nitrate and acrylic along with wax as found in the other samples.

### Conclusion of finish analysis

The top of the door of the corner cabinet in the Price office appears to retain original finish from 1956. This area has a very thin matte clear finish. This sample was found to contain cellulose nitrate, which would be indicative of a 1950s finish. Acrylic was also found in this sample, which could have been used in combination with cellulose nitrate as a substitute for the more expensive shellac or dammar. Cellulose nitrate finishes were often formulated from mixtures of cellulose nitrate and a gloss imparting resin. Wax was also found. Wax was likely used on the original finish to help preserve the finish from moisture and scratches while also assisting with bringing out the beauty of the wood. The samples at the Gordon House were also found to contain cellulose nitrate along with acrylic and wax. Many of the areas at the Gordon House appear to retain the original finish.

### Fabrics at the Gordon House

The only fabric currently found at the Gordon House is the fabric found on the cushions of the built-in sofa in the living area. These may be the original cushions or replacements based on the original cushions. Analytical testing of the foam cushion and the fabric present is necessary to determine if these are materials found in the 1960s.

The cushion is soft and resilient. There are early photos of the sofa and the fabric appears similar to what is currently present. It is difficult to see the texture of the fabric in the reproduction photographs and therefore original photographs should be examined. There was discussion in the correspondence that Evelyn Gordon had considered creating fabrics for the house.<sup>23</sup> The fabric present should be preserved until further testing is completed.

### Other materials at the Gordon House

#### Hardware

The following was found in the specifications:

#7 all exposed screws should be stainless steel or equal.

All hardware shall be finished bright brass (or as approved by architect)

All hinges throughout shall be continuous (piano type) brass finish

Wherever possible all hardware should be cast brass.

Fixtures:

#7 Fluorescent and slimline tubes to be “warm white” All exposed lighting fixture hardware (plates, covers, screws etc.) to be brushed or “satin” brass finish.

The majority of the hardware in the house appears to be original and should be preserved. There is likely a lacquer coating on the hardware to prevent tarnishing and should not be polished.

### Fabrics and colors at the Price Tower

The fabrics selected for the Price Tower were from the Schumacher “Taliesin Line” of Wright fabrics and wallpapers. This was a series of Wright wallpapers and textiles issued in 1955. The idea for a fabric line began in 1954 with Elizabeth Gordon, editor of *House Beautiful*. She suggested putting a line together to Rene Carillo, the director of

merchandising at Schumacher and he oversaw the project. Carillo knew that there was little on the market that could be used by architects or interior designers. He believed the Taliesin line would be successful. Wright did not like interior decorators. In a conversation with Carillo he called them “inferior desecrators” and said he had no other interest in anything except architecture. His comment was specifically directed at the work of Dorothy Draper, a famed socialite decorator working in New York City. Wright finally agreed to the project. The folio created was part of an edition of one hundred that was sold for \$35; it was printed and assembled by E.W. Bredemeier and Company, Chicago. The line was advertised in *Interiors* magazine in 1955, 1956 and 1959. Also, one advertisement in the November 1955 *House Beautiful* included Frank Lloyd Wright fabrics provided by the Belgian Linen Association at 420 Madison Avenue, New York and another promoted “furnishings you can buy” featuring fabrics, wall papers and furniture.<sup>24</sup>

The line involved creating repeat patterns based on selected elements taken from existing architectural designs. These were translated into silk-screened or woven products. Wright suggested to the Fellowship that they work on the designs. Fabric #104, designed by Wright, was used originally in the Price Tower. It was inspired by views of spherical homes designed by Wright for two of his sons, the David Wright House in Phoenix, Arizona and the Robert Llewellyn Wright house in Bethesda, Maryland. This fabric was produced until 1964. The Taliesin Fellow Ling Po, under the direction and supervision of Wright, designed fabrics #101, 102 and 103. Fabric #102 was also used in the Price Tower. Ling and other Fellows colored the designs under Wright’s direction. Schumacher also added input into designs. Fabrics #501, 502 and 503 were inspired by Wright, but the design was actually the work of Schumacher designers.<sup>25</sup> Fabric #501 was used as the furniture upholstery fabric in the Price Tower. Wright never intended the “Taliesin Line” for the interiors of the buildings he designed. It was the choice of the owner. In a letter

from Marylou Price to Wright on July 29, 1955, she requested samples of fabric for the apartment. It is not apparent, however, that Wright suggested the Taliesin line. The fabric #102 in leaf green and #501 in brick both appear in Price Tower inventory books (Taliesin file numbers 1101.020 and 1101.027).

Other firms that promoted Wright products in 1955 were Heritage-Henredon furniture, Karastan (rugs), and Martin Senour (paints). Martin Senour Paint Co. produced a “Taliesin” line of paint colors to be coordinated with fabrics. Wright was unhappy with the venture with Heritage-Henredon which produced only one of the three lines of furniture he had designed for the firm. They were introduced in the fall of 1955. These pieces used geometric elements that could be combined and recombined in various configurations and shapes.<sup>26</sup> The upholstered chairs in the living room of the apartment at the Price Tower are Heritage Henredon and were also originally upholstered in the #501 Schumacher fabric. These have been re-upholstered in a reproduction of this fabric. This furniture is featured in a *House Beautiful* advertisement from 1955.<sup>27</sup>

In an effort to make the office chairs more comfortable, the upholstery was replaced after the death of H.C. Price in 1962. They were recovered in leather and the graceful profile was altered with more padding. The David Hanks Dominos Collection publication shows a 1956 black-and-white photograph that includes “casual” chairs and the executive chair with a roughly textured fabric that appears to be the #501 fabric.<sup>28</sup>

The Price Tower currently has a sample of the #501 fabric in granite, which was partially used to re-upholster the stenographer chair in the collection. This was donated by Jimmie and Hans Schmaltz, who purchased unused remnants of the fabric from the Price Tower project and had drapes made for their home, as well as furniture upholstered in this fabric. It is not clear if this color was used in the Price Tower. Joe Price has two dining chairs



Figure 5. Price Tower apartment living area on the 17th floor after 2006 restoration.

with the original material in what he calls brown.<sup>29</sup> The #501 fabric did come in what was referred to as a “wood brown” color. There is also one chair that was in the Dominos collection, although the location is currently unknown. A color photograph of this chair in David Hank’s book appears to indicate a copper or brown color.<sup>30</sup> A Xerox in the Price Tower collection from the June 11, 2001 Phillips dePury and Luxembourg auction catalog shows this same chair with “gold/mustard” handwritten on it. According to a verbal account by Joe Price, red and blue were used along with brown. In the publication *The Story of the Tower*, color plates of Joe Price’s photographs show what appears to be the granite and gold colors on the dining room chairs although this may be due to the printing process. A variety of colors may have been used in the Price Tower.

Several color photographs were taken in the 1950s and 1960s of the Price Tower interiors. Many

contain helpful information. Most photographs, however, have suffered extreme color shifts. Photographs taken by Joe Price in 1956 appear to be Ektachrome transparencies. The severe loss of cyan and yellow dye is characteristic of the Kodak Process E-1, E-2 and E-3 Ektachrome films in use from 1946 until 1976.<sup>31</sup> This makes it impossible to determine accurate colors of the upholstery in these photographs. The only accurate color photographs from 1956 are of the apartment and show the #501 fabric in the brick color. The Price Tower collection has one accurate color photo and three others are in the Frank Lloyd Wright Foundation Archives. These photos do not include the dining area. Color photographs taken later of the Price office show furniture that has been reupholstered. Publications from 1967 and 1988 include photographs by Yukio Futagawa showing arm chairs in the Price office with replacement leather upholstery.



Figure 6. Price Tower Dining Room table and shelves on the 17th floor after 2006 restoration.

### Price apartment fabrics

The fabric for the first drapes chosen for the Price apartment was a silk fortisan casement in “wood brown.” This fabric was decorated with floating spheres and orange triangles (fabric #104, color #775769). These drapes, which deteriorated within a year, were hung along a track originally located at the top of the wall. The replacement drapes were attached to the aluminum curtain wall frame immediately above the bedroom balcony rail. This fabric was linen with a geometric pattern in various shades of red and pink called “coral and flame” (fabric #102, color #775742). This fabric was also used on the top cushions of the hassocks and for a table runner on the living room desk and dining table. One color photo in the Price Tower

Art Center collection that retains accurate color shows that the hassock’s lower portions were in three different colors; blue (light blue or turquoise), dark brown and cream. The sofa and arm chairs were upholstered with a red (brick) rayon and cotton bouclé damask with a diamond pattern (fabric #501, color #734624). The dining chairs were also upholstered in the #501 fabric, but may have been in a variety of colors as mentioned earlier. (figs. 5 and 6)

There is only one black-and-white photograph of the bedroom upstairs. The bedspread appears to have the rayon and cotton bouclé damask with the diamond pattern (#501). The drapes are pushed to one side and it is difficult to see what fabric was used, but it may have been the same damask in a matching color. Joe Price believes that he remembers the color was red.<sup>32</sup>

Black-and-white and color photographs show a light colored rug in the apartment. A December 21, 1956 letter from Armen Jaye of Spinning Wheel Rugs to Joe Price states “we are readying four rugs to go in Mr. Price’s office, the living room and the two bedrooms. They will be ready for shipment about the middle of January (1956).” The drawing #5215.006 shows the display of a rug in the living room.

### Other furniture materials at the Price Tower Aluminum, copper and brass trim

There are furniture pieces in the collection that retain either aluminum or brass trim. There were several letters back and forth between Joe Price and Wright regarding the metal trim used on the furniture and shelves.<sup>33</sup>

A telegram dated Sep. 28, 1955 from Joe Price to Wright stated: "What color do you want all angles on all moveable partitions? Aluminum half rounds on shelves and half round aluminum tubing on desk edge and hardware on base of desk." Wright's reply on Sep. 29, 1955 says "All aluminum except room and desk bases which are red on desks." Another letter from Joe Price on 9/29/55 states "Father likes brass on desks." Wright responded with hand written notes on the typed sheet: "All right Joe, thus it is. Then have aluminum cast chairs painted to match." Also on drawings stenographer chair 36, dining chair 38 and the casual chair 41 a note is written "All metal to be bright aluminum or brass if no aluminum in environment."

In a letter from Wes Peters to Haskell Culwell, dated April 12, 1955, item number one states: "The half-round metal covered mould is to be aluminum finish to match the other aluminum hardware. We suggest you use Alcoa aluminum solid extruded section #6044."

At one point, the Price apartment trim was removed from the shelves and furniture and the remaining holes as well as many of the shelves were covered with veneer. There are 1956 photographs that show what appears to be aluminum trim on the shelves and furniture in the living room. Aluminum trim has been made and placed back onto the shelves and furniture based on the original photos and physical evidence. The hardware remaining on the built-in furniture in the bedroom is brass. There are no original photographs of these pieces. The hardware may have been aluminum originally to match the hinge on the smaller cabinet and closet. The H. C. Price office and his secretary's workstation still retain the original copper trim also found on the copper furniture made for the commissary and on the built-in desk and shelves in the conference room. The drawing #5215.173 shows a handwritten note regarding the copper desk edge saying: "Use also tops of garden seats and tables."

### **Aluminum furniture**

Wright designed aluminum pedestal chairs for the

Price Tower. These included the dining chairs, casual chairs, and two types of office chairs: the stenographer's chair and the executive chair. They all have hexagon-shaped seats and backs resting on top of a pedestal and base. Dining chairs had fixed seats and backs and the stenographer chairs had backs that could be adjusted up or down. The base, seat and back of the "casual" chair are the same components as used for the dining chair. The arm rests and supports are the only additional components. The executive chair has a larger base than the other chairs and the arms project straight out rather than at an angle as in the "casual" chair.

There are 1955 drawings at the Taliesin West Archives (#5215.188, 5215.191, 5215.198, 5215.202, 5215.205, 5215.206, 5215.209, 5215.210, 5215.211) for the stenographer chair, dining chair, executive chair and the casual chair.

The cast chairs were made in Dewey, Oklahoma by the Blue Stem Foundry. The foundry was owned and operated by brothers Cecil and Frank Magana and Calvin Mason. Cecil was primarily responsible for the casting and construction of the chairs. He also redesigned the base of an executive chair for Harold Price to make it more stable. A loose form casting method was used because it was thought they would only be prototypes. Wooden molds were created and the originals are owned by Cecil Magana. A "low-tech" sand casting technique was used. The casting technique created a rough surface requiring buffing. As well, small flaws required filling with the automotive body filler Bondo, welds required grinding, and other imperfections were filed or sanded. The surface was then painted to hide these imperfections. A primer coat of paint was sprayed on, followed by a coat of aluminum paint and finally a sealer was applied. This sealer was likely a cellulose nitrate lacquer. The one stenographer chair in the collection retains the original finish. The top layer has now yellowed and is flaking off.

The number of chairs created are listed in a letter



Figure 7. (left) Price Tower coffee table after the plastic laminate was removed revealing contact cement on the original Philippine mahogany veneer, before treatment.



Figure 8. (right) Price Tower coffee table placed in the apartment living area on the 17th floor, after treatment.

from H. C. Price to Frank Lloyd Wright dated August 30, 1956. Price had forty of the “occasional chairs” or “casual chairs,” sixteen executive chairs and fourteen stenographer chairs made for the Price Tower. Several letters discuss the steps taken in designing the aluminum chairs and having them manufactured. There were some problems with the original prototypes.

A letter from H. C. Price to Wright on Sept. 2, 1955 states: “Yesterday we received one of our model desks and also, received a fairly well made chair based on your latest design... The metal parts of the chair damaged the woodwork of the desk under ordinary use. The aluminum base of the chair scuffed the shoes of those sitting in it, particularly when the secretary swung around from her desk to her typewriter.”

The plans for the stenographer chair #5215.198 include handwritten notations: “1” round black rubber heel-bumper all around base.” Plans for the dining chair revised on September 15, 1955 include a notation for a rubber heel bumper and “all metal to be bright aluminum or brass if no aluminum in environment.” Cecil Magana stated that the rubber bumpers placed on the base edge were eventually discarded. Originally placed to prevent scuffing of shoes, the heels of ladies’ shoes got lodged between the bumper and the base. This caused damage to the shoes or possible injury. Although there were

notations as mentioned above to painting the chairs to match brass trim, the original chairs are believed to have all been “bright aluminum.” According to Cecil Magana, only the chairs had the aluminum finish.

Most of the chairs in the collection have been painted with copper or brass-colored paint. There are indications that this is overpaint although scientific analysis has not been completed. Chips in the paint layer underneath are apparent. The new paint is also very uniform and does not show appropriate wear for its age. There is no documentation of when these chairs were repainted. Art Metal was approached initially for the production of the chairs. Joe Price in a letter on Sept. 21, 1955 states to Wright “Art Metal have doubt as to whether the single post back and the aluminum base will sufficiently hold a 200-pound man.” There were incidents of the chairs falling and snapping apart due to the brittle nature of the cast aluminum. Carolyn Price indicated that many of the chairs had broken and were likely repainted at the time of their repair.

### Copper furniture

Wright designed copper indoor/outdoor tables and stools for use in the employee lunch area or commissary. The tops of the tables are trapezoidal while the tops of the stools are hexagonal. All the tops are edged with stamped copper with triangle



Figure 9. Price Tower executive office on the 19th floor, after treatment.

shapes that echo the exterior copper panels. This trim is also found on the edges of the Price office furniture and in the conference room on the 18th floor. The tables and stool tops are made up of a plywood form under the copper to hold the shape. This wood has suffered damage from being exposed to humidity while outside.

Wright also designed patinated copper fireplaces for Harold Price Sr.'s 19th-floor office and the apartments that echo the exterior panels. Similar designs are also found on the copper panels placed along the balcony in the Price apartment. The copper used in these designs has been patinated like the exterior panels. As mentioned above, the application of acid and water created the patina. The treatment turns the copper shades of blue and green.

#### Apartment furniture

A drawing, FLWF #5215.126 in the Frank Lloyd Wright archives, shows an interior perspective drawing of a typical apartment first floor. Notations include numbers of pieces of furniture: six hassocks, six dining room chairs, two upholstered arm chairs, one table, one desk chair, one built-in desk, one built-in seat, three shelves along the south wall and three shelves along east wall. There are 1954 plans #5215.126 in the Taliesin archives for the dining table and hassocks. An August 10th letter states "All 64 hassocks are completed as designed and approved." Two drawings, #5215.185 and #5215.186, depict the interior of a "typical" two-level apartment. This shows the shelves, dining table, built-in sofa desk and coffee table with a half round aluminum strip 5/8" wide and 5/16" thick.<sup>35</sup> (fig. 5)



Figure 10. Price Tower secretary's office on the 19th floor, after treatment.

There is a small built-in cabinet that remains in the apartment on the 18th floor along with a set of drawers. The tops have been covered with slate, which likely occurred when Harold and Carolyn Price remodeled the apartment (date unknown). The bedroom dresser is no longer in the apartment. Part of a dresser remains in the Goff collection and another is stored in the Annex. One of these may be used to replace the apartment dresser. The tops with aluminum trim are missing on both, but the lower portions are intact. The drawing 5215.125 has a detail of the dressing table in the bedroom.

Shelves have been removed as well. These include shelves above the dining table and the shelves in the bedroom. The semicircular shelf and mirror originally attached to the mural have also been removed. The shelves under the window appear to be original, with replacement veneer attached to the tops and edges. The missing shelves on the 17th floor have now all been replicated based on photographs and physical evidence. (fig. 6)

A coffee table is included in the typical apartment sketch #5215.126 as well as in original photos.

There are construction drawings for this table in the Frank Lloyd Wright Foundation Archives.<sup>36</sup> Currently there are two coffee tables known to exist. One is in the collection of Carolyn Price with a slate top and one is in the Goff collection at the Price Tower. This table was covered in plastic wood grain laminate. Removal of the laminate revealed holes where aluminum trim had been attached previously and two of the copper sleeves for the feet were missing (figs. 7 and 8).

### Price Office

There are no accurate original color photos of the office (fig. 9). The only ones in the collection are the transparencies taken by Joe Price that no longer have accurate color. Early photographs show no rug or drapes and later 1967 photos by Yukio Futagawa show solid beige drapes and a cream colored rug. The drawing #5215.143 specifies drapery material as #775742, which is the number for the "coral flame" color in Schumacher #102. This is the same color used in the apartment. However, there are no photographs of the office with these drapes. Al Drap photos (included in John Womack's report) taken in 1975 include a copper trash

can rather than aluminum. There is only one copper trash can in the collection and it is likely that the Price office had a copper trash can to match the copper trim. These photos also show yellow and blue pillows on the built-in sofa. These pillows appear to be similar to pillows seen at Hillside in July 2004. Carolyn referred to the fabric on these as Thai silk and believed they were original to the house.

The furniture and shelves have matching copper trim. The desk also has a copper panel similar to the copper panels on the exterior, but smaller. A wood-burning fireplace hood made of patinated copper is in the office. It is considerably larger than the gas-burning fireplaces created for the apartments.

As mentioned earlier, the finish on the wooden panels and furniture has been bleached by the sun and is flaking. Areas of the surfaces appear to have been refinished or finish was added to consolidate the original flaking finish. The top of the door on the corner cabinet is believed to have retained original finish (see Analysis section). The sofa cushion retained may have the original foam interior with replacement orange leather or Naugahyde upholstery. There is a tear in the cover showing a brown highly degraded foam cushion that has stiffened and easily crumbles into a powder. This is characteristic of degraded latex foam, a material used for upholstery padding in the 1950s.<sup>37</sup>

The executive chair had been reupholstered in blue leather. This may be a clue to the original color of fabric. A black-and-white photo mentioned above in David Hank's *Dominos Collection* book, shows the executive chair in a textured fabric that appears to be the Schumacher #501 also used on the other aluminum chairs and the apartment furniture. As previously mentioned, brown, blue, granite, gold or red were possible colors used on the chairs. In the fall of 2006, the Executive chair was reupholstered in the replicated #501 Schumacher fabric in turquoise.

### Secretary's Office

The secretary's office is a small space that retains its original Philippine mahogany wall paneling that continues across the ceiling (fig. 10). There is a built in desk, cabinets and shelves with a continuation of the copper trim found in Price's office. Two metal filing cabinets behind the desk in Cherokee red appear to be original. These are surrounded by the mahogany cabinetry.

The finish in this area appeared to be bleached from light exposure. The polyurethane finish found on the desk top (see Analysis section) as well as the dark scratches apparent under the finish indicates that this area has been refinished. The other desk tops also appears to have been refinished. Other areas less exposed to constant wear may retain original cellulose nitrate finish as found in Price's office.

### General offices

A black-and-white 1956 photograph found in Hoffman's *Frank Lloyd Wright, Louis Sullivan and the Skyscraper* illustrates part of an office with hexagonal topped desks, and shelves trimmed in 5/8" half-round aluminum molding along with a triangular-shaped table with aluminum trim.<sup>38</sup>

The Price Tower Art Center collection includes several original office objects. These include office desks and typing extensions, one table with a triangular top, aluminum or stainless steel waste cans, cabinets, tables, one aluminum stenographer chair and several arm or "casual" chairs.

### Lobby and loggia

There are 1956 photographs of the main entrance lobby cushions showing the diamond pattern Schumacher fabric. The original upholstery covers on the hexagon-shaped cushions had been replaced with an orange fabric and recovered again during the hotel restoration in 2002–2003. They are now recovered in the replicated turquoise #501 Schumacher fabric.

There is a black-and-white photograph taken by Yukio Futagawa<sup>39</sup> of the waiting area off of the lobby (loggia). This shows lightly-colored thin leather cushions on the seat and back of the built-in sofa. There are no photos showing the original fabric at the time of the opening and the back cushions are no longer present. The back cushions were replaced during the 2006 restoration and the leather has now been replaced with the replicated turquoise #501 Schumacher fabric.

### **Conservation Treatment**

Treatment had not been executed at the Gordon House at the time this paper was written. The following is a summary of the treatment completed for the Price Tower.

The treatment of these objects included structural and surface repair as well as finish work. Treatments performed were as minimally intrusive as possible. The overall goal was to allow the pieces to appear aged but well cared for.

#### **Pretreatment Condition: Price Tower Structure**

Overall, the structure of the objects treated was found in good condition with some loose joins, damage from use, etc.

#### **Surface**

There were some scratches and dings from use around hardware and on tops of tables and shelves. Some areas of veneer had become detached or were loose. The plastic laminate on the coffee table was removed and the original veneer remained. It was buckling and lifting off on the lower shelves.

#### **Finish**

The main problem on the upper floors was sun damage to the wood and finishes. The finish was flaking in many areas and the wood appeared to be sun bleached on the wall paneling, door and built-in cabinets of the 19th floor. Many of the surfaces had been refinished on the upper floors. There were slight scratches and dings overall on the furniture from use, as well as apparent water damage

on some items. The plastic laminate on the coffee table was removed to reveal a large amount of contact cement on the surface. The vertical boards had been colored to match the laminate using an oil-based stain.

#### **Upholstery**

The office sofa cushion on the 19th floor with a replacement leather cover has a large tear in it. It appears to have the original foam padding inside which has become dry and powdery. This cushion was removed from display and put into storage. All of the original show covers on the furniture at the Price Tower have been replaced.

#### **Solvent tests**

Solvent tests were performed on clear finishes believed to be original using alcohol, acetone and mineral spirits. Cotton swabs were moistened with the solvents and rolled over the surface. A small amount of finish was removed on many of the wooden pieces using alcohol and acetone. Mineral spirits removed dirt and did not disrupt the surfaces. Several of the objects appeared to have been refinished. Due to the variety of finishes found, solvent tests were required for each item before conducting treatment.

#### **Treatment Summary: Price Tower**

##### **Wooden structure**

Any loose joins or veneer were readhered using reversible hot hide glue.

##### **Wooden surfaces and finishes**

Coated wooden surfaces were cleaned using cotton pads slightly dampened with water and/or mineral spirits. Some areas were waxed using carnauba and beeswax to reduce scratches, protect and resaturate the finish. Areas that did not retain original finish were matched in tone and color to areas known to be original using conservation varnish Regal-Rez 1126 (with an elastomer Kraton G1650 and a light stabilizer Tinuvin 292 added) as a barrier layer and then layers of shellac dyed with Orasol dyes. Areas of loss in the wood surface were filled with wax or Araldite epoxy with a reversible hot

hide glue layer. These areas were inpainted using natural pigments, conservation varnishes and/or reversible paints to allow areas of loss to blend with the surrounding areas. A final coating of reversible wax (carnauba and beeswax) was applied to protect the surface.

The coffee table in the collection required the use of acetone and mineral spirits to remove the contact cement that remained after the removal of the plastic laminate. The stain on the vertical boards was removed using Citristrip paint remover, wiped off and then cleared using mineral spirits. A considerable amount of the original finish remained. A barrier layer of Regal-Rez (with an elastomer Kraton G1650 and a light stabilizer Tinuvin 292 added) was applied along with thin layers of shellac to build up any areas of loss.

### **Fabrics**

There were no original fabrics left on the Price Tower furniture. Joe Price owns two chairs with the original brown #501 fabric. Price Tower Arts Center ordered new fabrics to be made from Schumacher based on their original designs. This includes the #102 coral/flame for the drapes and #501 in red and turquoise for the upholstery. New drapes were hung in the apartment on the 17th floor and furniture was reupholstered based on information from original photographs by a local firm. Original springs were retained on chairs that had been reupholstered by Taliesin in the late 1970s. The overstuffed chairs with leather had foam only and no springs remained. New cushions were created for the first floor hall, waiting lobby and 19th floor sofa. New open weave drapes were hung in the office based on the fabric seen in original photographs. These drapes have an opaque coated fabric backing that assists with blocking both visible and ultraviolet light and assists with maintaining a constant temperature level inside the room.

### **Metals**

The patina on metal surfaces was retained while removing surface grime and dust. In most instances

this included cleaning with soft cotton pads slightly dampened with acetone. The brass plated trim remaining on some of the furniture is worn with some losses revealing the aluminum underneath. Many pieces retain their original hardware, which is in good condition. The fabrication of new aluminum trim by Overly Aluminum in Pennsylvania was required to replace missing trim on the coffee table. Timmons Sheet Metal of Bartlesville fabricated two new copper sleeves to replace the missing ones on the feet of the coffee table. These were placed in ammonia for several hours to create a patina to match the others. Price Tower Arts Center also had new trim made in Bartlesville for the shelving and furniture in the apartment, provided by Superior Companies, Inc. of Tulsa.

### **Conclusion**

This study, along with research conducted by Wright scholars and curators, provides information that aids in returning the interiors of the Price Tower and the Gordon House closer to Wright's original intent. Research on the original fabrics of the Price Tower has allowed the opportunity to bring the interiors closer to their 1956 appearance. The same clear finish, "Satin lac," was found at the Price Tower and the Gordon House using scientific analysis. This assists with determining proper conservation treatment and preservation of the original finishes and helps to determine the original appearance. This information can be compared to other Frank Lloyd Wright sites from the period and will aid in their preservation.

### **About the Author**

Pamela Kirschner has been a private wooden artifacts conservator for the past several years and is also currently a Preservation Programs Specialist in the Preservation Department of the National Archives in Washington, DC. She received a Master of Science degree in Art Conservation from the University of Delaware/ Winterthur Museum's Art Conservation Program in 1998. In 1987, she received a Bachelor of Fine Arts degree in Communication Arts/ Media and a minor in photography from Virginia Commonwealth University. She

specializes in furniture and wooden artifacts from the nineteenth and twentieth centuries and has studied Frank Lloyd Wright furnishings in depth.

## Acknowledgments

The author would like to thank the following for their assistance with this project:

Kate Duffy, Conservation Scientist, Williamstown Conservation Center; Kay Johnson, Registrar and Manager of the Architectural Study Center, Price Tower Arts Center; Monica Ramirez-Montagut, Assistant Curator of Architecture and Design at the Guggenheim Museum and former Curator of Collections and Exhibitions, Price Tower Arts Center; Scott Perkins, Curator of Collections and Exhibitions, Price Tower Arts Center; Margo Stipe, Frank Lloyd Wright Foundation; Richard Townsend, Deputy Director for External Affairs, Miami Art Museum, and former Director, Price Tower Arts Center.

## References

### Price Tower

Futagawa, Yukio (editor and photographs) and Pfeiffer, Bruce Brooks (text). *Frank Lloyd Wright Complete Works*. Tokyo, A.D.A. Edita, 1988.

Gill, Brendan. *Many Masks, A Life of Frank Lloyd Wright*. New York, G. P. Putnam's Sons, 1987.

Guerrero, Pedro E. *Picturing Wright, an Album from Frank Lloyd Wright's Photographer*. San Francisco, CA, Pomegranate Artbooks, 1994. (time-line)

Hanks, David A. *Frank Lloyd Wright: Preserving an Architectural Heritage: Decorative Designs from the Domino's Pizza Collection*. New York, E. P. Dutton, 1989.

Hoffman, Donald. *Frank Lloyd Wright, Louis Sullivan and the Skyscraper*. Mineola, New York, Dover Publications, Inc., 1998. p. 63–81

Kirschner, Pamela and Joe Price. *Interview by phone*. December 2004.

Kirschner, Pamela and Price, Carolyn. *Interview at Hillside*. July 2004.

Kirschner, Pamela and Price, Carolyn. *Interview by phone*. November 2004.

Lacey, Susan (forward and interviewer) and Henderson, Arn (prepared by). *The Price Tower – Its Architects and Builders: An Index to the Bartlesville, Oklahoma Landmark Preservation Council Oral History Archive*. July 1991.

Maddex, Diane. *Frank Lloyd Wright's House Beautiful*. New York, Hearst Books, 2000. (Cassina cantilevered coffee table for his friend Lloyd Lewis, p. 163) (Schumacher and Heritage Henredon pp. 36-37).

Pawley, Martin (introduction and notes) and Yukio Futagawa (photos). *Frank Lloyd Wright I, Public Buildings*. New York, Simon and Schuster, 1970.

Pfeiffer, Bruce Brooks and Larkin, David. *Frank Lloyd Wright: The Masterworks*. New York, Rizzoli, 1993. p. 247.

Schumacher's "Taliesin" Line Price List for Decorative Fabrics and Wallpapers designed by Frank Lloyd Wright, F. Schumacher and Co. New York.

Sommer, Robin Langley. *Frank Lloyd Wright, American Architect for the Twentieth Century*, Greenwich, CT. Brompton, 1993. p. 160, Price Tower and p. 164, Harold C. Price Jr. house (Hillside).

Tafel, Edgar. *Years with Frank Lloyd Wright Apprentice to Genius*. New York, Dover Publications, Inc., 1979, pp. 119 and 120.

Thurman, Christa C. Mayer. *Make Designs to your Heart's Content: The Frank Lloyd Wright/Schumacher Venture*. The Prairie School Design Vision for the Midwest, The Art Institute of Chicago Museum Studies.

Wilhelm, Henry. *The Permanence and Care of Color Photographs, Color Negatives, Slides, and Motion Pictures*. Grinnell, Iowa, Preservation Publishing Company, 1993.

Womack, John Calvin, R.A. *Price Tower, A Report on Floors 17, 18, and 19*, National Endowment for the Arts Grant Report #0342006019, 2004.

Wright, Frank Lloyd *The Story of the Tower, the Tree that Escaped the Crowded Forest*, New York, Horizon Press, 1956.

### Finishes

Bjorkstein, Johan. *Polyesters and Their Applications*. New York, Reinhold Publishing Corporation, 1956.

Buck, Susan. A Study of Materials and Environment at Russell Wright's Dragon Rock. *Postprints of the Wooden Artifacts Group*. American Institute for Conservation of Historic and Artistic Works Conference, 1996, Norfolk, Virginia.

Davis, Robert L. *Applied Plastic Product Design*. New York, Prentice-Hall, Inc. 1946.

Fischer, William Von. *Paint and Varnish Technology*. New York and London, Hafner Publishing Company, 1964.

Fischer, William Von. *Organic Protective Coatings*. New York, New York, Reinhold Publishing Corporation, 1953.

Gaynes, Norman I. *Formulation of Organic Coatings*. Princeton, New Jersey, D. Van Nostrand Company, Inc. 1967.

Martens, Charles R. *Technology of Paints, Varnishes and Lacquers*. New York, Reinhold Book Corporation, 1968.

Mattiello, Joseph J., Ph.D. *Protective and Decorative Coatings: Paints, Varnishes, Lacquers, Volume*

*I - Raw Materials for Varnishes and Vehicles*, New York: John Wiley & Sons, Inc., 1941.

Mills, John S. and White, Raymond. *The Organic Chemistry of Museum Objects, second edition*. Oxford, Butterworth-Heinemann, 1994. (p. 74)

Morgan, John. *Conservation of Plastics*. Gainsborough, Lincolnshire: G.W. Belton Ltd., Museums and Galleries Commission. 1991, (p. 16)

Reilly, Julie A. Celluloid Objects: Their Chemistry A Preservation. *Journal of the American Institute of Conservation (JAIC)* 1991, Volume 30 Number 2, Article 3 (pp. 145–162)

### Aluminum

Kaiser Center. *Casting Kaiser Aluminum*. Oakland, CA, Kaiser Aluminum and Chemical Sales, Inc. 1956.

### Plywood

Freas, A.D. and Selbo, M. L. *Fabrication and Design of Glued Laminated Wood Structural Members*. Washington, DC, United States Department of Agriculture, 1954.

Knight, E. Vernon and Wulpi, Meinrad. *Veneers and Plywood*. New York, The Ronald Press Company, 1927. p. 153.

Meyer, Louis H. *Plywood What It Is—What It Does*. New York, McGraw-Hill Book Company, Inc., 1947.

### Upholstery

Gill, Kathryn. Approaches in the Treatment of Twentieth Century Upholstery, *Upholstery Conservation*. Preprints of a Symposium held at Colonial Williamsburg, 1990. pp. 305–321

*Schumacher's Taliesin Line of Decorative Fabrics and Wallpapers Designed by Frank Lloyd Wright*. Chicago, E.W. Bredemeier and Company, Chicago 1955.

### General information about Gordon House

Frank Lloyd Wright Quarterly Volume 13, No. 2.  
*Conserving Wright's Architecture* "Gordon House."  
Scottsdale, Frank Lloyd Wright Foundation,  
Spring 2002.

Pfeiffer, Bruce Brooks and Futagawa, Yukio.  
*FLW Monograph, 1951–1959*. Tokyo, A.D.A  
Edita, 1988.

Woodin, Larry A. *The Gordon House: A Moving  
Experience*. Hillsboro, Oregon, Beyond Words  
Publishing, Inc., 2002.

30. Hanks 1989, p. 119
31. Wilhelm 1993. p. 26
32. Womack 2004, p. 46
33. Womack 2004, p. 83
34. Kirschner and Carolyn Price Oct. 2004
35. Womack 2004, p. 32
36. Womack 2004, p. 25
37. Gill 1990, p. 309
38. Hoffman 1998, p.77
39. Pawley 1970, plate #67

### Endnotes

1. Hoffman 1998, pp. 63
2. Lacey and Culwell 1990, p. 15
3. Womack 2004 p. 9 (timeline)
4. Knight and Wulpi 1927. p. 153.
5. Lacey and Culwell 1990, p. 21
6. Lacey and Creel 1990, p. 6
7. Maddex 2000 p. 37
8. Gordon House Specifications
9. Womack 2004, p.84
10. Kirschner and Carolyn Price Interview June  
2004
11. Martens 1968, p. 133
12. Gaynes 1967, p. 20
13. Mattiello, 1941, p.476
14. Martens 1968, p. 139
15. Bjorkstein 1956, p. 225
16. Morgan 1991, p. 16
17. Reilly 1991, p. 11
18. Reilly 1991, p. 13
19. Mills and White p. 74
20. Reilly 1991, p. 13
21. Duffy 2004
22. Duffy 2005
23. Frank Lloyd Wright Quarterly Spring 2002, p.22
24. Thurman
25. Thurman p. 161
26. Thurman p. 162
27. Maddex p. 36
18. Hanks 1989, p. 118
29. Kirschner and Joe Price 2005