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Beyond Basic Preservation:

REHABILITATION

Figure 1. Rehabilitation of Anacapa Island Lighthouse.

Rehabilitation is defined as the act or process of making possible a compatible use for a property through repair, alterations, and additions while preserving those portions or features which convey its historical, cultural, or architectural values.

Rehabilitation as a Treatment: When repair and replacement of deteriorated features are necessary; when alterations or additions to the property are planned for a new or continued use; and when its depiction at a particular period of time is not appropriate, *rehabilitation* may be considered as a treatment. Before undertaking work, a documentation plan for *rehabilitation* should be developed.

Standards for Rehabilitation

- Use the property as it was used historically or find a new use that requires minimal change to distinctive features.
- Preserve the historic character and character-defining features (continuum of property's history).
- Do not make changes that falsify the historical development.
- Repair deteriorated features. Replace a severely deteriorated feature with a matching feature (substitute materials may be used).
- New additions and alterations should not destroy historic materials or character. New work should be differentiated from the old, yet compatible with it.

This is a summary of the central ideals of the *rehabilitation* treatment standards excerpted from the *CRM* article, "Historic Preservation Treatment: Toward a Common Language" by Kay Weeks (Vol 19, No. 1, 1996, pp. 32-33).

CASE STUDY: Design for Missing Historic Windows

by Michael Seibert, WPTC

A variety of factors should be considered when designing new windows for a historic lighthouse where no original windows remain. New windows should be designed or constructed only if the original historic windows are completely missing. The new window design should be a restoration based on historical, pictorial, and physical documentation, or a new design that is compatible with the historic character of the lighthouse. If adequate documentation exists, windows that were blocked in or boarded up after the historic period should be restored.

When developing a new design, there are many resources available to guide the design of missing features. Archival sources include historic lighthouse plans and photos. These are primary sources for historically accurate information. If these resources are unavailable, there may be clues on the existing window frames, such as hinge and lock mortises in casement type windows or remnants of parting beads or stops that would indicate sash thickness or size of double-hung windows. When designing a new window, avoid creating a false historical appearance based on insufficient historical, pictorial, and physical documentation.

When replicating missing historic lighthouse windows, it is essential to accurately reproduce the following character-defining elements of a window:

- Type of window: double hung, casement, or fixed sash
- Size and number of lights or panes of glass

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Figure 2.

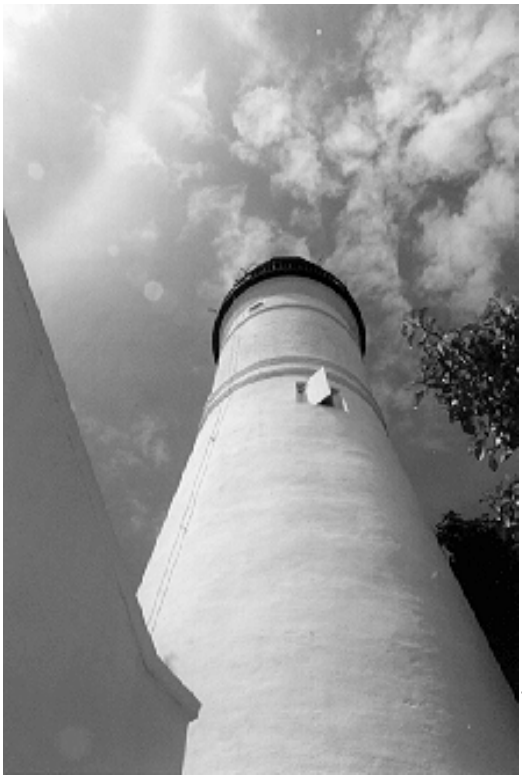

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Figure 3.

- Muntin (the vertical and horizontal members that divide the panes of glass) profile and size
- Size and shape of the sill, head, and jambs

Figures 2 through 5 illustrate successful replacement window designs. These solutions can be easily adapted to most historic lighthouse window designs. During the rehabilitation of the lighthouse shown in Figures 2 and 3, the metal multiple-light windows were reproduced based on the remnants of the original windows and on historic lighthouse construction documents from a lighthouse built in the same region during the same time period. During the restoration of the window opening, the granite window frame was also replicated from remnants found in another window opening. Even the tooling pattern on the stone surface was reproduced. A single-leaf, vertical-plank shutter can be seen on the lighthouse in Figure 3. This detail was also based on existing evidence. Not only is this detail historically accurate, but it has protected the lighthouse during hurricane-force winds.

The wooden, double-hung, six-over-six window were reproduced from historic photographs. Subtle details such as molding profiles and hardware that could not be determined from historic photographs were based on lighthouses constructed by the same builder during the same time period. Figure 4 shows a close-up of the exterior side of the window; note the simple detailing and lack of profiled trim. These characteristics are typical of lighthouses constructed before the Civil War. Figure 5 shows the lighthouse after the installation of the replacement windows.

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Figure 4.

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Figure 5.

CASE STUDY: Design for Missing Historic Doors

by Michael Seibert, WPTC

When designing new doors for a historic lighthouse where the original door is missing, a variety of factors should be considered. A new door should be designed or constructed only if the original historic door is completely missing. The new-door restoration should be based on historical, pictorial, and physical documentation, or be a new design that is compatible with the historic character of the lighthouse.

When developing a new design, there are many resources available to guide the design of missing features. Archival sources include historic lighthouse plans and archival photos. These are primary sources for historically accurate information. If these resources are unavailable, there may be clues on the existing door frame such as hinge-and-lock mortises that indicate the direction of door swing and hardware sizes and locations. When designing a new door, avoid creating a false historical appearance because the replacement door is based on insufficient historical, pictorial, and physical documentation.

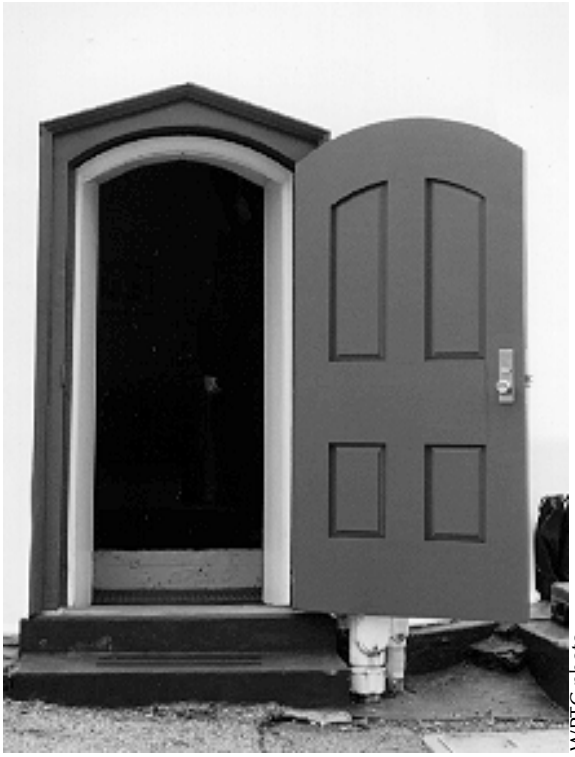

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Figure 6.

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Figure 7.

Figures 6 through 9 are examples of successful replacement door designs. The solutions displayed here can be easily adapted to most historic lighthouse door designs. The wood replacement door design in Figure 6 was based on wood-frame and panel-construction-style doors commonly used when this lighthouse was constructed in 1928. The only difference made to the c. 1928 design was the upgrade of the hardware to stainless steel components. This door design was based on information from historic photographs from the U.S. Coast Guard archives and

evidence found during the rehabilitation of the lighthouse. Historic photographs showed a vertical plank door on the exterior.

***Vertical wood plank door*:** The design for the door in Figure 7 was based on the information in the historic photographs. The materials used during the construction of this door were chosen for their durability. The wood chosen was fir, which was primed before assembly to ensure all surfaces would be coated to deter rot caused by damp wood. The planks were joined to the 'z' batten with stainless steel screws to decrease maintenance and eliminate the possibility of rusting fasteners. The hinges are salvaged bronze strap hinges that will also require minimal maintenance. The copper hood or awning above the door is another traditional protective measure for historic lighthouse doors.

***Wood frame and panel door*:** Partial remains of a wood frame and raised panel was found inside the structure during rehabilitation. This evidence was used in conjunction with historic construction drawings to develop this design. The door shown in Figure 8 was made by a local mill from Douglas fir. The hardware is all stainless steel to minimize maintenance and to extend the serviceable life of the door. As an added weather protection measure, a traditional drip edge has been installed along the bottom of the door to shed water away from the door opening.

The door in Figure 9 is designed to minimize the problems at a lighthouse that does not see regular visitation because of its remote location. Four factors took precedence over historical correctness: weathertightness, ventilation, security, and maintenance. The door had

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Figure 8.

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Figure 9.

to be weathertight to withstand the seasonal driving rain storms. At the same time the door had to provide adequate ventilation to minimize condensation buildup during hot and cold temperature changes. The door had to be secure because the remote location did not allow for regular security patrols; vandals or trespassers had to be effectively deterred. The rest of the structure required minimal annual maintenance; therefore the door should not require any more than annual routine maintenance.

The solution to the problems associated with the mothballing of this lighthouse was to use high-quality materials and sound design. The doors are made of Type 304 stainless steel. The louvers are baffled to allow for more than adequate air exchange, which will minimize interior condensation buildup, while at the same time preventing water infiltration. The louvers are also screened to prevent animal infiltration. The locks and hinges are also stainless steel to prevent corrosion and ensure long-term use. The installation of this type of door should not permanently affect the historic door frame.

CASE STUDY: St. Simons Island Lighthouse Lantern Glass Replacement

by Paul Neidinger, WPTC

The USCG Civil Engineering Unit (CEU) Miami maintains a classical third-order Fresnel lens as an active aid to navigation at St. Simons Island Light Station, Georgia. This lighthouse and associated keeper's quarters serve as the museum space and offices for the Coastal Georgia Historical Society and Museum of Coastal History. The third-order Fresnel lens remains in excellent condition because of the attention it receives by dedicated USCG Aid to Navigation Team (ANT) and CEU Miami personnel, as well as USCG auxiliarists. The NPS Williamsport Preservation Training Center was contracted through the CEU Miami to rehabilitate the lantern glass. This project had a limited budget and a tight schedule for completion.

Scope of Work

The scope of the project required the replacement of the 10 damaged wire-glass panels with laminated glass and contemporary glazing materials. The treatment had to incorporate and maintain the historic lantern elements as well as the character and appearance of the historic glazing system. Design development was aided by consultation with onsite USCG personnel and auxiliarists who perform routine maintenance on the lighthouse, along with examination of existing conditions. The project goal was not only to replace the lantern glass but to develop an incremental program of historic lantern preservation where the lantern glass and lantern frame members would be repaired without the need for a complete lantern restoration. Ultimately, this implementation strategy could be replicated by USCG ANT Teams on other lanterns, thus helping to preserve lighthouse lanterns without a complete costly restoration.

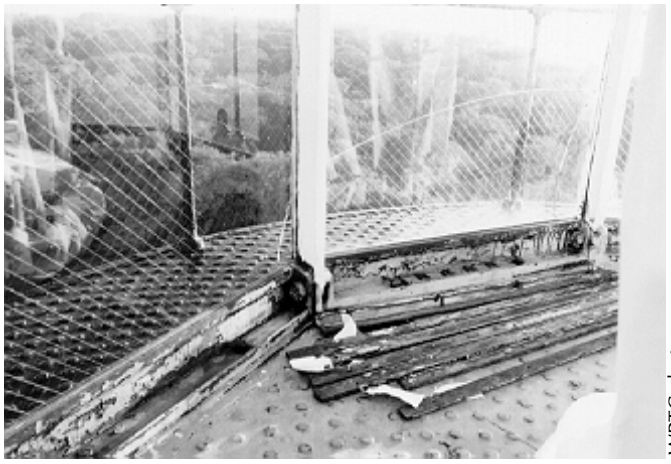

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Figure 10. Oblique of the interior of the lantern room with exterior bronze astragals stored in the foreground before cleaning and removal of the extent wire-glass panels.

The scope of work was limited to the lantern glass panel system, which included the restoration of the bronze mullions, astragals, and screws, as well as preservation of the cast-iron posts. Elements contributing to the deterioration of the lantern glass included inoperative bronze sill vents and a potentially blocked ventilator ball; both of this conditions elevated moisture levels in the lantern, which in turn caused premature corrosion of any exposed metal surfaces. (These deficiencies should be addressed as a separate preservation treatment.)

The rehabilitation of the cast-iron posts was limited to treatment of the exposed surfaces with rust inhibiting coatings. Any further treatment would have required the removal of the bronze sill and cast-iron deck. The perimeters of the treatment were

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Figure 11. The extent of the damage to the cast-iron column through exfoliation can be seen in profile after the removal of loose rust and the lower bronze mullion.

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Figure 12. Detail of the bronze sill when the lower mullion is removed; the fastener is re-tapped and the cast-iron column is treated with a rust converter. Note that the bronze astragals have been cleaned and are ready to accept the glazing system.

carefully decided before the start of the work; any other approach could have easily led to a total restoration rather than an incremental weatherization of the lantern by replacing and upgrading the lantern glass panel system.

Logistical Challenges

The scope of the preservation work was limited to that which could be done under typical conditions experienced by ANT Teams. The treatments were carried out using simple handtools, eliminating the cost of specialty items. The focal plane of the St. Simons Island Lighthouse is 102 feet above sea level. Regulations defined by the Occupational Safety and Health Administration (OSHA) for fall protection were adhered to throughout the project. Each worker wore a standard body harness that was tied off to a secured location inside the lighthouse. This system provided protection for the worker while maximizing his mobility around the lantern and gallery deck. When removing coatings that contained lead, the procedures outlined by the OSHA Interim Final Rule for Lead Exposure in the Construction Industry were followed to avoid contaminating the lantern room and tower, which is visited by tourists year round.

The area of operation, the lantern room, allowed for minimal movement. Access to, or movement of, glass had to be in limited tolerances, sometimes as little as a one-inch clearance, especially at the stairway from the service room of the lower gallery

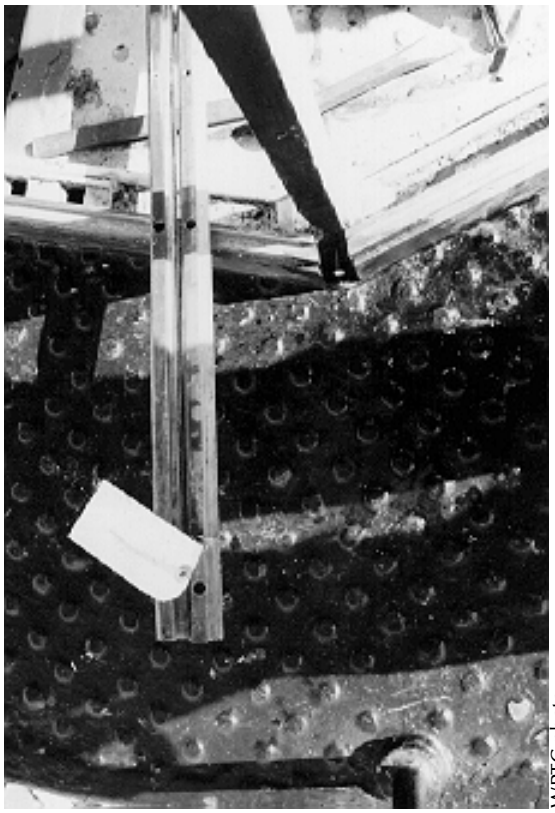

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Figure 13. This detail of the bronze sill shows the location of the new lower fastener before its removal and resetting with the lower bronze mullion.

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Figure 14. Following placement of the restored bronze mullion, the fenestration is ready to receive the new glazing system.

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Figure 15. The polybutyl sealant tape was placed on all receiving surfaces on the plane of the interior face of the glass and on the inside faces of the exterior astragals.

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Figure 16. This detail shows the new glazing system in place with associated cast-iron post and bronze sill available to receive additional cleaning and paint removal.

deck to the lantern room deck. With this in mind, each piece of glass was carefully hand carried and stored in the service room below the lantern room until it was time for installation. During the project, the lens was covered to protect it from damage.

Foul weather could have delayed the work on this structure; however, during the course of the preservation work, the only weather problem was cold temperature. High wind gusts did limit work for one day.

Astragal and Fastener Removal

Each glass panel relies on six bronze astragals fastened to bronze mullions with pan-headed bronze screws. The historic astragal screws did not have standard size threads. Machining new screws to fit extant threads in the bronze astragals and cast-iron posts was not an option because of prohibitive costs and lack of adequate lead time in the project schedule for machining. Making the extant threads of bronze astragals and cast-iron posts match contemporary thread sizes would have involved extensive field resizing and tapping of extant holes.

Since most of the fasteners remained in excellent condition and could be easily reused if extracted carefully, extant fasteners were retained and restored, and replacement screws installed only when necessary. Broken fasteners were usually limited to the lower sill astragal where the bronze screws, astragals, and sill experienced the most galvanic reaction with the cast-iron gallery deck. Since this area is directly below the lantern roof drip line, the rain splash-back readily supported the galvanic action because of the constant presence of water (the electrolyte). Typical damage to fasteners was fracturing of the pan head from the screw shaft. The shaft itself was typically heavily corroded in situ, making removal difficult or impossible without grinding the extant burr flush; drilling out the screw shaft followed with care taken

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Figure 17. Note the detailing of the finished exterior astragal in place and the polybutyl sealant tape visible in profile.

not to impact the receiving threads. During reinstallation, the reusable screws were strategically placed, thus distributing the missing screw locations to less critical locations in the lantern. This allowed placement of historic screws in critical areas while awaiting the manufacture of replica screws.

The astragals were heavily coated with linseed-oil-based putty, hard putty, paint, and polyurethane sealant. In spite of this, the base metal on all the astragals and associated bronze elements showed very little signs of deterioration. There was slight pitting of the surface of the astragals at the headers and sill. All of the astragals retained planing marks and identification numbers from their manufacture.

Glass Removal and Replacement

Damage to the lantern glass was the result of exfoliation or 'rust-jacking' on every exterior face of the cast-iron columns. Each bronze mullion fastened to the cast-iron column had been deformed, with complete failure of the lowest fastener. The exfoliating rust exerted forces on all ten glass panels, breaking the ¼-inch-thick annealed wire glass across the base of the panels. This allowed for water infiltration and endangered the classical lens. The glass was removed in two to three panels at a time so that rehabilitation of the fasteners and bronze mullions could be completed before placement of the new glazing system.

One of the first comments heard after completion of the lantern glass replacement was that the lighthouse projected a brighter and clearer beam of light. During the replacement of the storm panels, USCG auxiliarists received a complaint from a local pilot that the light on the lighthouse tower was going out. This impression resulted from the distortion between the new and old glass and plexiglas that was temporarily installed in the open panel locations while the work was in progress.

The success of this project indicates that preservation of historic lighthouse lantern glass can be achieved in an incremental manner, working under a reduced budget while being in full compliance with the *Secretary of the Interior's Standards for Treatment of Historic Properties* and with regulations defined by the Occupational Safety and Health Administration.