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Cape Neddick Light Station

**Specifications for Repair and Restoration of Exterior
Woodwork**

August 2016

Introduction

These specifications for exterior woodwork and siding repairs adhere to nationally accepted historic preservation practices, and also take into consideration the unusually harsh environmental conditions experienced by the wood-framed structures in the Lighthouse complex.

The Keeper's House underwent a fairly comprehensive exterior restoration in the mid-1990s, where much of the clapboard siding and exterior trims were replaced in-kind. The work, which included restoring later-altered windows to their original configuration and carefully matching molding profiles, was completed to generally high standards. However, the cuts of wood and the choice of fastening hardware, which could be acceptable in other, less harsh situations, have led to paint failure, decay and corrosion of hardware due to the damp, saline environment.

General

1. Contractor Selection
 - a. Contractors will have at least five years of experience working with structures listed in the National Register of Historic Places
 - b. All personnel working on the project will have at least five years of experience with the tools, techniques and skills associated with restoration carpentry.
2. Certification and Compliance
 - a. All workmen will possess the requisite licensing, insurance and certification (particularly regarding EPA regulations for potential disturbance of lead paint)
 - b. All local regulations or ordinances regarding scaffolding, parking, public streets and right-of-way will be observed.
3. Documentation
 - a. Contractor will complete photographic documentation of existing conditions before treatment, as well as before, during and after each procedure, for submittal to YPR building files.
 - b. Contractor will submit a brief report at the end of the project describing the final scope of work and treatment methods used.
4. Removals
 - a. All damaged materials that require replacement or removal for repair will be carefully pried loose using a flat, thin prying tool such as a 9 1/2" example made by the Hyde Tool Company.
 - b. Care will be taken to use gentle pressure to pry near the fastening nails, breaking the purchase of the nails from the substrate.
 - c. All nails that will not extract with low to medium hand pressure, or without potentially cracking or breaking the wood, will be cut from behind with a

hand-held hack saw blade or a reciprocating saw such as a Fein® saw fitted with a metal-cutting blade.

- d. If using a power saw of any kind, care will be taken to cut slowly and in short increments. The purpose of this is to avoid heating the nail to the point where it may ignite surrounding wood.
- e. Many recent repairs utilize screws rather than nails. These should be extracted with a drill fitted with the correct bit profile for each type of screw.

5. Salvage and Disposition

- i. All damaged materials that require replacement or removal for repair will be carefully pried loose using a flat, thin prying tool such as a 9 1/2" example made by the Hyde Tool Company.
- ii. Care will be taken to use gentle pressure to pry near the fastening nails, breaking the purchase of the nails from the substrate.
- iii. All nails that will not extract with low to medium hand pressure, or without potentially cracking or breaking the wood, will be cut from behind with a hand-held hack saw blade or a reciprocating saw such as a Fein® saw fitted with a metal-cutting blade.
- iv. If using a power saw of any kind, care will be taken to cut slowly and in short increments. The purpose of this is to avoid heating the nail to the point where it may ignite surrounding wood.
- v. Many recent repairs utilize screws rather than nails. These should be extracted with a drill fitted with the correct bit profile for each type of screw.

6. Repair versus Replacement

- a. An element will be considered "salvageable" if:
 - i. It is a major architectural component, and
 - ii. It is determined to be an original component
 - iii. It exhibits structural integrity, meaning that decay is limited only to end-grain checking and isolated/ minor areas of decay penetrating 1/2" or less into the material.
 - iv. It is more than 75% sound.
- b. An element will be considered "unsalvageable if:
 - i. It is not original, and/or exhibits extensive decay, loss of profile or dimension, or is a secondary/ sacrificial component such as a clapboard.
 - ii. It can be repaired using a Dutchmen or graft only if greater than 75% of the existing element is otherwise sound, exhibits quality craftsmanship and materials. For example, a decayed section of corner board can be cut out and replaced if three feet or less of a twelve-foot length is damaged. If more than 25% of the element is damaged, consider full replacement.

7. Investigation

- a. All areas of woodwork repairs described below require further investigation to determine exactly where repair or replacement is warranted.
- b. All loose, peeling paint must be removed to allow inspection of the wood.

Repair Guidelines –Exterior Woodwork and Porch Components

The exterior woodwork on the Keeper’s House and the hyphen connecting it to the lighthouse tower exhibit a mix of surviving historic material and more recent replacement. These details are discussed in greater detail in the Conditions Assessment produced by Groundroot Preservation Group, LLC in May, 2016. By and large, deterioration in exterior woodwork is occurring in more recently replaced elements, which were fabricated with poor grades of lumber. This is particularly evident on the east elevation of the hyphen, where pine with many knots and high sapwood content has led to chronic paint failure, mold growth and the beginnings of decay. All such material should be replaced with high-grade, clear eastern white pine with 90% heartwood content or higher, and air-dried rather than kiln-dried.

The fastening hardware used in recent repairs is also a contributor to paint failure, staining and moisture infiltration. It consists of ferrous-metal nails and screws that corrode quickly in the saline environment and thus introduce moisture. Only stainless steel nails and screws should be used to install replacement elements. All existing, corroded hardware found in otherwise sound elements should be treated prior to re-painting. Instructions for these procedures are outlined in a separate Exterior Preparation and Painting specification.

- All elements deemed “salvageable” will be repaired and placed back in service.
- For damage to flat or unmolded trim elements, only areas effecting more than three linear inches of material should be repaired with a Dutchman or grafted new wood. For elements with less than three linear inches of damage, repairs should be executed with architectural epoxies.
- For damage to decorative moldings affecting less than 6 linear inches, repairs should be executed using epoxy to consolidate wood and reconstruct profiles.
- No repairs will be conducted unless the moisture content of the wood is at or below 14%.

8. Epoxy Consolidation and Repair

- a. Cut back all friable wood fibers to sound material with a sharp chisel.
- b. Treat all exposed wood fibers with a thorough application of Abatron Liquid wood®. Allow manufacturer’s recommended cure time. This product will consolidate the wood and serve as a bonding agent for the next step.
- c. Fill damaged areas with an elastomeric, exterior-grade, two-part wood epoxy such as PC Woody Wood Epoxy Paste®. Build up with as many layers as required; do not attempt to fill deep or thick areas with a single application.

- d. After the epoxy filler has cured, shape the epoxy using sharp chisels, SurForm® planes and sandpaper until the profile of the existing molding is matched exactly and the repair finished to flush, smooth grounds.
- e. Prior to re-installation, treat all end grain such as miters with an application of Abatron® Liquid Wood and allow to cure as per manufacturer's specifications. This will prevent water absorption at the end grain and will ensure longer-lasting paint films.
- f. In the instance of the decorative, scroll-cut brackets decorating the Keeper's House porch posts, several original and later replacement brackets exhibit cracking and checking along the direction of the wood grain. These elements should be considered "salvageable" and should be treated as follows:
- g. Inject all open cracks with CPES (Clear Penetrating Epoxy Sealer) using a syringe.
- h. Apply until the wood will no longer absorb the material.
- i. Allow CPES to cure as per manufacturer's specifications, then inject all of the same areas with Abatron Liquid Wood, using a syringe or pastry bag. Wipe off excess and allow to cure as per manufacturer's specifications.
- j. For the exposed butt-ends of the floorboards of the enclosed porch on the east elevation of the Keeper's House, which also exhibit significant end-grain deterioration, follow the procedures outlined in section f above.
- k. For any areas of grain cracking in the scroll-cut barge boards decorating the eaves, also see section f above.

9. Replacement

- a. In the event that damage is discovered that is greater than three linear inches for unmolded elements and greater than six linear inches for molded elements, spliced repairs or Dutchmen are required.
- b. Cut out damaged areas, making 45-degree miter or scarf cuts, the direction of the cuts pointing away from the prevailing wind for horizontal elements, and with the outer (thin) edge pointing downward for vertical elements.
- c. Match profile of existing molding exactly with replacement material. For most moldings this will require making a machine cutter head. The profile of the cutter will be matched to the contour of the original molding, which may require removal of paint layers to ensure a precise match.
- d. All new wood used for trim must be 100% heartwood white pine.
- e. All new wood must be thoroughly back-primed with a high quality alkyd primer prior to installation.
- f. Pre-treat the end grain exposures in existing crown cuts and end grain of new sections with Abatron Liquid Wood® prior to installation of repair and allow to cure, following manufacturer's specifications.

10. Installation

- a. Placement and spacing of fasteners in any replacement pieces will conform to the installation of original elements. For fascia and soffits this includes any use of backing supports or blocks.

- b. *Do not* re-use existing nail holes. All new fastening hardware will be installed a minimum of one inch away from existing holes.
- c. *Do not* attach new repair material to abutting original material with epoxy, glue, caulk, or other adhesive.
- d. Install replacement sections with stainless steel nails and trim screws of appropriate length so the screws will pass through the element and into the substrate material by 1½ inches.
- e. Pre-drill all hardware holes with a new, sharp drill bit of appropriate diameter for the screws.
- f. Set heads 1/16" below the surface and cover heads with exterior-grade wood filler such as Elmer's Exterior Grade Wood Filler ®. Also fill abandoned earlier nail holes. Sand flush.
- g. Prime all repair areas immediately with a high-quality alkyd primer.

Exterior Built-In Gutter Repair

The exterior, molded, built-in wooden gutters on the Keeper's House exhibit many sections of original material, with a number of areas of later in-kind replacement. Specific areas of decay are described in detail in the Conditions Assessment prepared by Groundroot Preservation Group, LLC in May, 2016. While these gutters are an important historic character-defining feature contributing to the building's design, they are a source of chronic leaks and decay. The causes are the harsh climate of the site; the initial gutter design, which is prone to chronic leaks and decay; and use of poorly-chosen and inadequately prepared material for areas of more recent replacement. In the short term these gutters should be properly repaired and maintained as historic details. In the long term, they should be taken out of service. When the time arrives to replace the roof covering on the building again, the design of the eaves should be modified and extended slightly to cover the gutters.

- All original elements deemed "salvageable" will be repaired and placed back in service.
- For damage to original sections of gutter that is localized, affecting more than three linear inches of material (usually found at gutter miters and locations of end-grain) the gutter should be repaired with a Dutchman or grafted new wood. For elements with less than three linear inches of damage, repairs should be executed with architectural epoxies.
- Sections of gutter identified as modern replacements that exhibit decay should be removed and replaced in-kind with new gutter material, made from high-grade, clear, air-dried eastern white pine that exhibits at least 95% heartwood content.
- No repairs will be conducted unless the moisture content of any new or old wood is at or below 14%.

11. Epoxy Consolidation and Repair

These directions apply to all areas of original gutter material that is deemed “salvageable”. This includes both original material and areas of more recent replacement that are of sufficient condition and quality to retain.

- a. All friable wood fibers should be cut back to sound material with a sharp chisel.
- b. Treat all exposed wood fibers with a thorough application of Abatron Liquid wood®. Allow manufacturer’s recommended cure time. This product will consolidate the wood and serve as a bonding agent for the next step.
- c. Fill damaged areas with an elastomeric, exterior-grade two-part wood epoxy such as PC Woody Wood Epoxy Paste®. Build up with as many layers as required; do not attempt to fill deep or thick areas with a single application.
- d. After the epoxy filler has cured, shape the epoxy using sharp chisels, SurForm® planes, and sandpaper until the profile of the existing molding is matched exactly and the repair finished to flush, smooth grounds.
- e. Prior to re-installation, all end grain such as miters will be treated with an application of Abatron® Liquid Wood and allow to cure as per manufacturer’s specifications. This will prevent water absorption at the end grain and will ensure longer-lasting paint films.

12. Replacement

- a. All friable wood fibers should be cut back to sound material with a sharp chisel.
- b. Treat all exposed wood fibers with a thorough application of Abatron Liquid wood®. Allow manufacturer’s recommended cure time. This product will consolidate the wood and serve as a bonding agent for the next step.
- c. Fill damaged areas with an elastomeric, exterior-grade two-part wood epoxy such as PC Woody Wood Epoxy Paste®. Build up with as many layers as required; do not attempt to fill deep or thick areas with a single application.
- d. After the epoxy filler has cured, shape the epoxy using sharp chisels, SurForm® planes, and sandpaper until the profile of the existing molding is matched exactly and the repair finished to flush, smooth grounds.
- e. Prior to re-installation, all end grain such as miters will be treated with an application of Abatron® Liquid Wood and allow to cure as per manufacturer’s specifications. This will prevent water absorption at the end grain and will ensure longer-lasting paint films.

13. Installation

- a. Placement and spacing of fasteners in any replacement pieces will conform to the installation of original elements. This includes any use of backing supports or blocks.
- b. *Do not* re-use existing nail holes. All new fastening hardware will be installed a minimum of one inch away from existing holes.

- c. *Only* attach new repair material to abutting original material with epoxy (see Section 4.1 above). *Do not* use glue, caulk, or other adhesive.
- d. Install replacement sections with stainless steel nails and trim screws of appropriate length so the screws will pass through the element and into the substrate material by 1 1/2 inches.
- e. Pre-drill all hardware holes with a new, sharp drill bit of appropriate diameter for the screws.
- f. Set heads 1/16" below the surface and cover heads with exterior-grade wood filler such as Elmer's Exterior Grade Wood Filler ®. Also fill abandoned earlier nail holes. Sand flush.
- g. Prime all repair areas immediately with a high-quality alkyd primer.

Exterior Clapboard and Sheathing Repair

Much of the exterior clapboard siding on the Keeper's House has been recently replaced. The chief problem with recently-replaced siding is corrosion of the nail heads used to fasten the material. Treatment of this issue is discussed in a separate Exterior Preparation and Painting specification. Also, the western red cedar material used in the last replacement episode, which is highly tannic, inherently resists proper paint adhesion. Mitigating this problem is also discussed in a separate painting spec.

- 14. Any areas of existing clapboards exhibiting cracks longer than 3 linear inches, or that exhibit end-grain decay should be replaced.
 - a. Replace using only vertical-grain Alaskan yellow cedar material.
 - b. Match thickness and weather exposure of the surrounding material exactly.
 - c. Thoroughly back-prime all new clapboards prior to installation with high-quality alkyd primer.
 - d. Prior to painting, douse all new clapboard surfaces with an application of lacquer thinner, applied with a brush or pump sprayer and allow to dry. This will cut the surface resin in the wood and promote better paint adhesion.
 - e. Install all new clapboards using only stainless steel nails. The length should be sufficient to allow 1 1/2 inches of penetration into the underlying substrate.

- 15. The vertical, molded bead board sheathing forming the east and west exterior coverings of the hyphen are recent replacements. Both elevations experience chronic paint failure. This is due to poor-quality wood, which features many knots and high sapwood content. Paint failure follows the lines of the sapwood. This is because the cellular structure of sapwood by nature absorbs moisture. These materials should be replaced in the long term. However, in the short term, they can be treated chemically so they better retain paint films and resist decay.
 - a. Scrape and remove all areas of failed paint using a sharp painter's Five-in-One tool.

- b. Treat all areas of exposed wood with CPES (Clear Penetrating Epoxy Sealer) until the wood will no longer absorb the material. Pay special attention to end grain, knots and sapwood.
- c. After observing cure times as per manufacturer's specifications, apply new primer and paint as per separate, Exterior Preparation and Painting specifications.

16. Threshold

- a. Replace the threshold in-kind with a new example made from a single piece of 100% heartwood white oak.
- b. Match the exact profile and dimensions of the existing threshold.
- c. Prior to installation, treat end grain and bottom surface with Clear Penetrating Epoxy Sealer (CPES).
- d. Install the new threshold over an apron of lead flashing, molded to the contour of the masonry substrate, and with a front drip edge of at least 1", bent downward against the underlying masonry.

17. Door Frame

- a. If the feet of the door frame exhibit decay that prevents secure contact with the threshold, repair using epoxies.
- b. Remove all friable wood to bright, sound material using a sharp chisel.
- c. Treat all exposed end grain with CPES until the wood will no longer absorb any material. Allow to cure as per manufacturer's specifications.
- d. Apply Abatron Liquid wood to the end grain. This will serve as a bonding agent for putty-type epoxy filler. Allow to cure as per manufacturer's specifications.
- e. Build up repair area to original grounds using PC Woody epoxy paste filler. This may take several applications. Allow to cure as per manufacturer's specifications between applications.
- f. Finish to grounds using a Surform plane, sharp chisels and sandpaper. Achieve a flush, uniform joint.

Exterior Window Restoration

The exteriors of most windows in the building require treatment of paint and glazing failure. We discovered no noteworthy areas of advanced decay or failure. Basic preparation, glazing touch-ups and repainting is recommended. Treatment does not require removal of any sashes.

18. Procedure for Windows

- a. Remove any protective aluminum storms. Label each one so it can be replaced to its original location using existing holes for fasteners.
- b. Remove all failed paint and glazing using a sharp scraper, taking extreme care not to score the wood.

- c. Follow EPA and State of Maine regulations the containment of lead paint.
- d. If any areas of decayed wood are discovered, repair using epoxy systems described in Section **Repair Guidelines –Exterior Woodwork and Porch Components**, 4.1 above.
- e. Replace any broken panes with single-strength glass.
- f. Replace missing glazing with a high-quality linseed oil glazing compound such as Sarco® Window Glazing Putty.
- g. Allow two full weeks of cure time for the putty before painting.
- h. Seal with a high-quality alkyd primer.
- i. Install two coats of high-quality high-gloss alkyd enamel. Overlap final coat 1/8” over the putty line and onto the glass to create a seal between the glazing and glass. Form neat, straight, painterly lines.
- j. Take care to avoid sealing the lower sashes shut with paint. After the paint has cured for 24 hours, run a sharp putty knife around all edges of the lower sashes where they touch the sills and parting strips to ensure that no paint dries and cures in the joints.