Painting

Best practices from Historic New England experts

Exterior paints, stains, and washes are sacrificial layers meant to protect the substrate and contribute stylistically to a historic building. Additionally, these finishes hold important information regarding the class, style, and historic practices of previous residents and serve as a record of how a building or structure has changed through time.

Any painting project should consider the documentation of earlier layers as important as creating the new layer.

Historic New England has created the following guidelines for exterior paint:

- Monitor and maintain the paint finish to prolong its life.
- Plan thoughtfully, considering issues like materials, preparation, the impact of activities on people and the landscape, and timing.
- Follow all appropriate EPA and OSHA guidelines and standards for the safe removal and disposal of paint.
- Prepare the surface in a manner that balances the potential need to retain earlier paint layers with the need to obtain the longest-lasting finish possible.
- Apply the paint using a method that will ensure a lasting quality finish.
- Document the completed project in a way that will help future generations learn about this particular process.

Painting Topics

- Exterior Paint Overview
- Exterior Paint Selection
- Exterior Paint Project Planning
- Guidelines for Exterior Paint Application
- Draft Specifications for Exterior Paint
- Painting Project Documentation
- Paint Analysis
- Historic Paint Bibliography
- Washing Exterior Surfaces

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Paint: Exterior Overview

Exterior Paint: Wood Surfaces

Exterior paints, stains and washes are sacrificial layers meant to protect the substrate and contribute stylistically to the building. Additionally, these finishes hold important information regarding the class, style and historic practices of previous residents and serve as a record of how a building or structure has changed through time. For these reasons documenting and retaining examples of paint finishes is crucial to the overall understanding of the structure or feature. Any painting project should consider the documentation of earlier layers as important as creating the new layer.

Guidelines for Exterior Paint

- Monitor and maintain the paint finish to prolong its life.
- Thoughtful planning taking into consideration issues like materials, preparation, the impact of the activities on persons and the landscape, and timing.
- Follow all appropriate EPA and OSHA guidelines and standards for the safe removal and disposal of paint.
- Prepare the surface in a manner that balances the potential need to retain earlier paint layers with the need to obtain the longest lasting finish possible.
- Apply the paint using a method that will ensure a lasting quality finish.
- Document the completed project in a way that will help future generations learn about this particular process.

Additional White Papers of Interest:

- Exterior Paint Selection
- Exterior Paint Project Planning
- Guidelines for Exterior Paint Application
- Project Documentation
- Historic Paint Bibliography
- Washing Exterior Surfaces

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Paint: Exterior Paint Selection

Exterior Paint Selection

Selecting the right paint is crucial to a long lasting finish and maintaining historical accuracy. Determining a paint that meets all necessary criteria can seem overwhelming with many manufacturers and mediums, but by investigating certain key topics it will help narrow the options.

Guidelines for Exterior Paint Selection

- The following should be considered when selecting the paint color:
  - What color paint was most recently on the building?
  - Has paint analysis been conducted for the site?
  - Is there a change in the period of interpretation?
  - Who manufactured the paint & when was it manufactured?
  - What was the color formula used and has the manufacturer changed their formula system?
- The following should be considered when selecting the type of finish:
  - Historical precedent for alternate finishes (white wash, stains, linseed oil paint).
  - Type of paint currently on the building: oil vs. latex.
  - Sheen of the paint: flat/matte, satin, gloss or high gloss.
  - State and Federal laws regarding VOC (volatile organic compounds) content.

Paint: Exterior Paint Selection

Technical Information for Exterior Paint Selection

The following should be considered when selecting the paint color:

- What color paint was most recently on the building?
    - When selecting the proper paint color, the color should be replaced in-kind unless there is a change in interpretive approach or research provides additional information.
    - Color information from past painting projects should be documented in project files and may also be found in the Paint Task Force files. If paint analysis has been performed, the color identified in that analysis should always take precedent over previously painted colors. Labeled paint sticks stored in the Lyman Carriage Barn may also provide information about paint history.
- Who manufactured the paint and what was the color formula used?
    - It is typically best to order paint from the same paint company as previously used and to provide the vendor with as much information as possible, including the paint color, number and formula used.
    - Determine when the building was last painted and if the manufacturer's color formula system has changed.
    - If it is desirable to switch paint manufacturers, provide the new shop with a sample of the paint (i.e. shingle, piece of clapboard, or a draw down card) for color matching. Though several manufacturers will claim that they can match other companies' formulas, this is the best method to ensure color match.
- Has paint analysis been conducted for the site?
    - Paint analysis can provide details on the color and make-up of the finish during the period of interpretation;
    - Paint analysis can also provide color matches in the form of the closest commercially available match, a CIE L*a*b match and a Munsell match.
    - If no paint analysis has been conducted at the site, determine if this paint project is the appropriate opportunity to obtain a chromachronology.
    - If obtaining paint analysis, also request draw down cards with the correct color along with the Munsell color match and large-scale color chips to document the color choice.
    - If a Munsell color is matched make sure to document the store and color formula for better consistency in the future.
    - It is generally accepted that if there is a commercial match that accurately represents the historic color then that color should be used. If no commercially available color matches the color identified during analysis, a custom mix must be obtained.
- Is there a change in the period of interpretation?
    - If there is to be a change in paint color, the Proactive Preservation and Interpretation Planning committee (PPIP) must be consulted and will ultimately make the final decision.
    - If a change is proposed, the rationale will need to be documented and paint analysis will likely be required.

- Testing
    - Prior to painting the entire surface paint a small area to ensure that the paint matches the desired color.

The following should be considered when selecting the type of finish:

- Historical precedent for alternate finishes (whitewash, stains, linseed oil paint).
    - During the period of interpretation, was the feature white washed or stained instead of painted?
    - Returning to these finishes can have maintenance implications that should be addressed.
- Type of paint currently on the building: oil vs. latex.
    - When choosing an oil or latex product, determining the existing paint material is important as mixing the paint types can cause failure due to different drying methods and coefficients of expansion and contraction.
    - If switching paint types from oil to latex, an alkyd primer should be used.[1]
- Sheen of the paint: flat/matte, satin, gloss, or high gloss.
    - The paint's sheen can dramatically impact the way the color appears, changing the appearance of the surface. It is crucial to match the existing sheen especially when painting only a portion of the surface—the wrong level of gloss could make the new paint seem awkward and incorrect.
- State and Federal laws regarding VOC (volatile organic compounds) content.
    - Oil paints have been used traditionally in exterior applications, but they are becoming harder to buy as state and federal laws regarding volatile organic compounds (VOC's) render some oil paints illegal.
    - A full phase-out of oil paints is likely in the near future, so the switch to latex water based paints is inevitable.

[1] George Nash, *Renovating Old Houses*. The Taunton Press: Newtown, 1998. pg. 204.

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Paint: Exterior Paint Project Planning

Exterior Paint Project Planning: Wood Surfaces

A successful painting project relies heavily on proper and thorough project planning. Evaluating the substrate and testing different methods for washing the structure, removing paint and applying new paint are crucial to the primary goals of the project: ensuring strong adhesion while at the same time retaining historic paint wherever possible. Researching is also an important part of project planning and can help the project manager to determine previous colors used and if paint analysis has been conducted at the site. Review the project with colleagues and obtain all necessary internal reviews to promote full documentation for future painting projects.

Guidelines for Paint Project Planning

- Determine if approvals from a Historic District Commission are required prior to beginning work.
- Evaluate condition of substrate and determine if repairs are necessary.
- Evaluate scheduling constraints.
- Determine if additional projects can utilize staging.
- Determine the best method for washing the surface.
- Determine if removal of the paint layer is necessary.
- Determine an appropriate method for removal.
- Review what type of historic paint documentation exists for the structure and the need for new documentation.
- Determine the type of paint to use. (See "Exterior Paint Selection" White Paper)
- Determine the best application method.
- Review with landscape staff the recommended protection for shrubs and grass.
- The majority of paint finishes on historic buildings contain lead and removal should be done in compliance with all applicable EPA and OSHA regulations.
- Complete a project review form documenting the various aspects of the project and consult with the Paint Task Force.

Paint: Exterior Paint Project Planning

Technical Information for Exterior Paint Project Planning

Determine if approvals from a Historic District Commission are required prior to beginning work.

- If the property where work is occurring is located within a historic district, research the ordinance fully or call the local preservation planner to determine if this work requires review.
- Often painting the same color does not require review, but in some localities it requires an administrative or full commission review; if changing the color, review is more likely.

Evaluate condition of substrate and determine if repairs are necessary.

- If the substrate is damaged (i.e. split clapboards, damaged watertable, or rotting trim) determine if it is feasible to conduct those repairs prior to painting.
- Mitigating damage before covering it with a finish is always preferable; however there will be instances where painting a damaged surface becomes necessary. Fiscal limitations might not allow for the proper repair, but adding a protective coating can, in many cases, still help extend the life of the resource.

Evaluate scheduling constraints.

- Paint should not be applied when the temperature of the surface and surrounding areas is below 50^{o} Fahrenheit.
- Ideally, painting should happen in the shoulder seasons prior to June 15 or post October 15.
- Special programs and events at the site should also be considered when scheduling work to ensure a safe environment for all involved parties.

Determine the best method for washing the surface.

- Referring to the White Paper on Washing Exterior Structures, determine the best method of washing for the surface.
- Test the different techniques and evaluate condition prior to selecting the method; note that the gentlest way is the best way.

Determine if removal of the paint layer is necessary.

- Whenever possible, paint should not be separated from the substrate; only when paint is physically failing should it be removed.[1]
- Paint that is faded but otherwise intact should not be removed.
- In certain situations in order to provide a solid ground onto which to apply a new layer or series of layers, paint must be removed.
- The following should be considered when determining if paint removal is necessary:
    - Condition: Is the finish blistering or peeling? Has the substrate been exposed?
    - Can paint be removed to the next sound layer?
    - Documentation: Has paint analysis been performed?

[1] Kay D. Weeks & David W. Look, Preservation Briefs #10 *Exterior Paint Problems on Historic Woodwork.* The National Park Service: Washington, D.C., 1982. available at <http://www.nps.gov/history/hps/tps/briefs/brief10.htm>.

Determine an appropriate method for removal.

- The following should be considered when selecting a finish removal method:
  - Type of Material: Is this finish applied to wood, stone, brick, or another material?
  - Condition: Is the area brittle or damaged?
  - Prior Treatments: What has been done before and was it successful?
- Whenever possible, paint should be removed by hand-scraping the surface.
  - Paint should only be removed until the next sound layer is reached.[2]
- Do not use abrasive blasting or power/pressure washing to remove paint from wood or masonry.
- If full paint removal is required, infrared strippers can be considered, but they are still a risk and should only be used by trained professionals using a high level of care.
- If a smaller architectural fragment has been detached from the structure and full paint removal has been deemed necessary, a heat gun may be used. Heat guns and infrared strippers should only be used with the utmost care.
  - Heat guns should never be used on an element when it is *in situ* and should always be used on the lowest setting.
- On rare occasions when full paint removal is required on an element no longer attached to the building, a chemical stripper can be considered.
  - When stripping paint using this method, Historic New England typically avoids using methylene chloride because it is highly caustic and requires strong neutralization.
  - Preference should be given to an environmentally-friendly stripper,
  - Always test the product on a small patch to see how it performs and determine if it will be the best removal method for the situation. Also determine the neutralization requirements of the stripper to ensure paint adhesion in the future.
  - Proper ventilation is a necessity when using chemicals for removal.

- Sanding
  - Sanding has a three-fold purpose in painting: it removes additional paint, scarifies the surface enabling better adhesion and provides a smooth transition from existing layers of paint to the substrate.
  - Hand sanding is always the preferred method.
  - Finish palm sanders or random orbital sanders are permitted when feathering edges and removing multiple layers of paint, but they must be used with extreme caution because they can easily mar the surface.
    - Plan on regular quality control inspections.
  - If using a random orbital sander, it should be placed on the substrate, turned on, then remain in contact with the substrate during the process, turned off and removed from the substrate.
    - Turning the sander "on" or "off" prior to making contact with the wood or after removing it from the wood can result in circular marks.

[2] Kay D. Weeks & David W. Look, Preservation Briefs #10 *Exterior Paint Problems on Historic Woodwork.* The National Park Service: Washington, D.C., 1982. available at <http://www.nps.gov/history/hps/tps/briefs/brief10.htm>.

- Plan on regular quality control inspections.

Review what type of historic paint documentation exists for the structure and the need for new documentation.

- Retaining a record of paint history *in situ* is always preferable and standardized locations make finding complete areas of paint history simpler.
- Retaining representative paint samples in standardized locations aids future generations in finding complete examples of paint history. Samples are to be retained in the following locations whenever possible:
  - Windows: leave a 1" x 1" square in the upper right corner of the top rail and on the top right corner of the window hood or casing.
  - Siding: leave the upper three courses of siding intact with the original finishes.
  - Trim: leave a 3" x 3" square in the upper right corner of the trim element wherever possible.
- Not every architectural element falls into the above categories and will likely have to be addressed on a case-by-case basis.
  - In those instances, when determining a sample area, select a section which is shaded, protected (e.g. inside the raking molding or between dentils), and not prone to mildew growth.
- In situations where paint will be removed, documentation through the professional collection of paint samples for paint analysis is required.
- Always document areas where paint was retained in the project completion report.

Review with landscape staff the recommended protection for shrubs and grass.

- Always protect the landscape with plastic and collect paint fragments removed during surface preparation in accordance with applicable EPA & OSHA regulations.
- Emphasize staging areas with plastic only when work is physically happening.
  - Prolonged covering of grass and shrubs will cause damage to the vegetation below especially in areas receiving direct sun.
    - Be mindful during budgeting that grass may need to be reseeded.
    - Try to avoid damage to any plant larger than grass.

Paint: Exterior Paint Project Planning

Select paint and method for application best suited to the project.

- Select paint according to "Exterior Paint Selection" White Paper.
- To promote a long-lasting finish, the paint should be applied using the method recommended by the manufacturer, but finished with a brush unless a more modern approach is historically accurate.

The majority of paint finishes on historic buildings contain lead and removal should be done in compliance with all applicable EPA and OSHA regulations on the subject.

- Be mindful of lead paint hazards and perform all work that disturbs lead-containing paint in accordance with applicable federal, state and local laws & regulations.
- As of April 22, 2010 stricter laws involving lead paint removal took effect.

Complete all necessary internal reviews.

- Complete Project Review Form and submit for Paint Task Force Review.

Additional White Papers of Interest:

- Exterior Paint Overview
- Exterior Paint Selection
- Guidelines for Exterior Paint Application
- Project Documentation
- Bibliography
- Washing Exterior Surfaces

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Paint: Exterior Paint Application

Exterior Paint Preparation and Application

Paints, stains and washes are sacrificial layers meant to protect the substrate and contribute stylistically to the building. Additionally, painted surfaces act as historic records showing how a building or structure has changed through time and that paint history should be preserved for future generations. With extreme temperatures, exposure to ultra violet rays and moisture, exterior paint periodically fails detracting aesthetically from the surface and exposing the substrate to conditions which will hasten deterioration. When applying a finish to any historic exterior surface, analysis of paint history, proper preparation, and appropriate applications should be utilized in order to create a long lasting finish which can be replicated in the future.

Guidelines for Exterior Paint Preparation and Application

General Site Conditions

- Take precautions to protect visitors, staff, the workers and the landscape from various dangers on site.
- Follow the manufacturers' standards for application of the finish, paying close attention to weather conditions and the moisture content in the surface.

Surface Preparation

- Evaluate substrate for potential repairs which would adversely impact the success of the project.
- Clean the surfaces of organic matter and other soiling.
- Remove failing paint layers from the surface until a sound layer or the substrate is reached. Most Historic New England painting projects will attempt to retain earlier layers of paint in order to retain the historical perspective of the paint chronology.
- The surface should be hand sanded and the edges feathered to provide a smooth transition from the layers of paint to the substrate.
- Evaluate if consolidant should be used to repair the wood substrate.
- If a wooden substrate is exposed and appears weathered, dry, or brittle it should be treated with a wood rejuvenator in an effort to reinvigorate the wood.

Priming and Finish Paint

- Follow the manufacturers' standards for the finish paying close attention to weather conditions, the moisture content in the surface, drying times of the finish and application standards for the finish.
- Determine the application method for the primer and paint finish.
- Apply at least one coat of primer by using a brush.
- Seal all joints or gaps around doors and windows and any vertical joints. Do not seal along horizontal clapboard laps.
- Prior to applying the finish coats, lightly sand the surface as areas may be rough or fuzzed.
- Apply the finish coats according to manufacturer's specifications always completing the job with a brush application.

Technical Information for Exterior Paint Preparation and Application

General Site Conditions

Take precautions to protect visitors, staff, the workers and the landscape from various dangers on site.

- It should be assumed that most work on the historic houses will involve lead paint. Any surface preparation dealing with older paints should employ up to date EPA and OSHA guidelines.
- Follow all manufacturers' guidelines and instructions for material handling.
    - All material safety data sheets are to be available and copies kept on site until completion.
    - All personnel using materials are to be familiar with information contained within, and proper safety precautions are to be followed.
- Make certain that the painter contacts the power company and has any power lines coming into the building protected to avoid electrocution risks.
- All materials on site shall comply with fire safety standards. Take all necessary precautions to prevent fire and spread of fire.
- All waste products to be removed from the site daily and the site cleaned to original condition upon completion of project.
- The site shall be kept clean and free of debris, paint chips, and all equipment; the work area shall be cleaned in an orderly fashion before work completion daily.
- Protect the landscape with drop cloths and cover areas that should not receive paint.
- Every effort shall be made to accommodate the reasonable needs of the Historic New England site personnel in relation to scheduling.

Follow the manufacturers' standards for the finish paying close attention to weather conditions and the moisture content in the surface.

- Weather Conditions
    - The proper weather conditions are the key to a successful project as temperatures and humidity have a significant impact on paint.
    - Do not apply finishes when the temperature of surface and surrounding areas is below 50° Fahrenheit unless otherwise permitted by the manufacturer's instructions.
    - Do not apply finishes in snow, rain, fog or mist;
    - Do not apply when the relative humidity exceeds 85%;
    - Do not apply to damp or wet surfaces.
- Moisture content of the surface
    - Prior to painting, the moisture content should be tested in several areas on each of the surfaces to be painted and must be 13% or less.

Surface Preparation

Clean the surfaces of organic matter and other soiling.

- If the area needs to be washed or have organic material removed, refer to the "Washing Exterior Structures" white paper.

Remove failing paint layers from the surface until a sound layer or the substrate is reached. Most Historic New England painting projects will attempt to retain earlier paint layers in order to retain the historical perspective of the paint chronology.

- Retain a section of the chromachronology intact in a predetermined area.
- Historic New England shall only approve the stripping to bare wood on buildings where paint adhesion is a proven issue and where paint analysis has been performed.
- Should a noticeably complete layering of paint history be discovered during work, care will be taken to document this discovery and collect samples if desired.
- The following should be considered when selecting a finish removal method:
    - Type of Material: Is this finish applied to wood, stone, brick, or another material?
    - Condition: Is the area brittle or damaged?
    - Prior Treatments: What has been done before and was it successful?
    - Whenever possible, paint should be removed by hand-scraping the surface.
- Paint should only be removed until the next sound layer is reached.[1]
- Do not use abrasive blasting or power/pressure washing to remove paint from wood or masonry.

<u>Mechanical</u>

- Scrape with hand tools all other surfaces exhibiting areas of loose or peeling paint, and areas of adhesion failure

<u>Heat</u>

- If areas have been specified to be stripped bare of paint, this will be accomplished by use of an infrared heater or steam.
- Infrared heat will be used according to manufacturer's instructions and with care never to overheat wood.
- No heat guns will be used on architecture in situ.
    - If a smaller architectural fragment has been detached from the structure and full paint removal has been deemed necessary, a heat gun may be used. Heat guns and infrared strippers should only be used with the utmost care.

<u>Chemical</u>

- On rare occasions when full paint removal is required on a detached element, a chemical stripper can be considered.
    - When stripping paint using this method, Historic New England typically avoids using methylene chloride because it is highly caustic and requires strong neutralization.
    - Preference should be given to an environmentally-friendly stripper,

[1] Kay D. Weeks & David W. Look, Preservation Briefs #10 *Exterior Paint Problems on Historic Woodwork.* The National Park Service: Washington, D.C., 1982. available at <http://www.nps.gov/history/hps/tps/briefs/brief10.htm>.

- Always test the product on a small patch to see how it performs and determine if it will be the best removal method for the situation.
- Also determine the neutralization requirements of the stripper to ensure paint adhesion in the future.
- Proper ventilation is a necessity when using chemicals for removal.

The surface should be hand sanded and the edges feathered to provide a smooth transition from the layers of paint to the substrate.

- The preference is always hand sanding.
- Finish palm sanders or random orbital sanders are permitted when feathering edges and removing multiple layers of paint, but they must be used with extreme caution because they can easily mar the surface.
  - Plan on regular quality control inspections.
- If using a random orbital sander, it should be placed on the substrate, turned on, then remain in contact with the substrate during the process, turned off and removed from the substrate.
  - Turning the sander "on" or "off" prior to making contact with the wood or after removing it from the wood can result in circular marks.
  - Plan on regular quality control inspections.

If a wooden substrate is exposed and appears weathered, dry, or brittle it should be treated with a wood rejuvenator in an effort to reinvigorate the wood.

- For rotted and deteriorated areas:
  - Remove deteriorated material and retain as much original fabric as possible.
  - If wood consolidant must be applied use an Owner approved two-part, non-styrene epoxy system.
  - In areas to be filled and repaired use of a two-part, non-styrene epoxy system and fairing compound is preferred.
    - Patched areas are to be tooled to original appearance.
    - All holes, cracks, and penetrations where water might invade must be treated.
- If an application of wood treatment is deemed necessary prior to an application of paint, Historic New England will determine or approve the product to be used.
  - A boiled linseed oil based product is typically used and should be applied by flooding surface until saturation is reached, care should be taken to keep application off existing painted surfaces, or sanding of the product will be necessary before paint application. Excess should be wiped off the surface.
  - Surfaces must be allowed to dry a minimum of 24-48 hours.

Priming & Finish Application

Follow the manufacturers' standards for the finish paying close attention to weather conditions, the moisture content in the surface, drying times and application standards for the finish.

- Weather Conditions
  - The proper weather conditions are the key to a successful project as temperatures and humidity have a significant impact on paint.
  - Do not apply finishes when the temperature of surface and surrounding areas is below 50° Fahrenheit unless otherwise permitted by the manufacturer's instructions.
  - Do not apply finishes in snow, rain, fog or mist;
  - Do not apply when the relative humidity exceeds 85%;
  - Do not apply to damp or wet surfaces.
- Moisture content of the surface
  - Prior to painting, the moisture content should be tested in several areas on each of the surfaces to be painted and must be 13% or less.
- Drying times of the finish
  - Wait at least 4-24 hours, or the length of time suggested by the manufacturer, after the primer coat is applied before proceeding with any additional paint application.
- Application Standards
  - When applying the primer, always apply at least one coat and ensure that it is applied at not less than the recommended spreading rate to provide the dry film millimeter thickness specified by the manufacturer for each coating.
  - Typically one coat of primer is sufficient, but more may be necessary to cover the substrate satisfactorily.
  - When installing new wood, it should be primed on all sides to increase its resistance to moisture damage. Some items can be purchased pre-primed on all sides.
  - Primer must be followed by finish paint within a period of 4-6 weeks or re-priming will be necessary.

Determine the application method for the primer and paint finish.

- Paint can be applied using the method best suited for the application: brush, roller, or spray but in order to achieve a historically appropriate look, and proper coverage, all paint should be finished with a brush, unless a more modern historically appropriate method is identified.

Paint: Exterior Paint Application

Apply at least one coat of primer by using a brush.

- The entire surface should be primed using a brush or other historically appropriate method.
- New wood should be primed on all sides to protect it from moisture infiltration.
- Exposed nail heads to be spot primed with a rust inhibitor.
- Do not apply primer when the temperature and relative humidity are not ideal.
- All primer should be applied at not less than the recommended spreading rate to provide the dry film millimeter thickness specified by the manufacturer for each coating.
- Apply additional paint coating where undercoats, stains, or other conditions show through paint film, until uniform finish color is achieved.
- Wait at least 24 hours after the primer coat is applied before proceeding with any additional paint application.

Seal all joints or gaps around doors and windows and any vertical joints. DO NOT seal along horizontal clapboard laps.

- Use only a latex caulk for these purposes. Latex allows for a reversibility of the treatment.
- If the joint is larger than $^{1}/_{8}$", a repair may be necessary.
- Be mindful that caulk does fail and it can trap water behind it, accelerating rot.
- Under no circumstances should the caulk be used along horizontal clapboard laps as this space allows moisture to escape.

Prior to applying finish coats, lightly sand rough or fuzzed areas.

- Do not expose the substrate or re-priming will be necessary.
- Finish palm sanders or random orbital sanders are permitted when feathering edges and removing multiple layers of paint, but they must be used with extreme caution because they can easily mar the surface and can easily remove earlier layers of paint.

Apply the finish coats according to manufacturer's specifications always completing the job with a brush application.

- All paint is to be finished by brush application.
- Typically two finish coats are to be applied.
    - Apply each coat at not less than the recommended spreading rate to provide the dry film millimeter thickness specified by the manufacturers' instructions for each coating.
    - If undercoats, stains, or other conditions show through paint film, apply additional paint coats until uniform finish color is achieved.

Historic New England Exterior Paint Specification for Wood

SECTION 09 00 00

Note: Not all items in this document will apply to every painting project. Italicized sections are meant to be reviewed, eliminated, added-to or specified.

FINISHES

SECTION I—GENERAL

1.1—RELATED DOCUMENTS

A. *Related Documents*: The general provisions of the Contract, including Section 01 00 00 General Requirements; Section 08 01 52.71 Wood Window Rehabilitation; Section 06 40 13 Exterior Architectural Woodwork; Annotated Project Photographs, Drawings and any other related Construction Documents apply to the work specified in this section.

1.2—DESCRIPTION OF WORK

A. The extent of Exterior Painting includes, but is not limited to the following:
   1. All work to conform to current OSHA and EPA standards for lead paint removal.
   2. Assess substrate and determine if conditions require repair or may otherwise adversely impact the success of the project.
   3. Wash all surfaces to be painted using Owner approved solution.
   4. Scrape loose paint by hand; retain paint where directed by Project Manager.
   5. Sand surface and feather edges to provide a smooth transition between layers of paint accumulation.
   6. Apply one coat of primer using method best suited for application; finish by brush. Spot prime all nail heads with a rust inhibitor. Caulk all joints or gaps 1/8" or less around doors, windows, or vertical joints of siding using latex caulk.
   7. Lightly sand rough or fuzzed areas by hand.
   8. Apply at least two finish coats of paint using method best suited for application; finish by brush. Ensure full coverage and uniform color by applying additional coats as required.
   9. Review areas indicating stains due to corrosion of hardware.
   10. Glaze and paint sash where directed.
   11. Remove, label, assess, paint and reinstall shutters where directed.
   12. Paint and label owner provided sample paint sticks.

B. The intent of this work shall be to provide a very high quality, durable paint finish, while preventing any removal, destruction or adverse affects to the historic substrate.

C. Work will include completion of Owner provided daily job reports detailing weather and daily site activities.
D. Digital photographs of 300 dpi or greater showing work undertaken when Owner is not present.
B. The work includes preparation and painting with a three coat system (prime and finish coating) of exterior exposed materials and surfaces of all exterior surfaces and finishes.
C. Paint as used herein means all coating systems materials, including primers, emulsions, enamels, sealers, and other applied materials used as a primer or finish coating.
D. A coat refers to an application of paint at the required millimeter. thickness for each coating applied, as specified by the manufacturer.
E. Paint all exposed surfaces whether or not colors are designated, except where the natural (unpainted) finish of the materials is obviously intended and specifically noted as a surface not to be painted. Where items or surfaces are not specifically mentioned consult with Owner for direction as these areas will likely be painted the same as adjacent areas or material.
F. No samples shall be required for this work, unless specified by contract documents.

1.3 – TEMPORARY FACILITIES AND CONSTRUCTION AIDS

A. Temporary Facilities: Contractor is responsible for installation and maintenance of portable toilet; location to be determined with Owner prior to start of project. Portable toilet must be removed within one week following the accepted completion of the work.
B. Scaffolding:
   1. Contractor to set up OSHA approved staging if necessary at elevations as outlined in a pre-determined schedule. The schedule shall be subject to the approval of the Owner.
   2. Scaffolding will remain in place until the accepted completion of the job or a specific portion of the job, and removed within one week of accepted completion of the work.
   3. Any holes made for attaching scaffolding to the house are to be filled and repaired in a method approved by the Owner.
C. Dumpster: Contractor to coordinate the installation and removal of construction dumpster for debris. Approved location of dumpster onsite to be determined by Contractor and Owner.

1.4 – PROJECT MANAGEMENT

A. Documentation and Communication: Contractor shall create reports based on details uncovered during the Project work not already outlined in the specifications. Work shall be photographed by Contractor when Owner is not on-site. Photographs shall be at least 300 dpi. Details and suggested repair options shall be photo documented and submitted to the Owner for review.
B. Weekly Meetings: Contractor, Owner, and possible advisors and/or subcontractors to the Project are to meet on a weekly basis, which will include a site walkthrough and roundtable discussion of progress.

1.5 – SUBSTITUTIONS

A. Owner's Approval Required:
   1. The Owner will consider proposals for substitution of materials, equipment, and methods only when such proposals are accompanied by full and complete technical data and all other information required.
   2. Do not substitute materials, equipment or methods unless such substitution has been specifically approved in writing for this work by the Owner.
B. Availability of Specified Items:
   1. Verify that all specified items will be available in time for installation during orderly and timely progress of the work.
   2. In the event specified item or items will not be available on a timely basis, so notify the Owner.

1.6 – SUBMITTALS

A. Submit manufacturer's literature and data on any relevant materials.
B. Sumbit manufacturer's warranty information.
C. Submit completed daily job reports provided by Owner detailing work accomplished each day, trades present, and the weather.
D. Submit digital photographs of at least 300 dpi or greater detailing each step of work.
E. At project completion, a minimum of 1 quart of each type and color of paint/primer from the same production run (batch mix) used will be left, properly labeled and identified, and dated for Owner's later use in maintenance. Store where directed. Color formulas and vendor information for each color used will also be given to Owner for future reference.
F. Submit labeled paint stick (provided by Owner), .

1.7 – PROTECTION

A. Perform all work that disturbs lead-containing paint (LCP), handle all material that involves lead-containing paint, and transport and dispose of all lead-containing paint and residue in compliance with all applicable federal, state, and local laws and regulations for identification, removal, labeling, handling, containerization, transportation, and disposal of lead-containing material.
B. Provide protection for roofs, entrances, windows, walls and landscape as necessary to prevent damage during entire course of work of this Section.
C. Repair or replace to Owner's satisfaction all building elements and materials damaged by weather resulting from openings that did not sufficiently exclude weather at no additional cost.
D. Provide protective barriers to ensure the safety of visitors and site staff.
   1. Take all the safety of passersby near scaffolding and work areas. This includes setting up cones and safety tape as a barrier to block off areas as needed.
E. Take all necessary precautions to protect all persons, whether engaged in work of this Section or not, from all hazards of any kind associated with the work of this Section.
F. Take all necessary precautions to prevent fire and spread of fire.
G. Provide a properly rated 10 lb. fire extinguisher close by all workstations.
H. Provide adequate ventilation during use of volatile or noxious substances.
I. All MSDS are to be available and copies kept on-site until Project completion. All persons using materials are to be familiar with information contained within the documents and proper safety precautions are to be followed.

1.8 – QUALITY ASSURANCE

A. General: Painting Contractor shall be skilled and experienced in this type of painting and equipped to perform workmanship in accordance with industry standards, manufacturer's specifications and all applicable building codes.
   1. Employ only tradespeople experienced in painting.
   2. Any subcontractors used are subject to the approval of the Owner.
B. Materials: Obtain all paint from one manufacturer, at the same time, and from the same distributor to ensure homogeneity of manufacture and formula.
   1. All materials will be used according to manufacturer's specifications and standard industry practices.
   2. Contractor shall ensure that all project materials are protected from adverse weather during construction.
C. Prior to beginning any work, evaluate substrate and notify Owner of conditions which require repair or may otherwise adversely impact the success of the project.

1.9 – PRODUCT HANDLING

A. All products shall be stored and installed in a manner which upholds the manufacturer's warranty unless directed to do otherwise by the Owner.
B. All materials will be delivered to the site in their original containers baring manufacturer's label and instructions.

1.10 – JOB CONDITIONS

A. Pre-work Conference: Prior to the initiation of any work, meet at the project site with the Contractor, all approved subcontractors, and the Owner to discuss the project. Owner will record the discussions of the conference and the decisions and agreements (or disagreements) reached, and furnish a copy of the minutes to each party. Review foreseeable methods and procedures related to the painting work, including byt not necessarily limited to the following:
   1. Review project requirements (Specifications and other Contract Documents).
   2. Review required submittals, both completed and yet to be completed.
   3. Review availability of materials, tradespeople, equipment and facilities needed to make progress and avoid delays.
   4. Review weather and forecasted weather conditions, and procedures for coping with unfavorable conditions, including the possibility of temporary coverings.
   5. Review procedures needed for protection of the building during the remainder of the construction period.
   6. Review staging strategy if required.
   7. Verify all quantities, dimensions and materials in the field.
B. Weather Condition Limitations: Proceed with work only when weather conditions will permit unrestricted use of materials, ensure quality control and ensure water will not enter the building envelope. All installation procedures must comply with standard construction practices and manufacturer's recommendations where applicable.
C. Examination of Substrate: The Contractor must examine the substrate and other conditions within which the repairs are to be performed, and notify the Owner of any unsatisfactory conditions. Do not proceed with any work until unsatisfactory conditions have been corrected in an acceptable manner and approved by the Owner.
D. Weekly Site Meetings: Meet weekly with Owner to review work performed, challenges encountered or anticipated, and upcoming work. Project Manager will record the discussions of the conference and the decisions and agreements (or disagreements) reached, and furnish a copy of the minutes to each party.
E. Every effort shall be made to accommodate the reasonable needs of the Historic New England site personnel in relation to scheduling.

SECTION II – PRODUCTS

2.1 – MATERIALS

A. Cleaning:
   1. Gentlest means possible should be utilized. Attempt to use water at a pressure less than 60 psi and a natural bristle brush before moving on to a harsher means.
   2. If stubborn biological staining exists, a 3:1 hot water: bleach mixture should be applied by handheld compression tank sprayer or by hand with a natural brush. Thoroughly rinse the area with clean water at a pressure of less than 60 psi.
   3. The use of tri-sodium-phosphate (TSP) or other products containing phosphates or sodium (soluble salts) is forbidden.

B. Paint Removal:
   1. Mechanical: Scrape with hand tools all surfaces exhibiting areas of loose or peeling paint, and areas of adhesion failure. Hand sanding after scraping is preferable using a grit no lower than 80, but appropriate to achieve a smooth surface but not remove substrate. Sandpaper should be industrial, open-coat. Random orbital or palm sanders may be used, only following agreement by owner, so long as no or very minimal removal of existing substrate results. Any sander must have attached dust collector.
      a. Sand paper of the appropriate grit should also be used to sand rough or fuzzed areas left after priming—but should not expose substrate.
   2. *Heat*: If areas have been specified to be stripped bare of paint, this will be accomplished by an infrared heater or steam. No heat guns will be used on fragments in situ.
   3. *Chemical*: Chemical strippers shall be reserved for use in special situations, and shall never be used unless specified according to the scope of work of the contract documents. If a chemical stripper is used, preference will be given to an environmentally friendly product; no methylene chloride strippers shall be used. Chemical strippers shall never be used in situ.

C. Wood Treatment:
   1. For rotted and deteriorated areas, utilize a two-part wood epoxy consolidant applied per manufactures' directions. No styrene products should be used.
   2. If an application of wood treatment is deemed necessary prior to application of paint, Historic New England will determine or approve the product to be used.

D. Primer:
   1. Primer shall be (*Primer Manufacturer, Primer Color, Primer Number, Primer Sheen*). All primer shall be obtained from the same vendor at the same time.

E. Caulk:
   1. Should caulk be necessary, it shall be latex based and approved by the Owner.

F. Paint:
   1. Paint shall be (*Paint Manufacture, Paint Color, Paint Number & Paint Sheen*). All paint shall be obtained from the same vendor at the same time.

SECTION III – EXECUTION

3.1 – GENERAL PROCEDURES

A. Perform preparations and cleaning procedures in strict accordance with manufacturer's instructions and as herein specified, for each substrate condition. Progression of work from preparation to priming and painting shall proceed in a timely fashion so as to not allow time for bared, prepped, or primed, unfinished or incompletely finished substrate to dwell unnecessarily in the weather before receiving finish coats.

B. The goal of any painting project shall be to provide a very high quality, durable paint finish, while retaining as much of the paint history as possible and protecting the historic substrate from any unnecessary or adverse damage.

C. Take all necessary precautions to protect building elements and finishes from damage by precipitation during work of this Section.

D. Every effort shall be made to accommodate the reasonable needs of the Historic New England site personnel in relation to scheduling.

E. Every effort shall be made to protect any and all landscaping from harm.

F. Do not apply material when temperature of surface and surrounding areas is below 50 degrees F, unless otherwise permitted by manufacturer's instructions.

G. Do not apply paint in snow, rain, fog or mist; or when the relative humidity exceeds 85%; or to damp or wet surfaces. The moisture content of the surfaces to be painted must be 13% or less. Moisture content will be tested in several areas of each elevation prior to the application of any paint materials.

H. All manufacturer's printed instructions are to be followed unless otherwise instructed in this document or by the Owner directly.

I. Perform all work that disturbs lead-containing paint, handle all material that involves lead-containing paint, and transport and dispose of all lead-containing paint and residue in compliance with all applicable federal, state and local laws containing paint and residue in compliance with all applicable federal, state and local laws and regulations for identification, removal, labeling, handling, containerization, transportation, and disposal of lead-containing material.

J. All materials shall comply with fire safety standards. Take all necessary precautions to prevent fire and spread of fire.
K. The site shall be kept clean and free of debris, paint chips, and all equipment; the work area shall be cleaned in an orderly fashion before work completion daily.

3.2 – EVALUATE SUBSTRATE

A. Thoroughly assess substrate to determine if any carpentry repairs are necessary prior to beginning the painting project (siding, sills, thresholds, etc.).
B. Notify Owner if repairs are suggested and identify all locations for review.
C. Contractor should not perform any repairs prior to consultation with Owner.

3.3 – CLEANING

A. When cleaning the gentlest means possible should always be utilized. Always test a small area of the cleaning agent prior to washing the entire surface. Owner must approve condition prior to proceeding. Clean surfaces of dirt and mildew if needed by the following methods:
    1. Attempt to use water at a pressure less than 60 psi (garden hose) and a natural bristle brush before upgrading to a harsher method.
    2. If stubborn biological staining exists, a 3:1 hot water:bleach mixture should be used. The mixture can be applied by handheld compression tank sprayer, or by hand with a natural brush. All areas to be treated must be thoroughly rinsed with clean water at a pressure of less than 60 psi before proceeding further. Surfaces must be allowed to dry at least 48 hours before any material application.
    3. Window sash should be cleaned by hand and may be rinsed by handheld compression tank sprayer. Care should be taken to avoid any damage to the sash or leaking around the windows. Surfaces must be allowed to dry at least 48 hours before any material application.
    4. The use of tri-sodium-phosphate (TSP) or other products containing phosphates or sodium (soluble salts) is forbidden.
    5. Power washing is not permitted.
B. If difficulty washing the surface is encountered, confer with Owner to discuss further options.
C. Take all necessary precautions to protect building elements and finishes from damage by precipitation during work of this Section.

3.3 – PAINT RETENTION

A. Preference shall always be given to retain well adhered paint.
B. Retain samples of paint layers in situ as directed by Owner. Samples shall be maintained at the following locations:
   1. Windows: leave a 1"x1" square in the upper right corner of each top rail and on the top right corner of the window hood or casing.
   2. Siding: leave the upper three courses of siding intact with the original finishes.
   3. Trim: leave a 3"x3" square in the upper right corner of the trim where possible.
   4. Additional Elements: to be decided in consultation with Owner.

3.4 – PAINT REMOVAL

A. Mechanical: Scrape with hand tools all other surfaces exhibiting areas of loose or peeling paint, and areas of adhesion failure. Feather all rough edges with by hand sanding to provide a smooth transition between paint layers and substrate. As it is imperative that the substrate be free of all marks from sanding and tools, a disc sander will not be considered. Random orbital or palm sanders may be used, only following agreement by the owner, so long as no or very minimal removal of existing substrate results. Agreement by the owner will be contingent upon an accepted sample of the orbital sanding. Any sander must have attached dust collector.
B. *Heat:* If areas have been specified to be stripped bare of paint, this will be accomplished by use of an infrared heater or steam. No heat guns will be used. Infrared heat will be used according to manufacturer's instructions and with care never to overheat wood. Historic New England shall only approve stripping wood on buildings where paint analysis has been performed. Should a noticeably complete collection of paint layers be discovered during work, notify the Owner to allow for sample collection.
C. *Chemical:* Chemical strippers shall be reserved for use in special situations, and shall never be used unless specified according to the scope of work of the contract documents. No methylene chloride strippers shall be used. Chemical strippers shall never be used in situ.

3.5 – WOOD TREATMENT

A. If Contractor believes an area requires wood consolidation, review area with Owner for approval. If a consolidant must be applied, a non-styrene based two-part epoxy should be used. All epoxies must be approved by Owner.
B. If an application of wood rejuvenator is deemed necessary prior to an application of paint, Historic New England will determine or approve the product to be used. Products are to be applied according to manufacturer's directions and surfaces

must be allowed to dry a minimum of 24-48 hours.

3.6 – PRIMING

A. Primer shall be (*Primer Manufacturer, Primer Color, Primer Number, Primer Sheen*) of type specified in the "Materials" section of this document and shall be compatible make and composition as finish paint. No substitutions will be accepted without written approval from Owner.

B. Apply primer in accordance with manufacturer's directions. Materials to be applied by method best suited for application: brush, roller, or spray. All paint to be finished by brush application* (*unless a more modern technique is historically appropriate).

C. Apply each coat at not less than recommended spreading rate to provide the dry film millimeter thickness specified by the manufacturer for each paint coating.

D. Allow at least 4-24 hours dry time (depending on manufacturer's specification) before proceeding with any additional paint application. Coating failure may result by application of additional paint over non-dry film.

E. Apply additional coating where undercoats, stains, or other conditions show through paint film, until uniform finish color is achieved.

F. Exposed nail heads to be spot primed with a rust inhibitor.

G. New wood shall be primed on all sides (especially end grain) prior to installation or fabrication of structure. All wood to be installed with ground contact will be treated with wood preservative approved by Owner.

H. All joints or gaps around doors, windows, or vertical joints of siding where water invasion may occur are to be filled with an approved latex caulk, not to be applied until primer coating is dry. Silicone caulks are not approved. Never caulk horizontal clapboard laps.

I. All areas indicating stains due to corrosion of hardware shall be, pending Owner approval, removed, properly labeled and stored in an agreed-upon location on-site. Rust and corrosion shall be removed by wire brush. All surfaces are to be primed with a rust inhibiting primer, and reinstalled after finish painting, if possible.

3.7 – FINISH PAINT

A. Upon completion of previous treatments, inspect all surfaces prior to paint application. Lightly hand sand rough or fuzzed areas. Care should be taken not to expose substrate or re-priming will be necessary.

B. Apply (*Finish Paint Manufacturer, Paint Color, Paint Number & Sheen*) as specified in contract documents and according to manufacturer's directions; film thickness as per material specifications. Upon completion of coat, inspect all surfaces and allow to dry before applying a second coating.

A. Apply additional paint coating where undercoats, stains, or other conditions show through paint film, until uniform finish color is achieved.

B. Apply a coat of finish paint to the Owner provided sample stick for every coat of finish paint applied to the surface. Label the sample stick on the back with the following information:
   1. Project name; paint manufacturer; paint type; color name; color formula; sheen; vendor; number of coats; date of application & Contractor name.

3.8 – *WINDOW SASH*

C. Prepare surfaces following all guidelines in Sections 3.2-3.6.
D. Remove all loose and deteriorated glazing. If necessary secure loose glass with glazing points and apply glazing material selected by Owner. Allow glazing to cure and harden before paint application.
E. Cracked glass is not to be replaced without prior approval of Owner. Replace with like glass unless new glass usage is approved. All glass replaced is to be dated in the bottom right corner under glazing for future identification.
F. Apply primer to sash (shellac based paint cannot be applied over glazing). On all window sash extend paint $^{1}/_{16}$" onto glass to seal glazing. If sash is operable, it is important to paint bottom edge to prevent water invasion. Do not paint previously unpainted surfaces without prior approval from Owner. If sash is removed, do not paint the pocket-facing edge of the stiles.
G. If sash is operable apply paraffin wax or equivalent to sliding surfaces (jambs, insides of stops, parting beads, and sash sides, if accessible) to facilitate ease of operation.
H. It is desirable for all windows to be operable. No windows should be rendered inoperable by painting shut.
I. Clean glass prior to finish paint application with a solution not containing ammonia.
J. Apply finish paint following all guidelines in Section 3.7. As with the primer, extend paint $^{1}/_{16}$" onto glass to seal glazing. If it is necessary to clean the glass after applying the finish paint, do not break the paint seal between the glass and the finish paint. If seal is broken, a new layer of finish paint must be applied.

3.9 – *SHUTTERS*

A. Prepare surfaces following all guidelines in 3.2-3.6.
B. Remove shutters and properly tag with current location using shutter schedule provided by Owner. Store in an area directed by Owner.
C. Owner & Contractor will assess the need for repairs once the shutters have been removed. Any required repairs will be specified separately and Owner & Contractor shall agree on this work prior to commencement.
D. Apply primer following all guidelines in Section 3.6.
E. Apply finish paint following all guidelines in Section 3.7.

3.10 – CLEAN-UP

A. Perform operations so as to keep work areas and premises clean, and free from accumulation of scrap materials, debris and other surplus material (at the end of every workday).
B. Remove all debris from site and dispose of properly in accordance with all EPA regulations. Recycle debris when possible.
C. No materials or debris will be permitted to drop free, but shall be removed by use of material hoists, rubbish chutes, or other method approved by the Owner.
D. No materials or debris will be permitted to be passed through the finished interior without proper protection in a manner approved by the Owner.
E. The landscape is to be left in as-found or better condition upon the completion of the project.

HISTORIC NEW ENGLAND
Defining the past. Shaping the future.

Property Care White Papers

Paint: Project Documentation

Paint Project Documentation

The key to successful future painting projects is documentation. Documentation should take the form of project review forms, photographs, written notes, and completion reports incorporated into the project file. A copy of the completion report and project review form should be filed with the Paint Task Force to allow for annual inspections. In order to ensure that this crucial maintenance task is completed satisfactorily in years to come the project details must be well recorded to allow for accurate project replication and failure analysis.

Guidelines for Paint Project Documentation

- Documenting the painting process is essential to reproducing the finish in the future. Always note the following in your records:
    - Reviews required
    - Type of surface preparation
    - Primer used
    - Paint used & vendor location
    - Method of application
    - Any additional treatments applied
    - Weather during application
    - Reason for paint type and color choice
    - Contractor name & contact information
    - Project cost
    - Sample stick to accompany files
- Photography of the structure, methods and materials before, during and after the project.

Paint: Project Documentation

Technical Information for Paint Project Documentation

Paint is a sacrificial coat which needs to be renewed at regular intervals. When it comes time to re-paint the structure, having the past project details will be helpful and allow you to either replicate the process or potentially improve the longevity of the finish through modifications to the process.

- Reviews required: was a permit from a historic district commission required and obtained?
- Type of surface preparation: what tools were used?
- Primer used: manufacturer; color; formula; number of coats; vendor and type
- Paint used: manufacturer; color; number of coats; formula; vendor and type
- Sheen: what type of sheen was selected for the work?
- Method of application: number of coats and type of application
- Any additional treatments applied: wood rejuvenator; linseed oil; consolidant; etc.
- Weather during application: temperature ranges, precipitation
- Reason for paint type and color choice:
    - When documenting the rationale behind the color selection, make sure to note if the color is based on paint analysis—if so, a copy of the relevant sections of the analysis report should also be included in the project file.
- Painter name & contact information: note the names of the painters involved, their firm and any contact information.
    - Future project managers may want to contact the firm for additional information or if the result was not satisfactory, others will know not to work with them in the future.
- Project cost: Important to record in order to help in future project estimating.
- Sample stick: Creat a sample stick to be stored at the property care offices with the same number of coats as the final finished product. Label the back side by detailing all of the above information.
- Photography: An integral part of project documentation:
    - Always take before, during and after photos.
    - Images of primer and paint can labels can also be helpful.
    - Photographs should be incorporated into the completion report and also appropriately stored.

Paint Analysis

Paint and other paint-like finishes are character defining features of a structure or landscape feature. These finishes hold important information regarding class, style and historic practices of previous tenants. Finishes can range from white washes to distemper and oil paint and from basic wall protection to such specialized decorative finishes as stenciling, graining, marbleizing and *trompe l'oeil*. The physical analysis of the paint and finish layering can provide critical understanding and documentation of the history of finishes at the site and their associated colorings; support the understanding of the architectural evolution at the site; and can be used to determine why a layer has failed.

Guidelines for Paint Analysis

- There are many advantages to performing paint analysis at a site. At the minimum, analysis can provide a critical step in understanding the history of finishes and colors associated with a site, a deeper understanding of a construction chronology, or even an understanding of why a finish might be failing.

- Reviewing existing paint analysis or contracting for new analysis is an important part of the planning phase of a project involving paint or finishes. Ideally analysis should be contracted out with ample time before the planned implementation of the results.

- Paint analysis should be contracted out to a conservator with enough experience in the process to make reasoned analysis of the samples. Care should be taken during the Request for Proposals stage to identify and vet the qualifications of the consultants as well as specify which elements of the report will be the most helpful to managing the resource.

- There are many challenges to matching historic painting schemes including "color creep" (the tendency of colors to shift subtly over time), as well as changing interpretation of the site, and variations in interpretation of the analysis. The process should be entered into carefully with an understanding of the nuances involved with color selection.

- Although one would think a paint analysis report and the corresponding samples would serve as the official documentation of paint layers at a site, retaining a record of paint history *in situ* on the feature is always preferable.

- Retaining a record of actual paint colors used on all features is beneficial for the ongoing management of the site.

Technical Information on Paint Analysis

There are many advantages to performing paint analysis at a site. At the minimum, analysis can provide a critical step in understanding the history of finishes and colors associated with a site, a deeper understanding of a construction chronology, or even an understanding of why a finish might be failing.

- Generally the primary reasons for paint analysis are either to document the paint chronology before a project that might endanger the existing paint layers or to identify the appropriate paint scheme for an interpretive period.
- Paint analysis can support the overall architectural understanding of a structure by documenting and comparing the sequencing of paint layers.
    - Example: the absence of layers before a certain time period may support other evidence that the feature was not part of the original construction.
- Layers and paint materials can be analyzed as part of a process to determine why paint is failing in a location.
    - Example: At the Gropius House it was determined that an experimental paint from the 1960s had failed and was causing adhesion problems with the paint.
- Analysis can also provide information on sheen or the make-up of the binders and pigments of the paint finish.

Reviewing existing paint analysis or contracting for new analysis is an important part of the planning phase of a project involving paint or finishes. Ideally analysis should be contracted out with ample time before the planned implementation of the results.

- If no paint analysis has been conducted at the site, determine if the current paint project is the appropriate opportunity to obtain analysis. If the extant paint layers are not in danger from the project and there is no interpretive reason to change the color of the top layer it is acceptable to match the current paint scheme.
    - Be wary of directly matching colors to the extant paint as colors may have faded or otherwise changed over time. Review records for the last paint coating to find the color to be used.
- The paint analysis process includes collection of samples, laboratory analysis and then report creation. Ample time needs to be allowed for the entire process.
- After analysis is complete and the report has been generated, time needs to be allowed first for the acquisition of large format cards for each color identified and, second, for discussions in which the recommended paint colors should be reviewed in the context of the space, furnishings, other finishes and the period of interpretation.

Paint Analysis

Paint analysis should be contracted out to an appropriate architectural conservator with enough experience to make reasoned analysis of the samples. Care should be taken during the Request for Proposals stage to identify and vet the qualifications of the consultants as well as specify which elements of the report will be the most helpful to managing the resource.

- The conservator should have experience in sampling techniques, the ability to identify locations on the structure where complete stratigraphies, or layerings of finishes, are likely to exist, and where original paint colors are least likely to have degraded.
    - Samples should be sufficient in number to ensure a complete understanding of the paint finishes of the feature.
        - A small selection of samples risks missing important clues such as a stencil pattern. Sampling that hits only a repair or other new material can create a false sense of chronology through the lack of layering.
        - Samples should be labeled and documented in a manner that allows for the recreation of the analysis at a future date. Room designations change and ordinal directions are sometimes generalized creating confusion. Keying samples to floor plans and elevations eliminate the guess work.
    - An experienced conservator should be searching for areas that contain complete chronologies or recognize areas where repairs or additions have been enacted to support the chronology.
        - Reviewing layers *in situ* with a field microscope can aid the conservator to identify areas to sample.
        - The project manager should be prepared to provide the conservator with background material, a historic structures report, photographs and any other information that might be helpful in establishing documented architectural and social changes in the structure.
    - Sampling generally consists of carving out a sample of all paint layering down to and including the substrate.
        - Different conservators employ different techniques for this process and some take larger samples to allow for multiple testing protocols from the same sample in the future.
        - Sampling methodology and locations should be considered in conjunction with the maintenance of the feature or even the visitor experience. Guiding sampling to less sensitive areas may or may not be at cross purposes with the analysis and will need to be determined in the field.
        - Filling sample holes often is not always included as part of the contract. Not all sample holes require immediate filling however consideration should be made up front on the impact of the sample holes on future care of the property.
    - Carefully scraping away paint layers on the feature may reveal different layers of finish and convey the concepts of colors the feature may have had over time but it lacks the scientific analysis to support the findings.
- Laboratory analysis of the samples should be performed by a conservator with experience in the techniques of microscopy and microchemical testing techniques.

    - Samples should be embedded in resin, cross-sectioned, and polished perpendicular to the paint layers.
    - Samples are generally studied and photographed at high magnifications in both visible and ultraviolet light.
    - Target areas are exposed mechanically and prepared for color matching.
        - Samples are then light bleached for two weeks under a fluorescent tube to reverse darkening and yellowing of linseed oil.
        - Samples are then measured with a chromameter
- The conservator should have knowledge of historic architecture and building history, architectural finishes and their materials and manufacture, and an understanding of how color and pigments age.
    - Background information is critical to understanding the paint analysis process and one should be prepared in advance to provide access to historic records and images.
- Color matches for the specified time period should be requested in up to four different values:
    - CIE L*a*b*: the current industry standard for color measurement.
    - Munsell: an older system but one still widely used in preservation.
    - The closest commercial match
    - The closest commercial match in California Paint brand
- The Delta E between the CIE L*a*b* value and the closest commercial value should be provided. (see below for more information on Delta E)
- A paint chip of the closest commercial match and the closest California Paint brand should be requested.
- When analysis is completed and the color values have been identified use both the CIE L*a*b* value and the Munsell value and acquire draw down cards with which to compare commercially available paint colors.
    - A draw down card is a wet sample of the identified color match prepared by the conservator or a commercial paint company familiar with CIE L*a*b* and Munsell notations.
    - The ideal size is 8” x 10” because it is big enough to get a sense for the color but small enough to fit within a report.
- Historic New England should get a report that supports the ongoing management of the site. A draft table of contents has been created and is included at the end of the document that suggests a structure to a document that conveys information by feature.

Paint Analysis

There are many challenges to matching historic painting schemes including "color creep" (the tendency of colors to shift subtly over time), as well as changing interpretation of the site, and variations in interpretation of the analysis. The process should be entered into carefully with an understanding of the nuances involved with color selection.

- It is important to note that Historic New England, in keeping with our philosophical approach to the interpretation of the sites, more often is attempting to match later paint palettes than the original or earliest painting scheme.
    - Dating of paint layers is dependent on landmarks in time. Sometimes it may not be possible to definitively match a paint layer to a specific time.
- If you are trying to match the existing paint color for a project (with no analysis) be aware that paint colors are subject to "creep" or change over time. There are two main factors resulting in creep:
    - Over time the existing paint is physically affected by aging, dirt and grime, light degradation and chemical breakdown resulting in overall fading or discoloration. The project manager may try to then match an extant color but it is the wrong hue. Over time this introduces slight changes in color at each application that creeps the color away from the original or original intent.
    - Paint creep can also be attributed to manufacturing or mixing errors. The paint company may use new base paints, ingredients and pigments to create standard paint mixes and the new colorings might not match exactly the previous. Additionally the calibration for the devices paint stores use to mix paint may be different from store to store.
- If you are trying to infill paint colors custom mixing on site will often be necessary to get the best match.
- If one is only repairing a single feature (eg one window) the decision may be made to replace paint colors in kind even if the historic paint color is known to be of a different value in order to avoid multiple colors on a façade.
- The paint match developed during paint analysis is based on scientific analysis but ultimately is subjective. The conservator weighs certain factors, such as the fading of pigments and binders, as part of the process and different conservators may vary in their interpretations of paint matches.
- There is a calculation used by color professionals referred to as the "Delta E" which measures the difference between two colors.
    - The Delta E between the CIE L*a*b* color identified through analysis and the closest commercial matches should be generated and included in the final report.
    - A Delta E value of 1.0 or less is considered to be indistinguishable to the naked eye.
    - Determining a tolerance level for an acceptable Delta E above 1.0 is difficult because of how color is measured, as well as gloss levels, and lighting and orientation of the property or site.
    - The safest manner is to review colors under natural light conditions in as large a format as possible. Having draw down cards (see above) or even painting a section of the feature is better than reviewing chips.
- The goals is for the manager to have a range of colors from which to choose that are within the tolerances of what analysis identifies as the historic color. This now becomes an

interpretive questions. At Historic New England this is a decision not made by the conservator but by the *Proactive Preservation, Interpretation and Planning* (PPIP) task force.

- Any custom matches should have a Delta E of less than 1.0
- Commercial lines are sometimes difficult to match within a Delta E of 1.0. Common colors (like whites) are easier to match with a Delta E of less than 1.0 because there are great commercial variety whereas less common colors, like a dark green, have fewer commercial options and are therefore more difficult to match.
- The conservator will be asked to provide the two closest commercial matches to the CIE L*a*b* number.
- The project manager then will be asked to secure a draw down cards for all the color values in order to compare colors.
- The four colors should be reviewed by PPIP to determine which color to use.

Although one would think a paint analysis report and the corresponding samples would serve as the official documentation of paint layers at a site, retaining a record of paint history in situ on the feature is always preferable.

- Retaining paint analysis samples or architectural fragments that have historic paint layering in storage for future analysis is recommended but is not a fool proof documentation step as samples can be lost or accidentally destroyed over time.
- Retaining representative sections of paint *in situ* on the structure itself assures the maximum retention of paint chronology.
- Ideally, paint would never be stripped from a feature or the feature itself would never be removed from the building, however that is often not feasible. If paint layering or a feature must be removed try to retain representative sections of paint *in situ*.
    - The manner in which to attempt to retain paint chronologies *in situ* is documented in the White Paper on *Paint, Exterior Guidelines for Application*.

Retaining a record of paint colors used on all features is beneficial for the ongoing management of the site.

- Paint chips are small and colors can be hard to determine. Using large format draw down cards for the chosen color helps ensure a clear representation of the paint color.
- Create a paint sample board to document the various colors actually used.
    - Create a wooden board using stock that is about 1 ¾ inches wide, 1/8th of an inch thick, and about 18 inches long.
    - Use painters tape to mark off sections of the board to allow for about 2 inches of color. Sections should be large enough to provide a visual representation of the colors.
    - Prime and paint each section of the board with the appropriate materials.
    - Label each section with the location paint is used and the color used (commercial brand or CIE L*a*b* formula).

Technical Specifications for Paint Analysis

The following is a draft RFP for soliciting historical paint analysis based on the guidelines presented in the white paper. This RFP should be edited for use as appropriate with the specific project.

DRAFT Request for Proposal

Project Description

A. Conservator is to perform paint analysis for XX Site for YY purpose.
B. The goal of the analysis is to identify the finish colors and sheen for the chosen interpretive period of ZZ.
C. Qualifications
    a. The conservator should have experience in sampling techniques, the ability to identify locations on the structure where complete stratigraphies are likely to exist, and where original paint colors are least likely to have degraded.
    b. Laboratory analysis of the samples should be performed by a conservator with experience in the techniques of microscopy and microchemical testing techniques.
    c. Knowledge of historic architecture and building history, architectural finishes and their materials and manufacture, and an understanding of how color and pigments age.
D. The summary of key elements of the analysis are as follows:
    a. Review existing documentation on history and evolution of the structure and the history of paint treatments. Documentation will be provided, as available, by Project Manager.
    b. Collect samples as necessary to develop paint chronologies and identify paint colors from the requested time period.
    c. Process, analyze and curate paint samples taken in the field.
    d. Develop paint chronology charts for all paint layers on the sampled surface identifying colors by their common color names. Match the paint layers for the requested interpretive period to CIE L*a*b*, Munsell and the closest commercial match will be made using color charts from California Paint, Benjamin Moore and Sherwin Williams with the Delta E noted. Note that the closest match to California is required, but the actual closest match (that is, lowest Delta E) may be in one of the other paint lines.
    e. Deliver a report that incorporates the methodology, analysis and results, including sample chips of the interpretive colors identified.
E. The proposal should contain the following items:
    a. Goals of the project.
    b. Identification of principle investigator and their credentials
    c. The scope of fieldwork, including methodology and justifications, should be detailed including but not limited to:
        i. Sampling methodology
            1. Expected number of samples and locations to ensure:
                a. An accurate accounting of all of the finish layers on each sampled surface

b. To be able to cross reference building features through the number and color of layers.
2. Sampling techniques to be used
3. The labeling methodology to be used to identify each sample
4. Methods or devices to be used to access sampling locations.

ii. Laboratory analysis
1. Identification of the techniques that will be used to prepare samples and then identify layers, materials and color matches.

d. Take into account the creation of a report following the proposed table of contents noted in the deliverables section.
e. Optional Components:
i. Pigment testing to determine lead content.
ii. Media testing for materials such as for linseed oil or latex.
iii. Testing of clear or translucent finishes such as varnishes and shellacs.
iv. Further investigation of decorative painting such as graining, marbelizing, stenciling, or murals.
v. Creation of reveals for educational purposes.
vi. Consultation in the replication of historic finishes.
f. Identification of paint sample curation methodologies.
g. Schedule for the project including completion of field work, analysis of samples and completion of report.
h. Budget for the proposed work plan.
i. Budget should include hours allocated for each component of the project with salary expenses specified by personnel position, rate, and task; additional expenses should be identified and specified.
i. References and example reports for three similar projects.

F. All information, samples and resources, physical or digital, gathered or produced for this project is the property of Historic New England and should be provided to the organization at the completion of the project.

Deliverables

A. Before final report is considered complete a draft shall be reviewed by Historic New England for content and accuracy.
B. It is expected that the project report shall contain the following sections, or their equivalent, at a minimum:
    a. Executive Summary
    b. Personnel Involved
    c. Project Objectives and Scope
    d. Methodology
    e. Overall Site History and Context
    f. Summary of Previous Paint Studies, if pertinent
    g. Narrative: a clear narrative should accompany all findings. The narrative should:
        i. Identify the location or feature being sampled.
        ii. For each location or feature there should be a distinct summary that includes but is not limited to:
            1. Historical context of that location or feature
            2. Summary of previous paint studies for this location or feature
            3. The methods used to sample including all tools and equipment and how the samples were accessed.
            4. A list of samples taken and their unique ID labels.
            5. A graphical representation of location of samples taken.
            6. The stratigraphy images; identified by location, sample number, type of light and any distinguishing layers in the image.
            7. The chromochronology (Paint layering sequences/paint stratigraphy) for that location, feature or collection of features
                a. See below for more information
            8. The paint analysis findings and how they support or refute the previous historical understanding.
            9. Any special comments on paint techniques or material.
            10. Recommendations for repainting the feature including color and sheen
    h. Conclusions and Recommendations
        i. The conclusion should include, but not be limited to, the information necessary for the continued management of the property.
            1. The results of the analysis
            2. Clearly identify facts from observations and interpretation
        ii. Recommended Paint Palettes based on objectives of project
            1. For each space or feature or collection of features, clearly identify the color matches and sheen for requested interpretive period in the following system:
                a. CIE L*a*b* color match
                b. Munsell color match
                c. Identification of the closest available commercial match noting the Delta E between CIE L*a*b* and the commercial match.

d. Identification of the closest available color in the California Paint brand, if it is not the closest commercial, and the Delta E between the color and CIE L*a*b

C. More information about the graphic representations contained in the deliverables:
   a. Key to Sample Locations. All sample locations should be identified as follows:
      i. Approximate location of samples and their corresponding ID should be noted on owner provided floor plans and/or elevations. Contextual photographs (ii) may be substituted for the floor plans if agreed by Project Manager.
      ii. Contextual photograph of area after sampling identifying the location of the sample and the sample number
      iii. Measurements for each sample from static benchmarks (e.g., 6" up from floor; 18" from northeast corner).
   b. Stratigraphy images. All images of samples should include the following at a minimum:
      i. Sample ID number
      ii. Location of sample
      iii. Type of light in which the photo was taken
      iv. Magnification of the image
      v. Annotations identifying any distinguishing layers in the image that help benchmark the sample. At a minimum the layer identified as the period of interpretation should be identified.
   c. Chromochronology (Paint layering sequences/paint stratigraphy). A chart will be created using representative samples from the space, feature or collection of features that identifies the history of paint/finish colors.
      i. Record all paint layers for a feature or collection of features on standardized paint layering charts, using common color names and dates of the layer (if known). These charts should display the following graphically.
         1. Organize the charts by comparable features, ie all exterior trim, interior trim of a room, etc.
         2. The charts should be arranged vertically with the paint layer listed in the left hand column. Each layer should be identified in two ways; the first is with the name of the substrate then primer, first finish layer, second finish layer, and so on, with the present paint layer shown last, at the bottom of the column; the second is through the use of common color names.
         3. When key dates or time periods can be matched to a layer those dates should be incorporated into the chart as well.
         4. Across the top of the chart will be a series of representative samples appropriate to the goals of the chart.
         5. Through degrees of shading indicate whether or not the paint layer is present but no weathering (grey); the paint layer is topped by dirt or a fracture (black); or no paint layer is present (white).

6. Align paint chronologies of different samples so that the paint scheme for any layer/finish campaign can be read across a single horizontal line.
7. For features originally left unpainted, name the substrate at the top of the column and indicate "(unpainted)" in the corresponding finish layers.

Cross-section Analysis – Representative Stratigraphies for Brick Paint

Location	Sample #	Element	Notes
New Kitchen	CT-1	Brick wall – location of removed shelf	1806 exterior brick, enclosed with 1866 dining room addition for use as laundry
North Hemisphere	CT-9	Brick mortar	Sample taken adjacent to cornice fascia
Piazza	CT-14	Brick	North face, east corner
North Hemisphere	CT-17	Paint on brick and mortar	East side 2nd floor near north side of window
North Hemisphere	CT-18	Brick removed for investigation	

	= paint layer present but no weathering
	= paint layer weathered and / or topped by dirt
	= no paint layer present

Layer	CT-1	CT-9	CT-14	CT-17	CT-18
Off-white (1992)					
Off-white					
Cream (c. 1983)					
Off-white (c.1979)					
Off-white (c.1965)					
Cream-5					
Cream-4					
Cream-3					
Cream-2 (c.1908)					
Cream-1					
Pale pink					
Pale pink					
Off-white					
Dark cream (c.1866)					
Dark cream (c.1860s)					
Dark cream					
Orange-brown (c. 1859)					
Light brown					
Brown					
Light tan (pinkish)					
Tan					
Tan					
Tan					
Brick / Mortar					

d. Color matches and sheen for the identified time period clearly identifying location and type of material to be painted.
    i. As specified above, the following color matches will be provided:

1. CIE L*a*b* color match
2. Munsell color match
3. Identification of the closest available commercial match noting the Delta E between CIE L*a*b* and the commercial match.
4. Identification of the closest available color in the California Paint brand, if it is not the closes commercial, and the Delta E between the color and CIE L*a*b

ii. One paint chip per color match will be included in the report identifying closest commercial match.

iii. Sheen of the appropriate layer will be identified for restoration purposes.

D. Five bound hard copies of the report and all additional materials should be issued.

E. One digital copy of the report should be issued in PDF format.

F. All samples gathered or materials produced for this project are the property of Historic New England and should be provided to the organization at the completion of the project.

a. Samples should be clearly labeled, organized and safely packaged according to industry standards.

b. Physical documents, images or other reports created through the project should be delivered with the Final Report.

c. Digital data such as images or data generated through the process should be transmitted on a portable storage device with the PDF version of the report.

HISTORIC NEW ENGLAND
Defining the past. Shaping the future.

Property Care White Papers

Paint: Bibliography

Paint: Select Bibliography

Here are some resources we find helpful when thinking about historic paints.

Moss, Roger W., ed. *Paint in America: The Colors of Historic Buildings*. Preservation Press: Washington, D.C., 1994.

Nash, George., *Renovating Old Houses*. The Taunton Press: Newtown, 1998.

Weaver, Martin, E., *Conserving Buildings: A Manual of Techniques and Materials.* Preservation Press: New York, 1997.

Weeks, Kay D., and Look, David W., *Preservation Briefs #10,* "Exterior Paint Problems on Historic Woodwork." National Preservation Services, National Park Service: Washington, D.C., 1982.

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Property Care White Papers

Maintenance: Washing Exterior Structures

Washing Exterior Structures

Cleaning dirt, organic growth and debris from the exterior of a structure is an important maintenance task that will help to extend the life of the material. When organic growth develops on a structure it acts as a food source for other forms of fungi and creates a microclimate that traps moisture close to the surface, hastening deterioration. Combined these factors not only detract aesthetically from the structure but can lead to advanced degradation and eventually shorten the lifespan of the material. The method used to wash the surface should be the gentlest means possible and should not include high pressure techniques. Though important, cleaning the surface is not a permanent solution to prohibit biological growth.

Guidelines

I. Prior to beginning any course of treatment it is important to evaluate the existing condition and consider factors including the material, type of growth, and prior treatments. These details will help in selecting an appropriate cleaning method.

II. Always test the selected cleaning process on a sample area before committing to the process for the entire surface.

III. Methods for washing exterior structures vary, but when it comes to cleaning historic buildings the means must be mindful of the delicate nature of the materials.
    a. The preferred method of cleaning historic structures by the gentlest possible means be used. The most widely accepted technique to remove organic material is by hand, using a bleach and water solution with a soft scrub brush.
    b. Avoid abrasive cleaning methods as it is widely accepted that cleaning a surface in this manner can abrade the substrate, contributing to a loss of historic fabric. This not only applies to wood but also to these techniques can pit masonry and remove the hard exterior layer meant to protect the material from the elements.

IV. Protect the landscape from chemicals used during washing.

V. Organic biological growth cleaners are available on the market. In addition to wood, these products can also be safely used on brick and other forms of masonry like granite, brownstone and marble.

VI. Pressures greater than that of a typical garden hose (40-60 psi) are not typically necessary in most washing applications. No pressures higher than 100 psi should be used on wood or soft masonry (e.g. brownstone and marble); no pressures higher than 400 psi should be used on hard masonry (e.g. granite) or concrete.

VII. Consult an architectural conservator if simpler methods for removal do not provide the desired effect.

Maintenance: Washing Exterior Structures

Technical Information

I. The following should be considered when selecting a cleaning method:
   a. Type of Material
   b. Age of Material
   c. Condition
   d. Prior Treatments
   e. Type of Growth

II. Testing

Prior to cleaning any surface, it is important to evaluate its condition to ensure that the washing method selected will not have an adverse effect on the material. Condition is key—a roof may be covered in organic growth, but prior to taking action, the shingles must be tested to ensure that they are in stable enough condition to receive the treatment. The type of material has a major impact on the washing means selected—wood shingles behave differently from granite foundations which can accept higher levels of pressure. Always test a section approximately 3' square prior to continuing treatment to verify that the method does not negatively impact the surface.[1]

III. Use gentle methods

Abrasive cleaning methods are dangerous because there are often subtle architectural details found in mouldings, corbelling, or other building components which can be damaged or lost entirely because they are "blasted" off the surface.

Understanding pressure washing and power washing is a vital component when considering the surface cleaning options. Pressure washing takes hot water through a hose and projects it through a nozzle creating a high pressure stream. The force with which the water is applied is measured in psi, or pounds per square inch. Pressure washers can use extremely high psi, typically ranging anywhere from 1,500-15,000 for some of the professionally sized models.[2] Power washing utilizes the same process as pressure washing, but utilizes cold water. Risks involved with power washing include: getting water behind the substrate,[3] driving paint or another covering into the substrate, and abrading the softer spring wood, raising the grain which changes the texture. Neither application is the best choice for historic structures.

IV. Protect the landscape

The chemicals used to remove organic matter from building surfaces can be damaging to the landscape and care should be taken to minimize the negative impact. Prior to beginning any work, the ground and nearby plants should be wet with a hose and then covered using a tarp. When washing roofs, take notice of where the downspouts carry water and protect that area if possible. If at any point the solution comes in contact with a plant, immediately spray the area with copious amounts of water to dilute the mixture. Once the washing is complete, carefully

[1] Sydney Freedman. "Architectural Precast Concrete," *Twentieth Century Building Materials: History and Conservation*, 104.

[2] Anne E. Grimmer, *Preservation Briefs # 6*, "Dangers of Abrasive Cleaning to Historic Buildings." available at <http://www.nps.gov/history/hps/tps/briefs/brief06.htm>.

[3] Sharon C. Park, AIA, *Preservation Briefs # 19*, "The Repair and Replacement of Historic Wooden Shingle Roofs." available at <http://www.nps.gov/history/hps/tps/briefs/brief19.htm>.

remove the tarp so as not to spill the contents onto the ground. Thoroughly wet-down the area after the tarp is removed. After a rain storm, the area should again be sprayed to ensure that run-off from the building does not damage the landscape.

V. Cleaners

In general the best method of cleaning utilizes the common garden hose, a soft natural bristle scrub brush, and a mixture of hot water and bleach. The typical mixture is 3:1—three parts hot water and one part bleach. Using the brush, scrub the area vigorously. After scrubbing, rinse the area with clean water. In the past, some have added the cleaning agent TSP (trisodium phosphate) to the mixture, but that practice should be avoided because the phosphates in TSP act as a food source for mildew. When cleaning masonry, an organic biological growth cleaner should be used instead of bleach; the same scrubbing directions apply to these products. Follow the manufacturers' specifications for diluting the cleanser.

VI. Water Pressure

The typical psi (pounds per square inch) for a garden hose is 40-60 psi. As part of general practice, a psi above 100 should not be used on wood or soft masonry as it can cause more substantial damage than lingering organic growth or dirt. If the milder means of cleaning does not work on harder surfaces, like concrete, a higher psi of 100-400 can be used as long as the hose remains 3-12" away from the substrate.[4] If necessary, harder substrates may be able to handle less damaging aggregates in conjunction with higher levels of pressure to clean the surface; but be mindful that this is not the ideal and that testing is crucial in this scenario. Organic materials like walnut or cocoa shells are softer than typical aggregates, but they are still abrasive and should only be used after trying to clean the area manually using the method described above. In order to ensure the gentlest means possible is used to clean the area, begin with the lowest psi at 6-8" away from the surface and move the hose forward ½" at a time. As a secondary option, return the hose to 6-8" away from the surface and increase the pressure in increments of 50 psi to determine the pressure: distance ratio at which the material will be removed without damaging the substrate.

VII. Additional Consultation

If the simpler methods listed above do not provide the desired results, always consult an architectural conservator. Analyzing the offending material will help provide a treatment plan. Conservators can also test harsher chemicals, like certain acids, or provide the proper mixture and force for slightly more abrasive methods to determine if they will remove the offending material.

It is important to note that there is no one sensitive way to permanently rid a building from organic growth. Once a mold spore is in the wood, it will bloom again. Modifying the area by removing overhanging branches and increasing the level of light that hits the surface is the most effective solution to the problem.[5] Applying the water and bleach solution to the surface when

[4] Martin E. Weaver. *Preservation Briefs 38*, "Removing Graffiti from Historic Masonry." available at <http://www.nps.gov/history/hps/tps/briefs/brief38.htm>.

[5] Kay D. Weeks and David W. Look. *Preservation Briefs #10*, "Exterior Paint Problems on Historic Woodwork." available at <http://www.nps.gov/history/hps/tps/briefs/brief010.htm>.

necessary will help keep the microclimate at bay. Spraying mildewcides on wood surfaces is another option.

Works Consulted & Further Reading

Grimmer, Anne E., *Preservation Briefs # 6,* "Dangers of Abrasive Cleaning to Historic Buildings." National Preservation Services, National Park Service: Washington, D.C., 1979.

Jester, Thomas, ed. *Twentieth-Century Building Materials: History and Conservation*. US Department of the Interior National Park Service Preservation Assistance Division Technical Preservation Services: Washington, D.C., 1995.

Park, Sharon C., *Preservation Briefs # 19,* "The Repair and Replacement of Historic Wooden Shingle Roofs," National Preservation Services, National Park Service, Washington, D.C., 1989.

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