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**Historic Building Assessment and Feasibility Study**

**Center Harbor Town House**



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## Introduction

The purpose of this document is to assist the Town of Center Harbor to evaluate the best way to repair and renovate the historic Center Harbor Townhouse at the geographic center of the town, for permanent use of the building as a meeting place or storage building. The improved building is intended to provide 3-season meeting and storage space for the town's boards and commissions. The 1840's Greek Revival style structure retains much of its historic integrity to the time its 1933 renovation as a school. The building had been previously renovated in 1907 as a polling place for the town.

Investigations of the building were conducted by Norman E. Larson, AIA, of CPW Architects in Meredith along with Joel Fisher, P.E. of Fisher Engineering in Gilford in February and March of 2016. Center Harbor community members at times joined the investigative team and included Kim Baker, the chair of the Heritage Commission; Karen Ponton, David Riley and David Hughes, members of the Heritage Commission; Chris Williams, and Harry Viens, a Selectman of the town. The Center Harbor Fire Department provided ladders for the team to access the attic space of the building. The conclusions of the structural engineer are incorporated into this report and the full report of Fisher Engineering is included in the appendix of this study.

The Center Harbor townhouse is a significant historical building in the state of New Hampshire. The recommendations of this report are made in conformance with the Standards of Rehabilitation, one of the four approaches to the treatment of historic properties outlined by the U.S. Secretary of the Interior. This standard, according to the NPS.gov website, "acknowledges the need to alter or add to a historic property to meet continuing or changing uses while retaining the property's historic character." The Standards for Rehabilitation "are applied to projects in a reasonable manner, taking into consideration economic and technical feasibility." The recommendation made herein for the preservation and maintenance of the identified Character Defining features are made in light of the intended use of the building once again as a meeting place for members of the town government and the community. The New Hampshire Building Code includes, among several building codes, the International Existing Building Code, which gives some leeway to code officials to waive certain requirements of the International Building Code. It is important that the code officer and fire officials' appreciation for the historical significance of the building be developed, as decisions about what work will be required for the public to occupy the Townhouse will be made in light of their understanding of historic value of the property. A limited understanding will affect the integrity of the historic building as it is returned to the service of the public.

Likewise, structural solutions suggested in this report are made to comply with the Standards of Rehabilitation. While the building requires many structural upgrades to meet (or more closely meet) the requirements of the building code, the changes suggested are additive so that the historic fabric is retained AND the building structural systems are improved. In making these recommendations and in proceeding with the work, necessary repair work required by building codes should be achieved first by waiver, if not by waiver then by retention and augmentation, and only if this still cannot meet the requirements of the code should replacement of structural systems be considered. The Town of Center Harbor should not need to make any such wholesale replacement of structural systems, as the building is in relatively sound condition. A copy of the Secretary of the Interior's Standards of Rehabilitation is included in the Appendix of this study.

## History and Development of the Property

In 2014, an Inventory was prepared for the New Hampshire Division of Historical Resources by Mae H. Williams of Center Harbor for listing the Center Harbor Town House on the NH Register of Historic Places. This document provides a significant history of the Town House and the decentralized community it served, drawing on local records and interviews from the community. Community history including specific dates of renovations presented herein were gleaned from this Inventory. For further reading, the entire Inventory can be found at [http://unlockinghistory.com/CEN007\\_Townhouse\\_State\\_Register.pdf](http://unlockinghistory.com/CEN007_Townhouse_State_Register.pdf).

Constructed in 1844 on land purchased Paul and JJ Perkins, the building was located near the geographic center of the town at the approximate half-way point between two villages then extant in the town of Center Harbor. To the east, a village centered around the Congregational Church remains today as the civic center of the town. To the west, the village at the west side of town was had lumber milling as a core industry and the Freewill Baptists and Methodists shared a meetinghouse.

When originally constructed in 1844, the building had only one room with a single door at the center of the east facing gable façade.” The common framed construction is atypical for a building of this period and only the floor frame under the building exhibits the timber frame elements that might be expected throughout the building. Town records were re-checked and there is no evidence the frame of the building was ever substantially repaired or rebuilt. The entry porch on the east façade is unmentioned in the records in terms of its original construction, and might be considered to date from the original assembly, perhaps with later modification of the original roof to the steeply pitched hip roof seen today. The differences in the moldings used in the porch capitals vs. those used in the cornice line suggest the porch may be a later addition. The wide cornice board, wide corner boards, corner pilasters with molding caps, and discontinuous eave trim at the gable end are all hallmarks of the Greek Revival style.

In 1907, the building was renovated to include a raised platform at the west end of the space and exterior double five-panel doors at the east entry where the previous single door was apparently removed. These renovations were purportedly made to bring the building into compliance with legislation of 1881 which required certain standards for New Hampshire polling places. The raised platform was fitted with a balustrade (now removed) and railing separating the raised area from the rest of the space. Windows at the stage area were likely raised at this time to their current locations, with the windows behind the stage moved to the south side of the building. A report in the 1908 town report lists work done as extras to the the \$1000 renovation and included work on window frames, 2 windows and frames, and laying of the floor are identified as extras paid for at that time. Given that no window work is identified specifically in later records, this renovation was likely the time of the creation of the window wall on the south side of the building. A bulletin board is also mentioned and perhaps it was this that was removed later from the center of the north wall. The entry porch and the building sign were most likely added at the time of this renovation, though not mentioned in the records.

In 1933, the building was renovated and brought into service as a schoolhouse, a purpose it served until 1945. As part of the renovation of 1933, a small privy addition was made behind the building on the west and the building interior was re-furnished and re-finished. It seems likely, but not

certain, that the primary interior finishes seen today at the building's interior were installed prior schoolhouse renovation. The town records indicate that interior work was completed but list such work as refinishing with paint and oil finishes without mentioning the wainscoting any more clearly than to refer to it as other materials. At the time of the wainscoting installation, the windows were modified to provide a window wall on the south side of the building, a change that undoubtedly dramatically increased the natural light inside the building. Since the plaster above the privy doors indicates that the original west facing windows were removed when the privy was constructed, it points toward all the interior finish work occurring in the 1933 renovation. In 1934, there were reportedly 24 students attending school in the Town House.

In 1939, the building was modified a final time with the addition of a large gable roofed woodbox addition. This portion of the building remains unfinished at the interior and has the building's only concrete floor slab at the crawl space below the stage-level floor. Half of the addition has its lowest wood floor platform a half-story above the main level floor that aligns with the stage floor. The exterior door at the east face of the wood storage area sits just atop the stone foundation, and there is no sign that there was ever a floor at the interior of the door. As part of the 1939 renovation, the schoolhouse woodstove was relocated to its current position near the north side stairs to the stage, a move which shortened the stovepipe as well as the distance to the wood storage.

After 1945, the Town House was no longer used as a school, but continued to be used for town meetings until 1964 when such meetings were moved to the larger Grange Hall at the east side of town. For a period of time in the 1980's, the building was reportedly leased to an association of Disabled American Veterans who modified the front porch to accommodate a workable but non code-compliant ramp to the front door. Further investigation into the history of this organization in Center Harbor may turn up additional photographs of the historic structure and its interior.

## Architectural Description

### Exterior

The one-story single room gable-front main block measures 24 feet 4 inches wide by 40 foot 4 inches deep with a 12/12 pitch roof and sits on a fieldstone foundation without capstones. The crawlspace beneath is shallow and excavated only slightly below the original grade. The symmetrical front façade is adorned with a hipped-roof wooden entry and faces NH Routes 25 and 3 to the east. The entry porch has a painted wood floor, low railings with square ballusters and a large granite step. The porch roof is supported at the outer corners by square wooden posts with molded capitals and bases and at the exterior building wall with pilasters that mimic the vernacular Doric detailing of the posts. The railing on the south side of the porch has been cut away to allow for the construction of a wheelchair ramp of pressure treated wood from the grade to the double doors that were installed one step up from the original porch floor. The porch is flanked on either side with a 2 over 2 double hung window with a wide head casing and a molded cap. Above the roof of the porch, a painted wooden sign identifies the building as the

**CENTER HARBOR**  
1843 1907  
**TOWN HOUSE**

All facades of the original block are finished with clapboard siding fastened with wire nails to reveal a 4 inch exposure. Wide corner boards adorn the corners of the building. The eaves and rakes are

boxed with a crown molding and a single frieze board beneath. The eaves are discontinuous at the gable end with a boxed cap above and a pilaster capital of crown molding below the frieze board. The decorative eave, rake, and corner details are repeated at the rear corner of the main block. The north façade of the main block is plain apart from two 2 over 2 windows. The south façade contains a bank of six 2 over 2 windows in the classroom area and another at the area of the stage is sized similarly but raised higher than the others in the façade.

Behind the original building is a shed-roofed privy with a shallow pitched roof. The boxed eave and rake detailing of the main block is repeated at the privy, which is windowless apart from two awning units at the west elevation tight to the frieze board, one at each side of the addition. A single flue chimney rises through the privy roof in line with the ridge of the main block. An original chimney at the center of the building has reportedly been removed very recently. The privy no longer functions and the space where holding chambers were previously stored within the stone foundation has been recently filled with earth.

A gable roofed addition on the north side of the main block has its western side aligned with the the west (rear) side of the main block and its gable face fronting Waukegan road to the north. This woodshed has only one window and one door, both in the eastern façade. The boxed eaves and rakes and corner details are again repeated on this addition and there is no sign that the clapboard finish on the west side was installed at two different times. All of the siding on the building appears to be newer than the original construction but wire nails used in the installation of the clapboards would have been available at the time of all of the renovations/additions documented with the building. The woodshed sits on an uncapped fieldstone foundation assembled with a mortar bed.

The corner site is steeply rolling to the north and east and flattens to the south where a small parking area has been established with a continuous access to the state highway. The terrain and the location of the building make merging into fast moving traffic on this road a little tricky. An area of the site to the west of the building is undeveloped and a trail through these woods provides winter passage for snowmobilers.

### Interior

The interior of the Center Harbor Town House dates extensively to the renovation of the building for use as a school in 1933. It is unclear from the record which portion of this work may date from 1907, though it is established that the raised platform at the west end of the hall was originally constructed as part of that earlier work. The double entry doors in the east wall open into the back of the main hall, opposite the raised stage. The main space is now divided into two spaces by removable panels sitting upon a molded railing that separates the raised platform area from the larger hall. At 11 feet 6 inches deep, the raised platform occupies almost a third of the 39 foot long room. The railing at one time sat upon a balustrade of unknown height, all of the balusters having been removed from the building. The railing and the panels can be removed to open up the platform as a stage to the main hall. A woodstove with an enormous heatshield stands near the stairway at the north side of the stage. Two of the room-separating panels have been remade to allow for the passage of the stovepipe over the center of the stage to the chimney at the privies. The older panels remain in the stage area, which is accessible at this time only through two panel doors standing on the bottom step of narrow three-step stairways on either side of the stage. The floor of the stage and of the hall are of narrow wood strips of unknown species.

A continuous wainscot of beaded board paneling wraps the main hall and the stage area with a molded wooden cap and painted plaster finishes on the walls. A mechanically fastened acoustic tile ceiling has been installed underneath an older plaster ceiling which was installed over sawn lath. The wood finishes are of high gloss, and the cap is modified to hold chalk pieces at the location of the chalk board. A large bank of six windows floods what could be a dark room with southeastern daylight. Paint failures and glue residues indicate that there was once a chalk board at the center of the north wall between the windows but this has been removed. A smaller chalk board on the same wall west of the window may be a smaller piece of the other, or may have existed at the same time. A kitchen of sorts has been established in the southwest corner of the stage area with an electric stove, a small corner counter and a sink basin without running water.

The interiors of the two privies, including all the walls and ceilings, are of the beaded board like the wainscoting in the adjacent space. All these surfaces are finished with a similar high gloss finish. The floors are of narrow wood of unknown species. There are no sinks or casework in these rooms. The privy seats are freestanding in the space and vent through the roof. A storage closet in the southern space provides shelves for storage of bathroom supplies.

The interior of the wood storage shed is unfinished with exposed balloon framing of rough sawn softwood. Floor platforms sized about half of the size of the addition hang off the wall framing on the south and north sides of the space with the south platform at the level of the stage and the north platform about 64 inches higher. The rough concrete basement floor is a set about two feet lower than the level of the adjacent crawl space. The stone foundation wall is exposed at the lower level to a height of about 36 inches.

The following is a list of Character Defining Features related to the original construction or the historically significant 1907, 1933, or 1939 additions, each of which is important to preserve and/or repair as part of any future work on the Center Harbor Townhouse:

- Front-Gable form
- Greek Revival eave, rake, and corner detailing
- Entrance porch with decorative columns and pilasters
- 2 over 2 double hung windows with decorative drip caps
- Double exterior 5-panel entry doors
- Raised platform / stage at west end of building
- Two panel doors to raised platform
- Sawn common frame with hewn timber frame sills
- Hewn ceiling joists that once supported chimney
- South façade window cluster
- Interior wainscoting, window and door casework, and trim
- Five panel interior doors
- Strip wood flooring
- Sawn lath and plaster finishes
- Stone foundation walls
- Schoolhouse woodstove



## Assessment of Condition

### Building Frame

The building frame of the Center Harbor Town House is almost entirely of sawn common softwood with 4" deep balloon-framed exterior walls and a roof assembly of 2" x 7" rafters overlain with board sheathing. The floor frame of the original Town House is composed of recycled hewn timber sills and floor girts across the short dimension of the building at approximate 10' intervals. The floor beams support 1 ¾" x 10 ¼" wood floor joists and bear intermittently on piles of large, loose stones. The specific condition of the floor frame was difficult to evaluate because the crawlspace was inaccessible, but what could be seen seemed in sound condition and the floor feels firm for a building of this age and limited recent use. Structural review by the structural engineer concludes that the joists are appropriately sized but the heavy



notching at their ends make them unacceptably susceptible to splitting. The timbers were determined to be the weak link in the floor system and are only sized to support about half of the 100 lb/s.f. loads required by the NH state building code. The proximity of the floor frame to soil in the shallow crawl space is a cause for concern and the floor frame may be deteriorated from long term exposure to unacceptably high moisture conditions

The light roof framing appears in sound and dry condition with limited instances of localized splitting. It was noted that the roof rafters tie to each other in pairs at the ridge with no ridge board and that there are only two collar ties in the attic. The roof framing also supports the original flat plaster ceiling and a newer acoustical tile ceiling with 1x wood boards side nailed into the rafters and attic joists at their 1/3 points. A curiosity in the attic is a pair of heavy hewn timbers spanning across the middle of the main hall which until recently supported a brick chimney. A makeshift truss and reinforcing iron bars were installed apparently after the original chimney construction as a hole in the original plaster ceiling that allowed for the passage of the stove pipe seems awkwardly placed with the steel tie between it and the chimney location. The chimney itself has been removed and there is no way draw a conclusion about the actual location of the original (or later) stovepipes. An engineering analysis shows the roof is undersized for the snow loads it must carry by code, but the steeply pitched roof has seemingly performed acceptably to date.







The stage and privy addition to the rear of the building are later additions to the Center Harbor Town House. The stage platform is made of recycled vertically sawn 2x10s that clearspan from the original rear wall to a recycled sawn beam at the stage front. The beam and many of the joists are supported intermittently with short wood pieces standing on the original floor. The engineer identifies the limited support of the stage floor without regard to the main level framing as a cause for concern. The small privy seems square and well-built but no evaluation was made of its inaccessible frame.

The woodshed addition is constructed of light balloon framing in a slightly different manner than original Town House. 2x4 wood framed walls stand directly on the stone foundation instead of on a wood platform. Two independent wood floor systems are framed with 2x floor joists spanning east to west across ledger boards on the north and south walls. On the south side, a floor aligns with the stage floor and an attic floor bears on the walls top plates above. On the north side, a floor is installed about half-way between these levels. The roof of the woodshed is framed with 2"x7" roof rafters with a 2x ridge board and few collar ties, all in sound condition.



This roof is also calculated to be undersized to meet current code requirements for loading and sheer stresses.

### Chimneys

Only one chimney remains of the two previously extant in the Center Harbor Town House. The one-flue chimney of brick masonry appears to have been previously repointed with fair results. A small stone cap adorns the chimney top and there is no interior sign of water leakage, though the chimney itself is completely hidden within the building. Built to serve the woodstove in the main hall, the chimney may not be lined as would be required to be able to continue its original purpose.

The original chimney stood on the roof frame at the center of the main block and a woodstove here tied into the chimney above the ceiling line. Chimneys are often a source for moisture infiltration through a building's envelope and demolition of the abandoned chimney above the roof occurred prior to the last re-roofing. The remaining portion was removed very recently. A large quantity of stone materials in the crawl space at the center of the building might once have composed an



inflammable hearth for the original stove, though there is no other direct evidence of such an assembly .

## Foundation



The foundation of the Center Harbor Town House is entirely composed of small to medium fieldstone likely laid to a depth of less than three feet below grade. All of the stonework is in fair to good condition. The stones of the main block were originally dry laid but these walls were later pointed with mortar at the exterior side only, likely because of the inaccessibility of the

crawl space. The foundation of the wood shed addition was constructed with full bed mortar setting and is in good condition and as seen from both sides. Foundations of fieldstone are prone to moving under frost action, but there is only limited evidence of such movement here, predominantly found in the north foundation wall of the main block near to the east building corner. Interior plaster damage at each side of the south facing bank of windows in the meeting hall indicate some additional foundation movement at these locations along the bearing wall. The privy foundation seems similarly constructed to the woodshed wall, but this foundation is only minimally exposed and visible only from the exterior.



The piers at the interior of the crawlspace were also inaccessible, but observation from the locations of the limited vent spaces in the perimeter foundations reveal that these are the weakest components in the foundation system. These piers serve to support the beam floor beams that span north to south across the crawlspace and are typically composed of two or three stones stacked together. Because there are no footings for these piers below grade, they are the most subject

to movement under frost conditions. Some are raising the floor beams higher than necessary and introducing curvature to the floor above, and others fail to even support the beams at all, leaving air gaps under their intended bearing points. Four vents into the crawlspace are provided with fixed louvers, removal of which does not allow an adult to enter the crawlspace. No standing water was observed in the crawl space, though the proximity of soils to the building floor frame is a concern. Grades around the building appear to pitch more than the minimum of 3" in six feet that would be desirable.



## Exterior Envelope



The roof of the building was inspected from the ground and through photographs as it was covered with snow during the season of this investigation. The architectural asphaltic shingle roof is reportedly fifteen years old and is showing signs of localized curling with no failures of performance noted at the interior. The patch made where the chimney was removed is well done and not readily observable from the ground. The type of roofing installed is capable of providing good protection for an extended period of time, but can be affected by building movement, wind damage, and poor installation techniques. The cupping of the shingles is concerning and should be watched carefully.

The clapboard siding on the building is generally in poor to fair condition with the greatest degree of deterioration at the interior corner where the woodshed meets the original structure. Additional damage to the clapboard finish is concentrated at areas near the lower portions of the walls where splashback from roof stormwater repeatedly wets the wood. Additional damaged materials may be found with additional inspection in areas where roofs and the chimney meet sidewalls of the west side of the original structure. Inspection from the ground did not reveal problems in these areas.



The paint finish on the exterior is in poor to extremely poor condition, with paint failure a primary concern on the north, east, and south elevations of the main block and woodshed addition. The west façade is in better condition with fewer complete paint failures. At large areas of the clapboard siding and trim, paint is heavily peeling with substantial areas of bare wood visible. Paint is peeling off in large flakes and falling on the soils around the building, a concern because all paint applied prior to the mid-1970s is likely to contain lead, a known hazardous material with special state and federal handling requirements.



Paint on doors and windows is in mixed condition, generally similar to that of the clapboard finishes on the same facades. The window glass in the window at the rear of the stage north of the privies has been broken and temporarily secured with a plywood cover on the exterior. The paint on the double entry doors and trim is in fair condition as these doors are protected from the weather by the porch roof. Paint on the lower panels is in worse condition and has started to peel at the left side.



The door to the woodshed addition is served by no entry step though it's sill is approximately three feet above the grade and four feet above the concrete floor at the interior. Two of the five panels in this door have been replaced with hardware cloth, perhaps as an aid to drying the fire wood that was once stored here. Similarly, the double hung window adjacent has been fixed in place with the upper sash open and the opening infilled with hardware cloth. Window glazing putty is in fair conditions with limited failures.



The floor of the entry porch and the bottoms of the decorative posts that support it the porch roof are suffering from structural deterioration as well as finish failures. The shallow porch frame is even closer to the soils beneath than is the floor of the main block to the crawlspace dirt and is therefore exposed to even higher levels of continuous moisture. Compounding that, the porch floor is laid to allow water through the porch floor deck, but the space below the porch is closed in at the porch perimeter with stonework. The addition of the ad-hoc handicapped accessible ramp over the top of the porch floor all conspire to allow moisture into the cavity beneath the porch and then trap it there without adequate ventilation of the space to allow for drying. The porch floor is deteriorating and crushing where it bears on the corner stones and elsewhere. The column bases and lower portions of the railings are suffering from rot as well as paint failures.



## Energy Issues



The existing building is furnished with a 1930's vintage Waterman-Waterbury wood stove wrapped in an enormous metal heat shield. While attractive to look at, this stove was reportedly finicky to use even when it was new and is inadequate to meet the heating needs of a modern structure without a major servicing and a dedicated individual to keep it running well. Combustion air is provided to the stove through an intake vent under the window in the west wall behind the stage and through ductwork under the stage. A single-walled stove pipe is intended to carry waste gasses to the chimney at the privies with a horizontal stove pipe two feet or so below the ceiling.

There is no insulation in the Center Harbor Town House anywhere in the walls, ceilings, or floors. The main attic was once ventilated with a single louvered gable vent but this was closed over prior to the installation of the Town House sign on the east gable face. Passive bathroom vents from two bathroom stack vents appear are likely joined in the attic above the privies and vented through the roof in a stovepipe type vent just west of the chimney.



## Integrity of Historic Interior Features



The most recent significant renovation made to the Center Harbor Town House was the addition of the wood shed and storage structure in 1933. Apart from the deterioration outlined elsewhere in this report, the building maintains a high degree of historical integrity, especially at the interior where finishes have been largely spared from the impact of weather. With the exception of some 1980s vintage electrical work and the changes made for handicapped access at the front entry porch, the building is very much as it was when the new stove was placed in the classroom and the woodshed addition was made to the building in 1939.

In the building interior, the notable exception to this lack of change is the installation of a mechanically fastened acoustical tile ceiling to the underside of the original plaster ceiling at an

unknown date. This new ceiling was significantly damaged during the recent demolition of the chimney above the ceiling, resulting in an open hole into the attic. The acoustic ceiling is installed on strapping attached to the face of the original ceiling plaster, the condition of which is unknown. Plaster ceiling failure is often an issue in buildings subject to movement on stone foundations and the new ceiling may cover loose or failing plaster. Alternatively, the new ceiling may also simply have been installed to dampen the acoustics in what would be a noisy room with lots of hard surfaces. Either way the original ceiling plaster is likely in poor condition.



These hard surfaces: the wood floor, the wood wainscot, and the plaster walls above the wainscot all remain intact as they were in 1939. The narrow strip wood floor was covered in dirt and dust and the overall finish may be well worn. The window and door trims and wainscot, where visible, are intact and in good condition. Plaster finishes are generally in good condition with localized failures at the upper corners of the bank of windows on the south wall and diagonal cracking at the northeast corner of the meeting hall. Hairline cracks also appear in the plaster above the

black board installed on the north wall adjacent to the stage door. There is an incidence of dramatic paint failure on the plaster at the north wall between the windows and above the wainscot. Previous replacement of the wainscot cap on this wall and bonding cement on the wainscot indicate that this portion of the wall was once covered with a blackboard or bulletin board, now removed.



The stage railing has been modified to allow removal of the rail and to support a system of multi-paneled solid wood screens in fair condition. Tall, two panel doors in good condition close off the bottom of three step stairways at each side of the raised platform. Among the articles in the stage area are two uninstalled additional panels which appear to be original components of the wood screen from prior to the installation of the stove pipe. There are signs on the wall that there may have been a panel dividing the stage area in half with the panel end attached at the west (back) wall. The uninstalled panels on the platform may have been built for this purpose instead

or perhaps used for both. The wainscot and plaster finishes in the stage area seem to be intact and in fair to good condition. There is marked cracking in the plaster above the doors probably relating to the infill patching of these areas where windows were replaced with the five panel doors. The makeshift kitchen without running water at the southwest corner of the stage area is poorly made and unrelated to the historical aspects of the Center Harbor Town House.





In the two privies, the wall and ceiling finishes are all the original narrow beaded board wood oriented vertically in a wainscot and horizontally above. The lacquered wood in good condition. The floors of narrow strip wood are very dirty and likely in need of refinishing. The storage cabinet in the ladies room is also original and in fair condition. The



later addition, the wood shed, is completely unfinished. Although quite dusty, this space retains its rough, original character.

### Life Safety



Built as a meetinghouse and used most recently by the town of Center Harbor as a site for town meetings, and by the Disabled American Veterans Association as a meeting place, the Center Harbor Town House is classified as an Assembly building according to the 2009 edition of the International Building Code. It's light wood framing is not protected by any fire rated assembly and thus the building is classified as Type Vb construction. The area and height of the building comply

with the requirements of the code, but there are elements of concern that should be noted. Most notably, the building only has a single means of egress: a pair of front entry doors. Technically, each individual door is too narrow to meet egress requirements, but their historical value and lack of closers should make them acceptable. Although there is a second door out of the wood shed addition, that door is not accessible from either the exterior or the interior as there are no entry steps on the outside or floor on the inside of the door. A single exit is permitted in an assembly space when it opens directly to the exterior, but occupancy in the space is limited to fifty people. With the stage area closed, required egress from the stage area is not directly to the outside but instead through other spaces. This is a significant hazard. There is no automatic smoke or fire alarm system in the building and no sprinkler. The absence of both could be catastrophic in a fire event where the town must rely on any problem becoming significant enough for passerby to notice and call the fire department. While not a life safety issue, the broken window at the rear of the stage indicates that a security system for the building may also prove useful. Vandalism may be additionally protected against with the installation of Lexan storm windows, which would also afford weather protection for the historic wood windows.







Electrical service in the building is of mixed quality. Electrical systems have been updated to provide grounded service at the limited locations convenience outlets are located, but much of the older wiring remains within the ceilings and likely the walls. Out of service wiring should be removed and the service panel on the wall should be opened and the wiring inspected to confirm that any dangerous wiring is out of service. The service entrance wiring outside the building to the meter is cloth jacketed and the jacketing is failing. This



wiring should be replaced immediately, as it poses a fire risk to the building.

### Accessibility

Neither the Meeting Hall nor the stage area are accessible according to the standards of the Americans with Disabilities Act. The ADA requires accessible parking and an accessible path through the building to the major spaces and an accessible restroom if a restroom is provided. No handicapped parking is provided. The makeshift ramp overlaid on the front porch is too steep and lacks adequate railings and 5' clear turnaround required at the top landing. The stage at 22 ½" above the floor is impossible to access by wheelchair. Minimum openings for doors are required to be thirty four inches with the door open 90 degrees, a condition met by none of the doors in the building. There is no running water or working restroom in the building. Any restroom facilities added should be universally accessible.



## **Recommended Rehabilitation Approach**

### Building Frame

All of the building's timber sills should be inspected at the time of siding repair and replaced if damaged by insects or rot. At the first floor platform level, the floor joists should be re-supported with a continuous ledger or joist hangers to eliminate structural overstrain on the notched joist ends. The hewn timber beams supporting these joists could be seen at a distance during the inspection. Recommendations for improving their performance up to code standards is discussed in the section following on Foundations. With no way to get into the crawl space, a thorough exam of the condition of the frame was impossible. The proximity of the exposed soil to the frame members is a cause for concern related to high moisture levels. Elements of the framing should be inspected and any materials damage by moisture or rot should be replaced.

Wall framing and roof framing in place is generally in good condition. The structural engineer has determined that the roof framing would generally be capable of carrying code required snow loads with the addition of collar ties and gusset plates in the main block. 2x6 collar ties should be installed across rafter pairs in the attic connecting to the rafters just above the vertical ties supporting the ceiling. Plywood gusset plates should be cut to match the roof profile and face nailed to the rafters where they meet at the ridge. In the wood shed addition, new 2x8 attic joists should be installed at the tops of walls to prevent roof spreading.

The largest framing shortcomings in the Center Harbor Town House occur in the and around the raised stage added in 1907. The stage construction transfers loads to the original floor at concentrated locations, often without consideration for the layout below. A new bearing wall or beam should be installed under the stage directly over the timber beam in the main floor frame. Posting at the front edge of the stage should be increased to engage more of the floor joists below instead of just a few. New framing can be coordinated to allow for table storage under the stage if required. The engineer has also called for additional fasteners to be installed to better secure the ledger supporting the stage floor joists where they meet the west (back) wall.

Because the Center Harbor Town House is a place of public assembly, the details of any final structural solution should be calculated by a licensed design professional. In keeping with the Secretary of the Interior's Standards for Rehabilitation, repair work and improvements should be additive wherever feasible. Localized timbers and joists damaged by moisture or insects should be replaced in kind.

### Foundation

The engineer has commented that replacing the building's fieldstone foundation with a new reinforced concrete foundation would be a very expensive approach to bring the building's foundation up to the requirements of a new building. Because the existing foundation appears stable, he does not recommend any substantial upgrades to the existing foundation. This outlook is completely in line with preservation Standards for Rehabilitation, which would seek to maintain the fieldstone foundation, a Character Defining Feature of the Center Harbor Townhouse. An area of the stonework at the northeast corner should be rebuilt to properly support the corner of the the frame. Adding two feet of rigid insulation buried below grade at a 45 degree angle could help to protect the likely shallow footings against the kind of frost action that has affected this small portion of wall. The rest of the exterior walls should be inspected and open mortar joints re-pointed. Any openings in the walls large enough to allow animal entry to the building should be completely filled.

At the foundation level, there are significant additional challenges with the building structure that need to be addressed: moisture in the crawl space and frost action under the building's central piers. The following recommendations should greatly improve the building's current moisture problems. In the crawl spaces, all soil within 18" of the wood frame should be removed by hand (8" +/-). A vapor barrier should be installed over the dirt floor of the crawlspace, taking care to allow for a wide overlap and taping of all vapor barrier components under all structural work. Once the ground is covered, vents in the foundation should be rebuilt to allow them to be opened in the late spring and early fall and closed in the remaining seasons.

The timber floor beams supporting the common joists in the meeting room floor are currently supported intermittently with stacks of stones at convenient locations, but the structural engineer's report finds that the spans for these beams is too large. New 22"x22" x concrete pads should be cast with their tops flush with the new lowered grade and pressure treated 6x6 posts installed to support the timber floor beams at their third points or another interval as determined by an engineer.

The fieldstone foundation poses many challenges for the proper insulation of the Center Harbor Townhouse. Because the foundation is heavily textured, prone to some movement, and a potential water source, it is exceptionally challenging to insulate. It would be preferable to insulate these walls and condition the basement space but this should wait until confidence is achieved that all water issues in the basement walls have been controlled. If development of the project proceeds faster than this assurance can be made, the first floor frame should be insulated in the interim with unfaced fiberglass batt insulation.

The closed stonework under the entry porch has likely contributed to the deterioration of the porch frame. These walls should be removed and replaced with deep concrete cast footings and single stone blocks above grade to support the corner posts. Once the porch floor has been reconstructed, the stone step should be re-set on an 8" minimum bed of 1 ½" stone to a level 7" below the porch floor.

### Exterior Shell

Keeping water out of any historic structure like the Center Harbor Town House is always a high priority and it seems like the architectural asphalt shingle roof has been doing that job well. Excessive curling of the roof shingles may be indicative of premature failure of the roofing system. The main roof and those of the additions should be inspected by a qualified roofer and any damaged materials replaced. Extra attention should be paid to the likely locations of failure around roof penetrations (like the chimney), the valleys, and any areas of previous repair such as where the central chimney was previously removed. The roof's ridges, eaves and any horizontal joints should also be reviewed.

Paint finishes on the Center Harbor Townhouse should be undertaken with care appropriate to specific conditions identified elsewhere in this report. The age of the building indicates a very high likelihood of lead paint being a part of the failing paint and appropriate steps should be taken in the removal of lead paint according to state and federal standards. All trim and decorative wood on the Town House should be retained, as should the wooden windows and doors. Heavily damaged wood should be repaired with an epoxy consolidant after paint removal and before repainting. Window sash should be removed and refurbished, not replaced, and the window at the west (back) side of the stage should be reglazed. The exterior doors with missing panels should be fitted with new panels to match the original intent. The entry door with the cracked or split bottom panel should be repaired.

It is preferable to retain existing siding material and remove damaged paint finishes than to replace the siding wherever possible. On all areas of the north, east, and south elevations of the building where paint is peeling to bare wood, remove all remaining existing paint by hand and apply a quality latex primer and two coats of finish paint. On the west side, where the existing paint condition is better, painting preparation should be as appropriate for localized conditions. Painting in fair to good condition should be lightly sanded to assure that new paint binds adequately to the

existing. Some of the texture of the older paint will likely be visible when the work is complete, but this is preferable to a false clean look created by unnecessary replacement of large swaths of clapboard siding. A copy of the Secretary of the Interior's Preservation Brief #10 on Repairing Exterior Paint Problems on Historic Woodwork is attached as an appendix to this document for reference. Other Preservation Briefs (offered online at no cost) that may be of interest with this project include: Brief #9: The Repair of Historic Wooden Windows; Brief #18: Rehabilitating Interiors in Historic Buildings - Identifying Character-Defining Elements; Brief #21: Repairing Historic Flat Plaster - Walls and Ceilings; Brief #32: Making Historic Properties Accessible; and Brief #45: Preserving Historic Wooden Porches.

The wooden sign for the Town House is in fair condition but has endured New Hampshire's weather for a long time. The sign should be removed and repaired for rehanging by an experienced signmaker. Existing lettering styles and sizes should be used to restore the refurbish the building sign. The area behind the sign should be inspected while the sign is removed and all damaged finish materials previously hidden should be inspected and repaired as necessary.

It appears that the entry porch floor and the porch's corner columns require rebuilding because of water damage. The existing molded railings, balusters, and post trim should be carefully removed and set aside. The porch roof assembly is in good condition and should be supported in place while the existing ramp, the water damaged porch floor, and the porch frame are replaced. Use pressure treated pine with painted pine trim for the the porch floor and vertical grain douglas fir with a clear finish for the flooring. Coordinate foundation work described elsewhere in this report to be done in conjunction with the porch repair. Damage to the corner posts may be limited to the decorative base moldings only or may include damage to the structural post as well. To the highest degree possible, retain or reinstall original post materials. Once the posts are secure, fabricate additional materials to rebuild the railings to match the original intent. Regrade across the front of the building to provide good access to the reset stone step at the front of the porch.

At the rear of the wood shed addition, construct a new entry porch adjacent to a relocated drive for the building with a new three-panel door with a glass upper panel. Construct the drive to connect the existing parking area with Waukegan street to provide safe access to Center Harbor roads and add additional parking along the drive including two handicapped accessible spots near the new entry. The existing access from the parking area to NH Route 25 should be closed off and landscaped to prevent serious accidents at the existing blind driveway.

### Chimneys

While it appears from the ground that the existing chimney has been previously repointed, the pointing work appears to have over-filled the masonry joints or been trying to repair spalled bricks with mortar. The work in place should be inspected for new cracking or spalling and any problems found repaired appropriately.

The suspended chimney which was only recently removed was a bit of a novelty that, while not uncommon in New Hampshire meeting houses of the time, is less common to remain in place. In telling the story of the Center Harbor Town House, it would be edifying for the public to see pictures of the unique chimney installation and a description of its special purpose near the woodstove that sat in the center of the room.

## Energy Issues

The intended use of the Center Harbor Town House is for occasional meetings and not daily use. It can be cost prohibitive to fully insulate a large building used this way because the space needs only to be comfortable when actually in use. It is intended that the building's interior be heated (or cooled) only when the building is actually occupied. Better insulation may stretch out the time the empty building retains heat, but there is no real benefit to this during times when no one is in the building. Instead the mechanical system should be sized to quickly heat or cool the building so that users can turn on the system and have the building become comfortable in a reasonable period of time. Insulation should be installed in areas where readily able like the attic while finished exterior walls, which would require impacts on historical finishes should be left uninsulated. Until the use of the building becomes regularly more than several times every week, this will be both the cost effective solution as well as the approach that best preserves the building's historic integrity. A two zone mini-split system with an air to air heat pump will provide a cost effective approach for the building.

A new bathroom in the wood shed addition, which will require both a well and a septic system to be installed, can be well-insulated within the structure so that keeping this one room "warm enough" when the building is unoccupied will protect the plumbing from freezing. Adding a kitchenette outside of this enclosed space will require seasonal shut-offs of at least a part of the system or a different approach to insulating and conditioning the building than is being proposed here. All-borate cellulose insulation is recommended in the wood shed addition behind new finishes and in the attic of main block, as this material has excellent characteristics to encourage drying and discourage rodents.

The existing electrical service to the building should be replaced to remove this fire hazard. The service panel should be inspected and made safe by an electrician, who can remove and replace any deteriorated wiring or remaining ungrounded circuits. Unused wiring from previous repairs should be pulled and removed from the building. New LED lighting in warm color should be installed to augment lighting levels without changing the lighting patterns. The Center Harbor Energy Committee has expressed an interest in providing assistance with energy related issues with the Town House.

The remaining pendant fixtures in the building are in poor condition and are missing their original globes. It may be possible to re-wire the fixtures to meet UL standards and buy new globes that match those seen in (to be discovered) historic photos of the building interior. The re-wiring is important because electrical shorts in older electrical systems are one of the most common causes of fire in historic buildings. Alternatively, new "schoolhouse" fixtures could be found to replace the current fixtures.

## Interior Work

Necessary interior finish work is limited because of the relatively good condition of the existing finishes. The one real challenge is the ceiling, now fitted with fixed acoustical panels. It is unknown whether this previous modification was made to repair a failing ceiling or to correct a loud room. With the moldings at the meeting space side of the removable panel wall installed to accommodate this lowered ceiling, it may be that replacing this ceiling may be a reasonable approach. From a preservation standard, however, this ceiling should be removed and the original

plaster ceiling above repaired. The existing plaster has been heavily impacted by the tile ceiling installation and should be well inspected prior to refinishing and any loose or questionable materials removed, including that within the keys. New plaster should be keyed to the lath as well or better than the existing.

The raised platform area should be left open to the Meeting Hall. Removable panels should be removed and stored in the building, either as modified to be used again, or for future generations under the stage or in the attic. The stage will need to be modified to provide access from the meeting hall to the renovated wood shed which will now house an accessible restroom and a second exit from the building, one that is handicapped accessible. It is not recommended that the stage area itself be made accessible at this time as there is accommodation for those with mobility impairments can be easily made by conducting meetings or ceremonies on the Meeting Hall floor level. A place for a future lift should be set aside near the northwest corner of the existing raised platform near the window.

There are minor plaster repairs to be made at four locations in the Meeting Hall. Buckled plaster should be removed and new scratch coat and finish coats applied to leave a flat surface textured to match the existing. Minor cracks can be filled with new skim materials. Flaked paint at the north wall should be removed by hand and the surface roughed up to receive new skim plaster. Once all plaster repairs are made, prime any new plaster and re-paint all the plaster finishes with latex paint. Historic wood floors in the Meeting Hall and Bathroom can then be re-finished.

The wood shed addition was never used for anything other than storage and was never finished. Because of the need for accessibility, a second means of access, and a working bathroom in the building, all while preserving the integrity of the historical fabric to the greatest extent possible, it is recommended that these functions be served in the woodshed. The existing floors of the wood shed should be removed and a single level floor in the whole of the woodshed should be constructed at the level of the meeting room. Simple finishes and a two new partitions will allow for the installation of a new bathroom and a serving kitchen if desired. A new door with glass in it can be added on the west side of the building where it will be impossible or very difficult to see from any road.

### Life Safety

In addition to replacing the existing unsafe electrical service entrance to the building, new communication lines should be brought to the building to support the installation of a new fire alarm, with smoke and security functions and an ability to automatically alert the town's fire or police of any issues with the building. This functionality should be installed as soon as possible to avert any future threat to the building.

A second means of egress would allow the building to be used for larger groups as the size of the meeting house floor. Because of other issues, one might discount the raised platform for calculating allowable occupancy of the building. Base on the Meeting Hall main floor being 640 s.f., the occupancy requirements for egress would be based on 91 people. This loading should not require panic hardware at the exits and lend credibility to an argument that there is no need to change the front doors to be wider or swing outward.

## Accessibility

The Center Harbor Town House is completely inaccessible according to the standards of the American's with Disabilities Act. Overlaying other requirements for rehabilitating the building and preserving its historic integrity to the greatest extent possible, a new entry porch with a 36" wide entry door has already been proposed along with a new driveway to the west of the building. At this new entry should be a ramp and two accessible parking spaces near the door. With new parking along the drive, many users may make this convenient entry their access to the building, along with those with mobility impairments. Adding a ramp at the rear eliminates the need for any ramp at the front (east) of the building and allows for the return of the entry porch to its original configuration without a ramp.

The wood shed form allows for the construction of an efficient, universally accessible restroom once services are available. Modifications will be required at the north side of the stage where the door and stair will have to be removed or relocated to allow one level access from the Meeting Hall to the restroom and the building exterior. Although the stage will not be accessible without a lift, such a lift could be provided in the future. Until then, program accessibility can be provided with limited individuals accessing the new storage spaces where the privies are currently located. The Center Harbor Town House should be able to provide meeting space for generations to come.

## **A Phased Approach to the Project**

In an effort to provide the Town of Center Harbor with information to help understand and prioritize their efforts to preserve the Center Harbor Town House and to return it to useful service, pricing information is provided below. It is important to remember that these figures are drawn from nationally published average construction pricing and the experience of the architect preparing this report, these figures are presented primarily to establish an order of magnitude sense of the work. These are not bids, and the size of the scope and details of final design solutions may have a significant impact on the actual pricing.

## Hazard Mitigation

For the purpose of assisting the Town of Center Harbor, the work effort for the building has been broken out into several phases, which may be done one at a time or grouped together depending on the anticipated resources at each step of the project. The first phase consists of work which should be undertaken immediately to stop ongoing damage or protect the building from several conditions identified as potentially hazardous during the investigation.

Replace shattered window glass at west side of stage	\$208.00
Inspect and close critter entries to crawl space	\$216.00
Replace utility line from street to meter	\$0.00
Inspect and repair asphalt roofing	\$760.00
<i>Estimate of Items to be done immediately</i>	<hr/> \$1,184.00



## Deferred Maintenance

A second grouping of tasks focuses on maintenance tasks that can be undertaken at any time and that need not necessarily all be done at once. Some of these projects are smaller in nature and some could also conceivably be done by skilled volunteers. It is important that all of the work done on the Center Harbor Townhouse be completed according to the Secretary of the Interior's Standards for Rehabilitation. A copy of these standards is included in the appendix of this report. Every person who works on the building should be familiar with these standards before working, organizing the work, or bidding on work on the building as following the Standards for Rehabilitation may result in different solutions to various aspects of the project. The National Park Service has published a number of Preservation Briefs to aid in the understanding of appropriate methods to identify and treat historic properties in keeping with the Standards. Preservation Brief (#10) dealing with historic exterior painting is included in the appendix of this report for painters to read before undertaking any work on the exterior. Other relevant topics are available without charge at [www.nps.gov/tps/how-to-preserve/briefs](http://www.nps.gov/tps/how-to-preserve/briefs), including (#9) on repairing historic wooden windows and (#21) on repairing historic flat plaster.

Repoint masonry chimney	\$588.00
Scrape and Paint West Façade	\$6,200.00
Consolidate and repair front porch	\$6,000.00
Scrape and Paint East Façade incl. three 5-panel doors	\$7,600.00
Repair, Scrape and Paint North Façade	\$7,000.00
Repair, Scrape and Paint South Façade	\$12,400.00
Refurbish building sign	\$1,200.00
Install fire detection system, 6 detectors	\$4,990.00
Install automatic fire alarm control panel	\$2,125.00
Install motion based intrusion protection system	\$2,300.00
Install exterior mounted lexan storm windows	\$1,980.00
Reset granite stoop(s)	\$1,200.00
<i>Estimate of Deferred Maintenance Items</i>	<i>\$53,583.00</i>

### Environmental and Structural Stabilization

A third grouping of tasks to complete relates to the need to protect against deterioration of the building and its components due to forces of nature including gravity and moisture movement (including frost action) within and under the building. As long as these tasks go undone, more and more of the historic fabric of the building will be lost and more and more work will eventually be required to faithfully repair the building. These projects should be undertaken as soon as possible. Some will require additional design work prior to their undertaking.

Make structural and cosmetic repairs to foundation	\$5,600.00
Excavate in crawlspace to provide 18" minimum depth	\$6,400.00
Jack and re-level new posts – Install new post footings	\$4,300.00
Shore frame per recommendations of structural engineer	\$1,350.00
Install vapor barrier and vents	\$3,500.00
Replace existing stone-pile piers with new wood posts	\$1,200.00
Clean all historic wood wall finishes	\$1,280.00
Patch historic plaster in 4 locations	\$864.00
Repaint interior walls	\$3,400.00
remove accuoustic tile ceiling and repair original plaster	\$5,490.00
Repaint ceilings	\$1,210.00
Refinish wood floor (fir?)	\$4,900.00
<i>Preliminary Estimate of Infrastructure Items</i>	<i>\$39,494.00</i>

### Building Systems Upgrade and Renovation

Not all projects are easily broken down into small manageable parts. The building systems described below are integral to all parts of the building rehabilitation. These systems and equipment should be designed for the whole of the building, even if decisions are made to install them in a more piecemeal fashion as opportunities arise.

Install new two zone split mini heating system	\$9,900.00
Upgrade electrical throughout building	\$5,875.00
Insulate woodshed walls with cellulose	\$4,257.00
Insulate attic with cellulose	\$4,822.00
Remove woodstove from service - Clean for exhibit	\$250.00
Insulate woodshed floor with cellulose	\$1,000.00
Make Structural Repairs to attic framing	\$1,920.00
Install new accessible public restroom (fixtures + finishes)	\$13,871.00
Install new serving kitchen at main level	\$1,800.00
Refurbish historic window sash	\$3,750.00
Install woodshed and serving area fixtures + finishes	\$38,600.00
Construct new west side entry porch	\$18,300.00
<i>Preliminary Estimate of Building System Improvement</i>	<i>\$104,345.00</i>

It was noted during the investigations that some consideration has been made to removing the existing stone foundation and replacing it with a new concrete basement foundation. This is not recommended, even with a new foundation finished with stone to look like the existing foundation. The building is stable as it is and does not require a new basement for its long term health. The following pricing is for a basic foundation in addition to other basement costs listed above.

*Alt. replace original stone foundation with new basement      \$85,000.00*

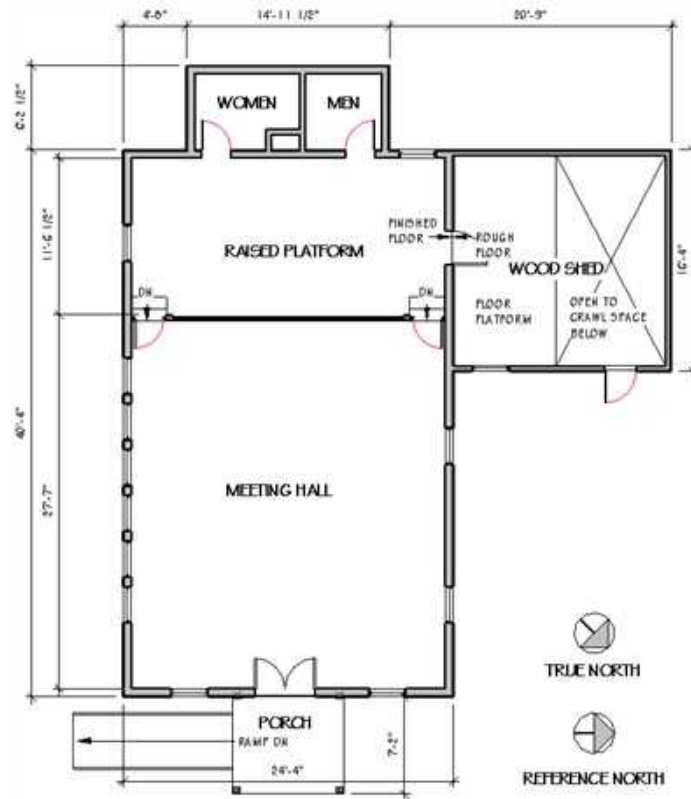
## **Conclusion**

Having served in several capacities since its original construction in 1844, the Center Harbor Town House is in good condition for a building of its period. Although in a concerning condition of general paint failure, the exterior of the building maintains its classic Greek Revival detailing including strong cornice lines that were tremendously popular from the 1830s to the 1860s in the United States, especially for civic structures. The building is purposefully located at the geographic center of the irregularly shaped town and hosted Center Harbor Town Meetings almost 120 years. Renovated to accommodate a raised stage and to serve as a school in the 1930s and 1940's, the building has remained intact at its interior and offers a generous space with lots of daylight because of the bank of windows in the south.

The challenges of truly making the building welcoming to all of the public combined with the need to add a second means of egress and a working restroom drive the conclusion to renovate the interior of the woodshed addition, which has never before been finished, to provide all of these needs with minimal impact to the existing interior finishes. The existing stone foundation is in very good condition and with minor repairs will meet the building's needs for the next hundred years. The site should be re-worked to allow for a new driveway off Waukegan Road to pass behind the building to the existing parking area, which should be made safe by eliminating direct access to the state highway. With parking along the new drive, including handicapped parking, the Center Harbor Town House will be readily able to once again serve small and large groups of people readily through three seasons of each calendar year.

## Drawings and Photographs:

### Plan of Existing Conditions

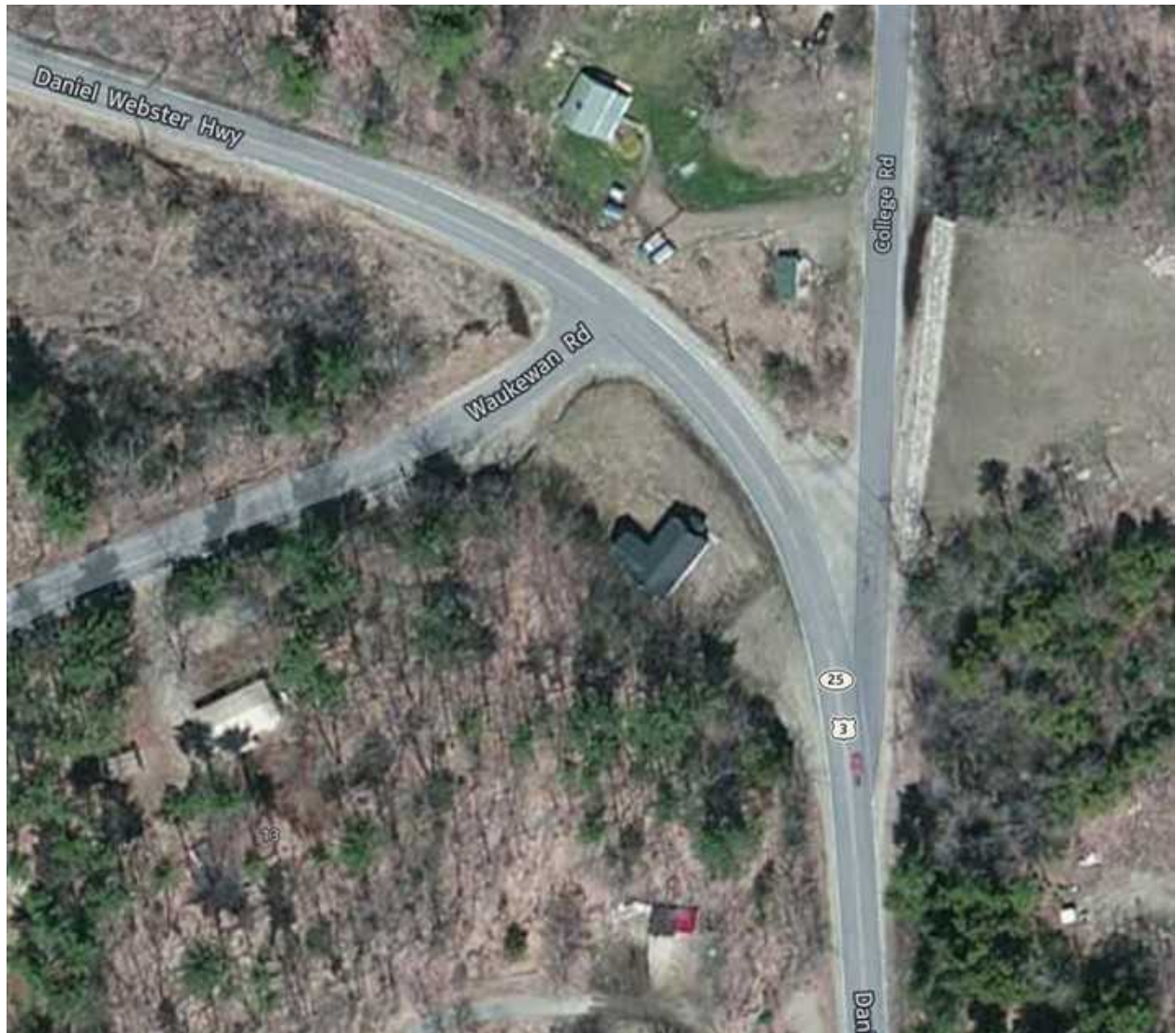


### Tax Map Plan of Center Harbor Town House property



Note: Project North is to top left (actually north northwest)

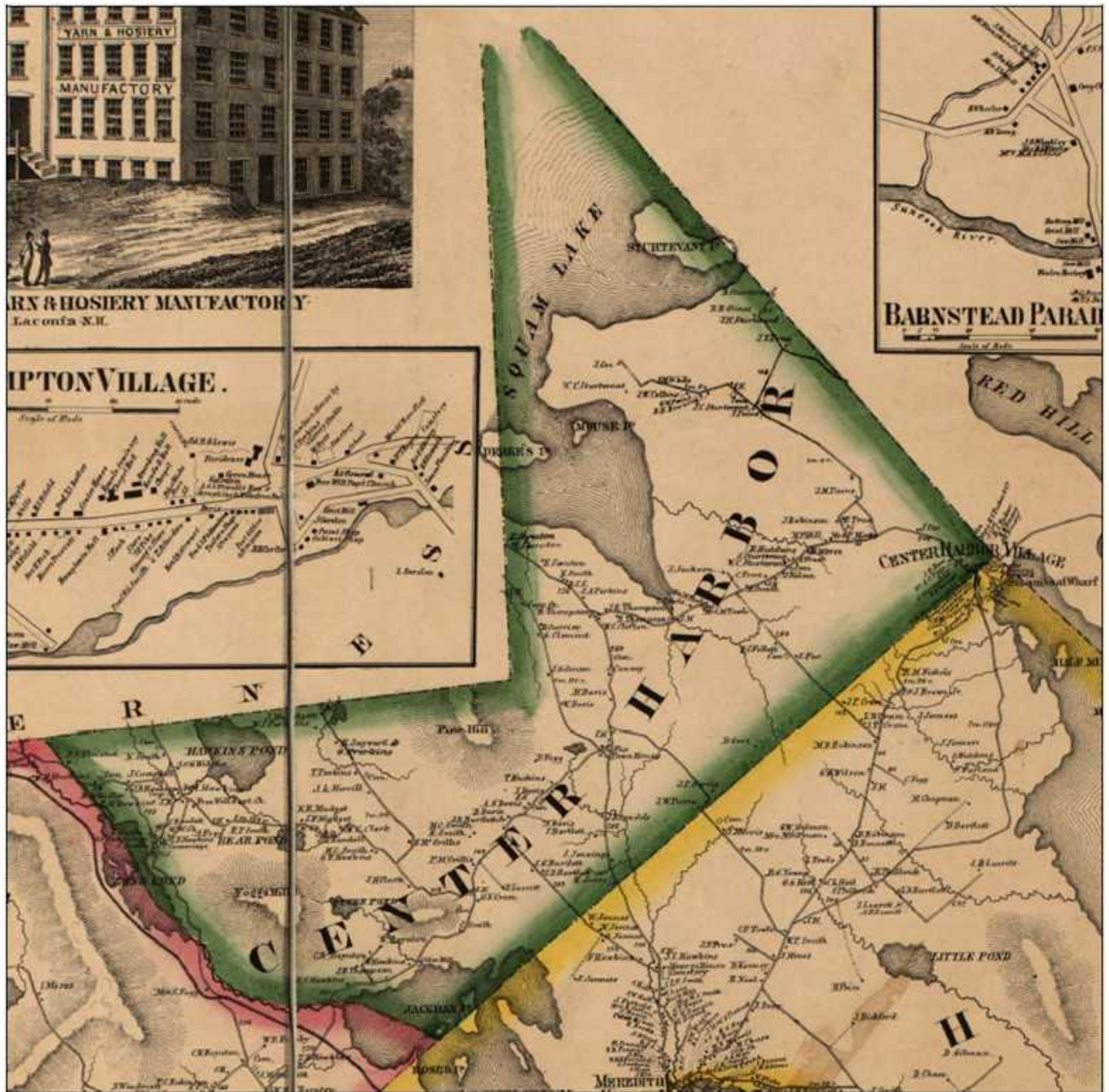
Satellite Image of Center Harbor Town House property



Note: Project North as referred to in this document is to top left of image (actually north northwest).



1860 Map of Center Harbor (Image courtesy of Mae Williams)



1860 Map of Center Harbor, New Hampshire

Source: E. M. Woodford "Map of Belknap County, New Hampshire."

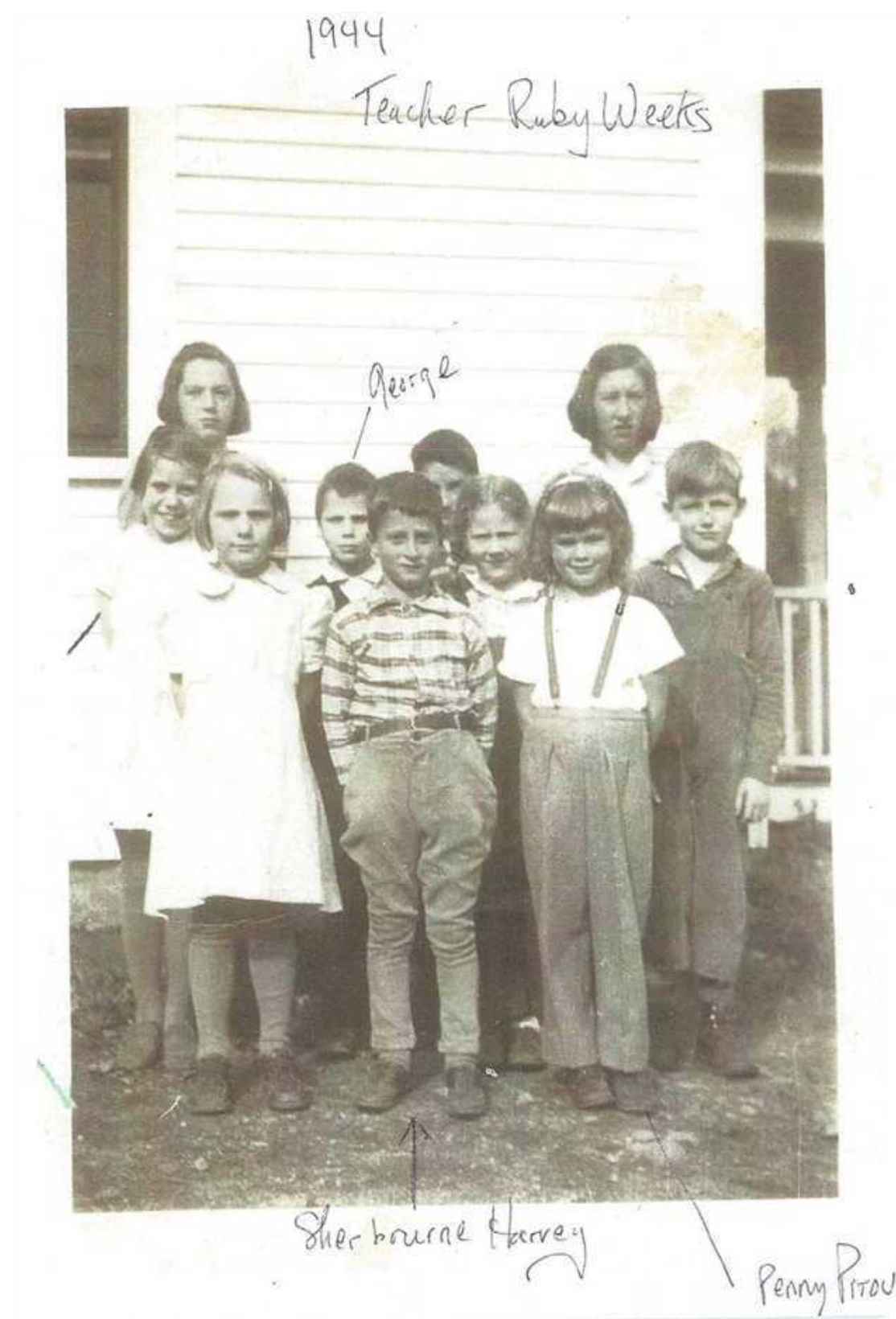
1942 Photograph in front of East Entry Porch



Town House School  
1942



Photograph showing 1944 Southeast Corner



## Photographs of Existing Building



Center Harbor Townhouse as it stands today.



East elevation of Greek Revival Center Harbor Townhouse showing 2/2 windows and entry porch



North side elevation showing strong relationship to ell. Note window of woodshed is placed at level of stage



West end of main block showing Privy addition at rear of raised platform and chimney





South elevation of main block with the privy seen to the left and the entry porch on the right side with its overlaid non-conforming ramp.



North east corner of main block showing extreme paint degradation and stone foundation



Porch floor is in very poor condition related to trapped moisture in the current assembly



Existing crawl space with stone supports under beam - note proximity of floor framing to soil and complete lack of insulation in floor system above.



Interior of hall with removable solid panels on the railing separating the stage area



Interior side of 1907 double doors





Circuit breaker panel. Most electrical work appears to have been updated in the 1980s, and other new wiring installed ad-hoc.



Makeshift kitchenette in southwest corner of stage area has no running water





Privies are no longer working. Note that no plumbing in this bathroom impact the original wall finishes.



Minor cracking of plaster typical of foundation movement under frost action.



Localized area of paint failure behind where chalkboard or bulletin board was previously removed



Attic with sawn common rafters. Additional framing to left was apparently added for lateral support of recently removed hanging chimney at center of meeting hall.



Stress cracks in plaster work have been previously repaired at northeast corner of meeting hall



## **Appendix i**

### **Review of Structural Conditions Fisher Engineering P.C. (with photographs)**





# FISHER ENGINEERING, P.C.

686 Belknap Mountain Road  
Gilford, New Hampshire 03249  
(603) 528-7641  
joel@fisherengineeringpc.com

March 4, 2016

Norman Larson, AIA, LEED AP  
Christopher P. Williams Architects, PLLC  
P.O. Box 703, 4 Stevens Avenue  
Meredith, NH 03253

Re: Review of Structural Condition  
Center Harbor Town House  
Center Harbor, New Hampshire

Dear Norman,

You requested that we observe the existing building and provide our opinion of the structural condition, and provide general recommendations for remedial work as we deem appropriate.

## Introduction

On February 19, 2016 we met with you to observe the existing building. The floor framing is exposed to view but inaccessible. Most of the wall framing is covered by finishes and not observable. The roof framing is exposed to view from within the attic space. Please refer to the attached images for additional information and comments.

Codes referenced as the basis of our work include the 2009 International Existing Building Code (IEBC) and the 2009 International Building Code (IBC), both of which are part of the NH State Building Code.

## Background

The original construction reportedly dates to 1844. The interior space was divided by a proscenium and elevated stage floor in 1907. Two additions were constructed; one for lavatories on the west side in 1933, and one on the north side in 1939.

The building is a wood structure, conventionally framed for the dates of construction. The roof framing consists of 2"x7" wood joists spaced at 22 to 24-inches on-center. The joists are supported by wood framed walls, and in the main hall are tied at the walls by 2"x7" ceiling joists. The main floor is framed with 1 3/4" x 10 1/4" wood joists spaced at 16-inches on-center, supported by timber beams spaced at 10-feet on-center. The timber beams were inaccessible and measurements were not obtained.

The foundation consists of field stone which was dry laid for the original building, and has likely been mortared for the additions.

## FISHER ENGINEERING, P.C.

### Current Code Required Load Capacities:

Floor Live Load for Place of Assembly = 100 pounds per square-foot (psf)  
Floor Live Load for Stage = 125 psf (Production Theater)

Elevation Adjusted Ground Snow Load  $P_g$  = 75 psf at elevation 700 feet  
Required Flat Roof Snow Load Capacity  $P_f$  = 55 psf if kept above freezing  
65 psf if kept unheated

Wind Speed = 90 miles per hour; approximately 15 psf applied to wall and roof

Seismic Base Shear = 20% of structure weight

### Results of Analysis

The species of wood used for the framing lumber is not clear but is one or more of the softwood species commonly used for framing in the area, such as the pine, hemlock, fir or spruce families. The wood mostly appears to be good quality, probably a mix of No. 1 and 2 grades.

The National Design Specification for Wood Construction provides allowable design stresses for lumber graded by various lumber grading agencies. The values are not intended to be used for design or analysis of lumber which has not been properly identified or graded. However, we reference the 2005 National Design Specification for Wood Construction strictly as a frame of reference to provide an approximate range of load capacity. Sampling and testing the wood framing is the only way to accurately determine the appropriate allowable design stresses for analysis.

We used the No. 1 grade Eastern Softwoods species classification and the No. 1/No. 2 grade Spruce-Pine-Fir species classification of the 2005 National Design Specification for Wood Construction to determine the approximate allowable design stresses. These classifications encompass the softwood species likely to have been used at the time.

### 1844 Main Hall

The existing roof framing for the 1844 main hall appears to have an approximate snow load capacity in the range of 40 to 50 psf. This is compared to a required capacity in the range of 55 psf to 65 psf for uniform loading, and 75 psf for unbalanced loading (snow only on one side of the roof). The installation of properly designed collar ties and gusset plates at the ridge would increase the snow load capacity significantly, enough so that the roof would probably meet current snow load requirements, regardless of lumber species or grade.

## FISHER ENGINEERING, P.C.

The existing floor joists for the 1844 main hall appear to have an approximate live load capacity in the range of 120 psf to 135 psf. The joist ends are notched beyond what is acceptable. Notching the ends of the joists excessively can cause the members to split. The member ends should be provided with supplemental support, or at minimum, inspected to verify no splitting has occurred.

The existing floor beams for the 1844 main hall were not analyzed but probably do not have the required 100 psf live load capacity. The floor beams need to be measured and an approximate analysis performed to determine whether additional supports are needed or an additional beam added underneath. An appropriately sized beam would also provide the necessary supplemental support for the notched joist ends.

### 1907 Stage Floor

The existing joists for the stage floor are intermittently supported on the original floor below at locations which have the potential to overstress the original floor framing because of the configuration of the supports; they are too close to the mid-span of the joists below. The existing stage floor joists will have an approximate live load capacity of at least 125 psf provided a bearing wall is constructed at an appropriate location on the original floor below.

The joists do not appear to be adequately supported at the proscenium wall, and should be retrofitted with a bearing wall on the original floor below, or beams and posts added to transfer the load to the foundation. The ledger at the rear of the stage wall needs to be better fastened to the existing studs or supported with verticals fastened to the existing studs.

### 1933 Lavatory Addition

The framing for the 1933 addition was concealed from view and inaccessible, and was not analyzed.

### 1939 North Side Addition

The existing floor joists for the 1939 addition appear to have an approximate live load capacity in the range of 35 psf to 40 psf. The addition of a center support, such as a beam or bearing wall, would increase the live load capacity significantly, enough so that the floor would meet the current floor live load requirement.

The existing roof joists for the 1939 addition appear to have an approximate snow load capacity of at least 75 psf, however the ceiling joists need to be tied together at the top of the walls to prevent spreading. This is compared to a required capacity in the range of 55 psf to 65 psf for uniform loading, and 75 psf for unbalanced loading.

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## Consideration of Lateral Loads

The building and additions were likely constructed with little thought given to wind loading, and no thought to seismic loading. Great advancements in the understanding of wind loads and seismic loads have been made since the building was constructed, and retrofitting for lateral loads should be considered.

The effort required in retrofitting the building for wind and seismic loads will depend in part on the amount of existing wall finishes to be replaced. It is relatively easy to add sheathing to resist lateral loads once wall finishes have been removed. Plywood sheathing, or diagonal boards to keep with the historic nature of the framing, could be used to provide resistance against lateral loads. The horizontal boards used for sheathing do provide some resistance against lateral loads, but it is not significant.

The building should be tied to a solid foundation if overall building stability and resistance to lateral loads is to be provided. The existing foundation is partially mortared field stone and does not have the capacity to resist uplift or lateral loading. The building foundation should be replaced if overall building stability is to be achieved.

## Observations and Discussion

Overall, the building framing appears to be in good condition. Signs of distress or overloading were not observed, indicating that the building has performed adequately.

The front porch has settled and the post supports for the roof are badly deteriorated, and should be replaced. We suspect most of the porch framing is deteriorated. The foundation for the porch should be reconstructed and new porch framing provided.

The foundation for the building was constructed with field stone. The stone for the original 1844 building was dry laid, and pointed on the outside with mortar at a later date. The foundations for the addition appear to have been mortared at the time of their construction. It is clear that foundation for the original building has been repaired, and is presently in need of repair or replacement.

The foundation is in good condition considering the age and construction type of the foundation, with minimal signs of distress. Signs of frost action and settlement are apparent, as evidenced by the occasional cracks in the mortar, movement of the stones in the wall, and minor cracking in the front and south walls of the building. This was observed in the foundation for the original 1844 building. There is no simple fix to prevent further movement of the foundation. The wall will continue to move, however slightly, and require maintenance in the future if left as-is.

The foundation could be replaced with concrete bearing below frost penetration depth, transitioning to mortared stone above grade to maintain the character of the original construction.

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The floor beams for the original 1844 construction are supported by precariously stacked stones, some partially mortared. The main hall has a pronounced hump in the middle which is the result of either an attempt to shore the beams in the past, heaving and settlement of the piers, or likely a combination. Regardless of the cause, the piers should be reconstructed on a solid concrete footing, preferably placed below frost penetration depth.

### Summary of Recommendations

In general, the Building Code permits the existing conditions to remain as-is unless additions or modifications increase the stresses in the framing by more the 5 percent. Retrofits for lateral loads are recommended but not typically performed for old historic structures unless there are signs of distress, or the building is highly significant from a historic perspective. The retrofits and upgrades recommended for support of live and snow loads are strongly encouraged from an engineering perspective but are not mandatory from a Code perspective. The recommended upgrades may be phased pending availability of funding.

We make the following recommendations:

1. Retrofit the roof framing with collar ties and reinforce connections with plywood gussets or similar.
2. Retrofit the floor beams with new engineered lumber below to provide the required floor live load capacity, and to address the issue of notched floor joists.
3. Retrofit stage floor joists with an intermediate bearing wall, and an additional bearing wall or beams and posts added at the proscenium, and improved support at the back wall of the stage. The actual location of the wall is to be determined after better access to the crawl space is available.
4. Repair or replace the foundations for the building.
5. Reconstruct the support piers for the floor beams using mortared stone or CMU on concrete footings. The spacing of the piers will be 8-feet to 12-feet on-center, depending on the new floor beam size.
6. Consider retrofitting the building for lateral loads.



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The conclusions and recommendations contained this report are based on limited observation and analysis, without the benefit of materials testing. There may be areas with varying conditions from those which we observed or analyzed, and may need to be addressed at a later date.

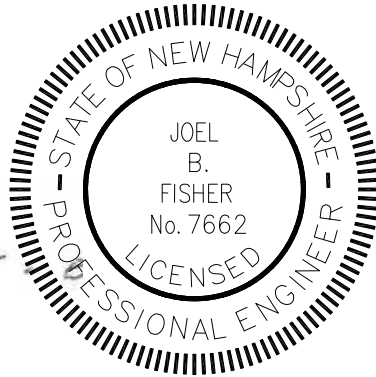
Please feel free to call if you have any questions or require further assistance.

Thank you.

Sincerely,



Joel B. Fisher, P.E.  
Principal



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Center Harbor Town House  
Center Harbor, New Hampshire



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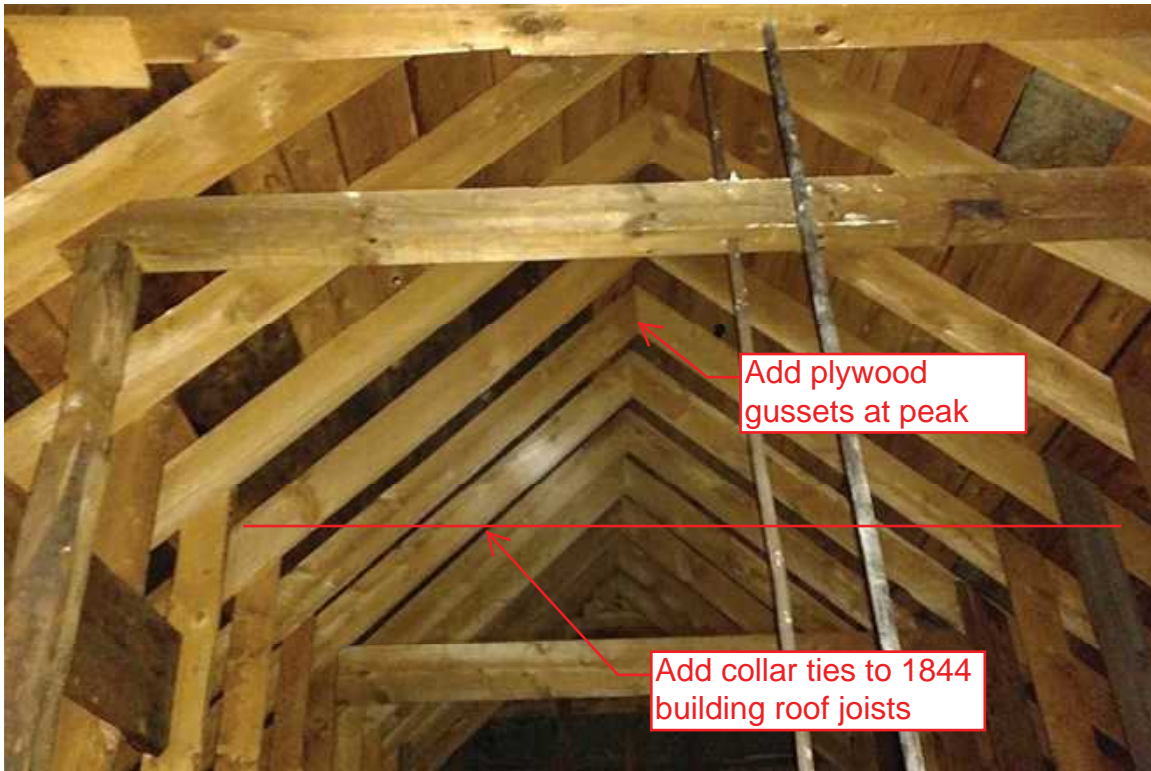
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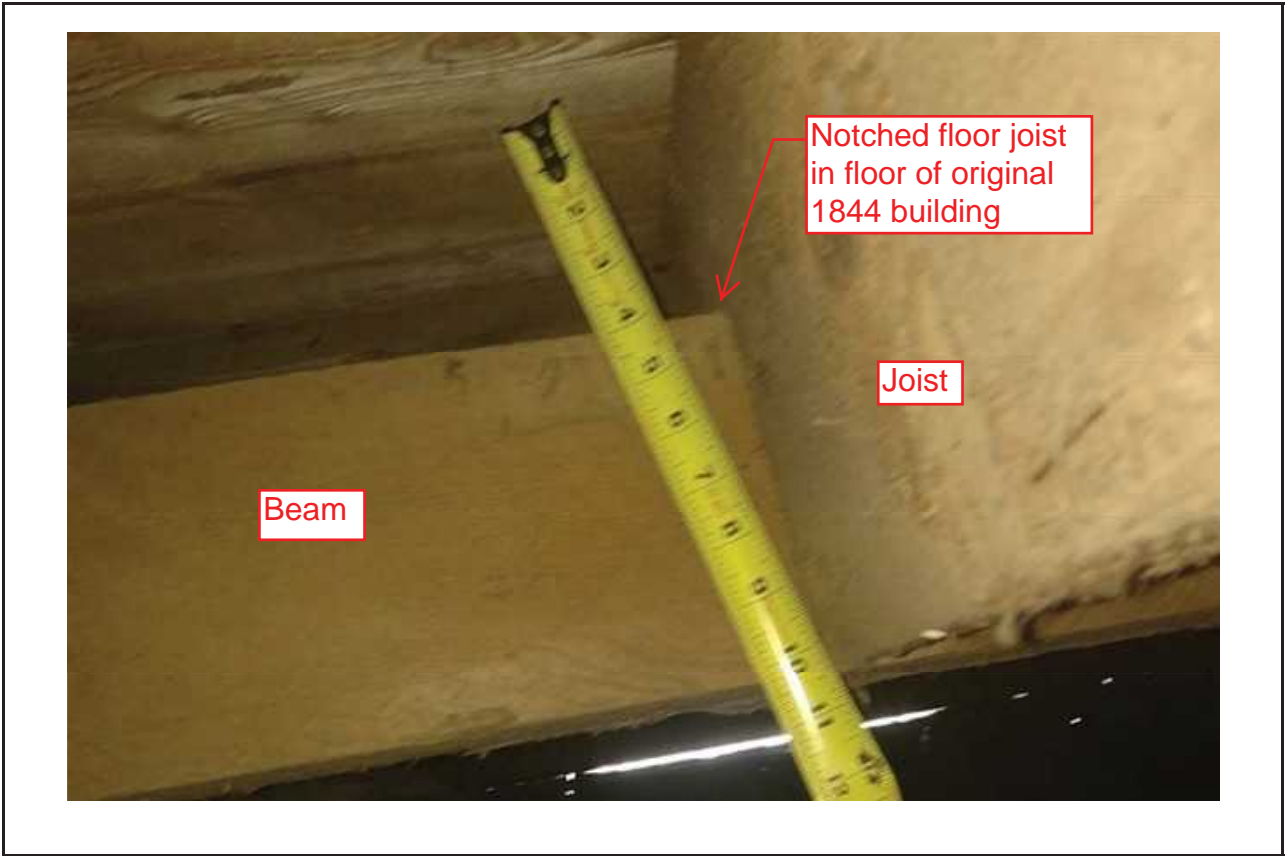
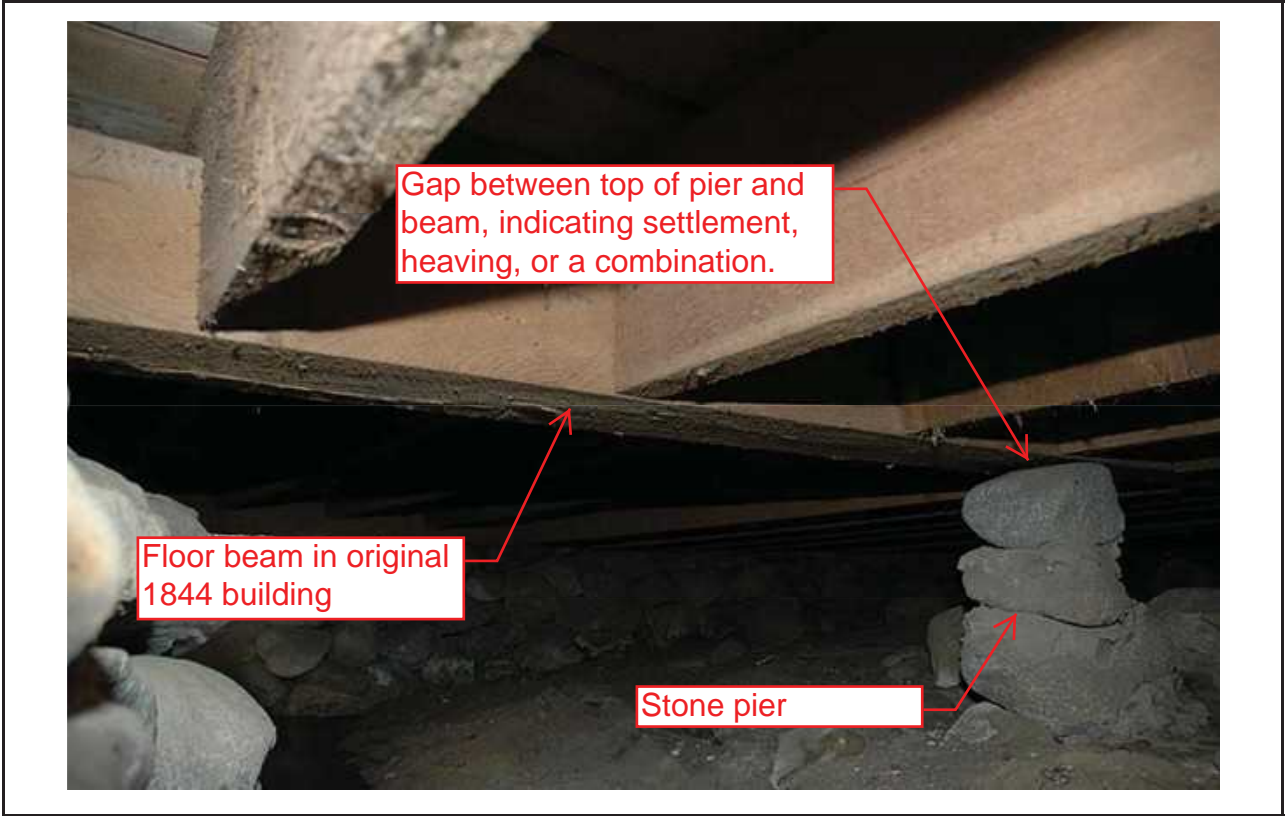
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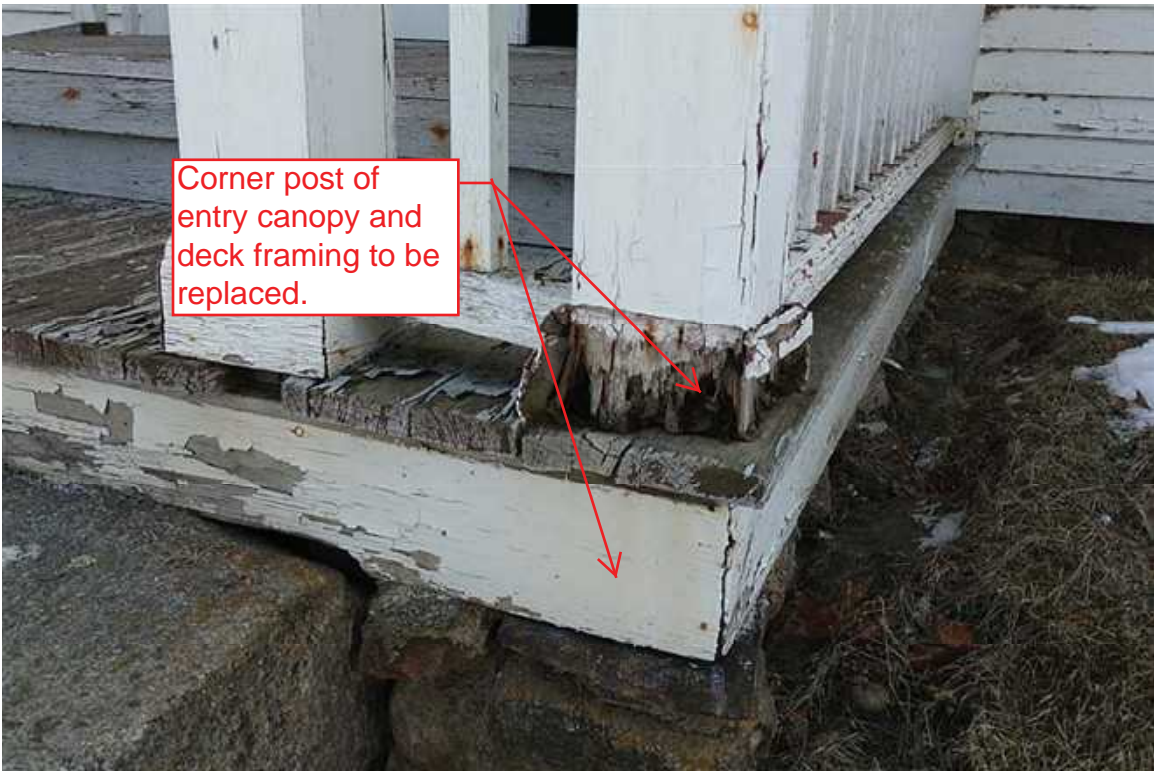
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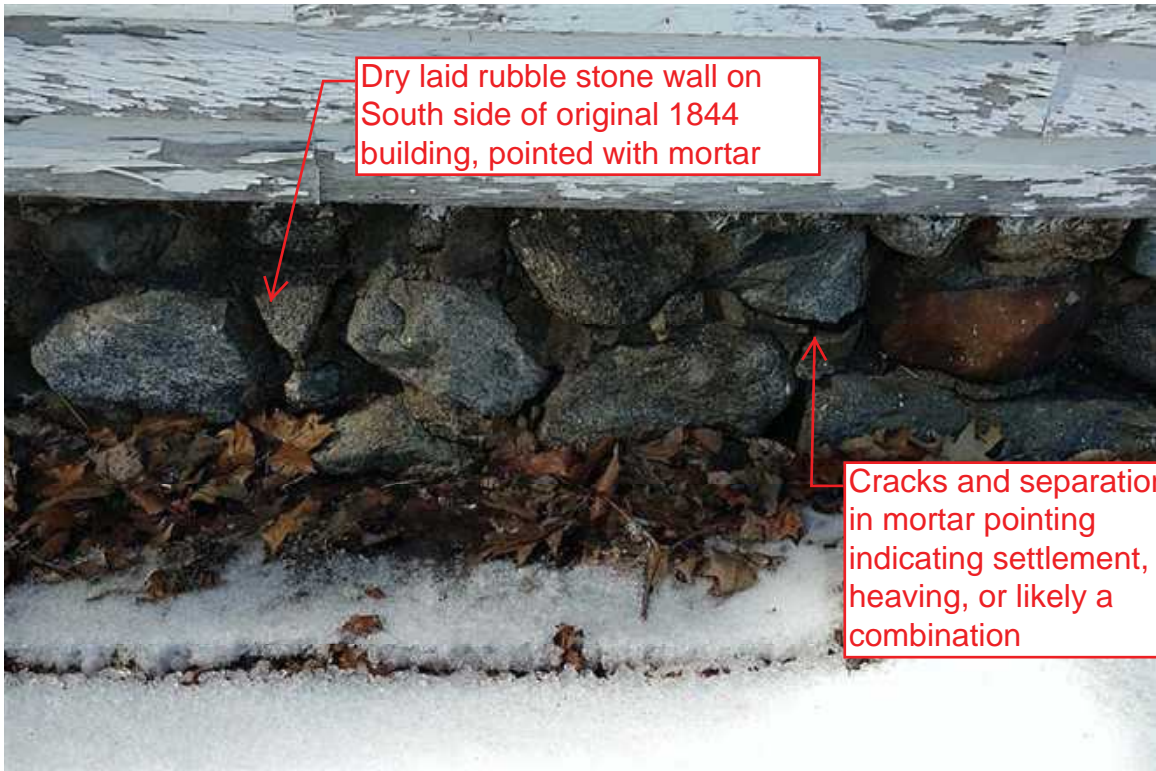
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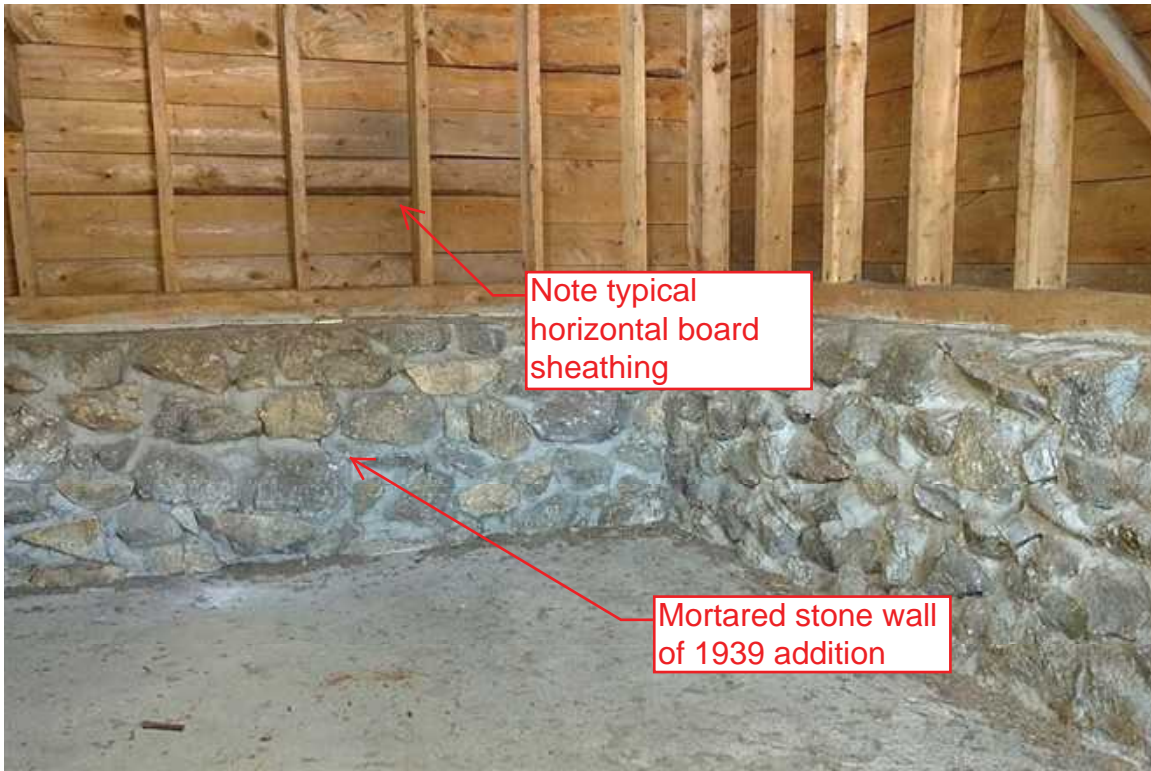
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Center Harbor, New Hampshire



Minor cracks in plaster  
indicating foundation movement



**Appendix ii**

**Standards for Rehabilitation  
U.S. Secretary of the Interior**



## **Secretary of the Interior's Standards for Rehabilitation**

Rehabilitation projects must meet the following Standards, as interpreted by the National Park Service, to qualify as “certified rehabilitations” eligible for the 20% rehabilitation tax credit. The Standards are applied to projects in a reasonable manner, taking into consideration economic and technical feasibility.

The Standards apply to historic buildings of all periods, styles, types, materials, and sizes. They apply to both the exterior and the interior of historic buildings. The Standards also encompass related landscape features and the building’s site and environment as well as attached, adjacent, or related new construction.

1. A property shall be used for its historic purpose or be placed in a new use that requires minimal change to the defining characteristics of the building and its site and environment.
2. The historic character of a property shall be retained and preserved. The removal of historic materials or alteration of features and spaces that characterize a property shall be avoided.
3. Each property shall be recognized as a physical record of its time, place, and use. Changes that create a false sense of historical development, such as adding conjectural features or architectural elements from other buildings, shall not be undertaken.
4. Most properties change over time; those changes that have acquired historic significance in their own right shall be retained and preserved.
5. Distinctive features, finishes, and construction techniques or examples of craftsmanship that characterize a historic property shall be preserved.
6. Deteriorated historic features shall be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature shall match the old in design, color, texture, and other visual qualities and, where possible, materials. Replacement of missing features shall be substantiated by documentary, physical, or pictorial evidence.

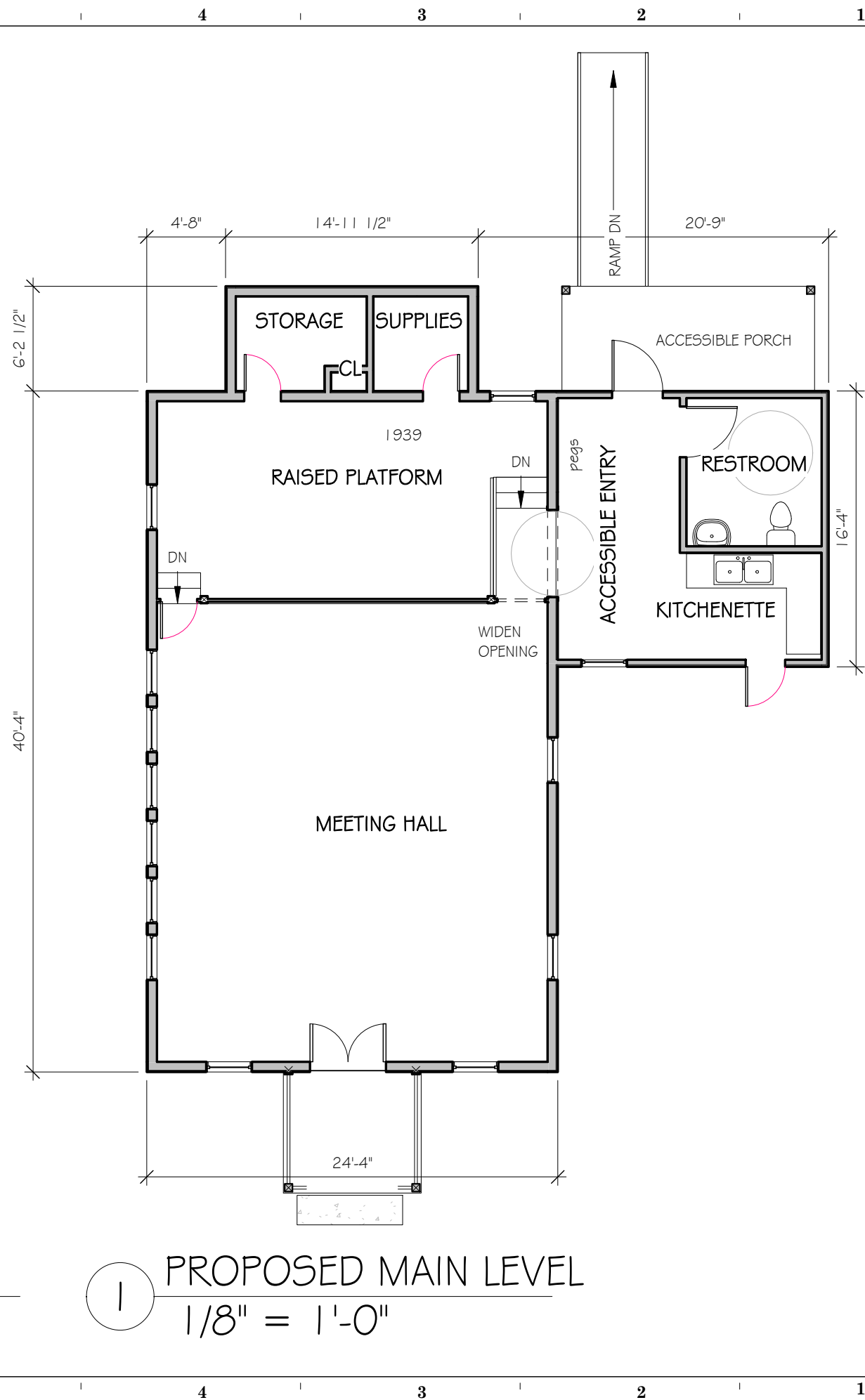
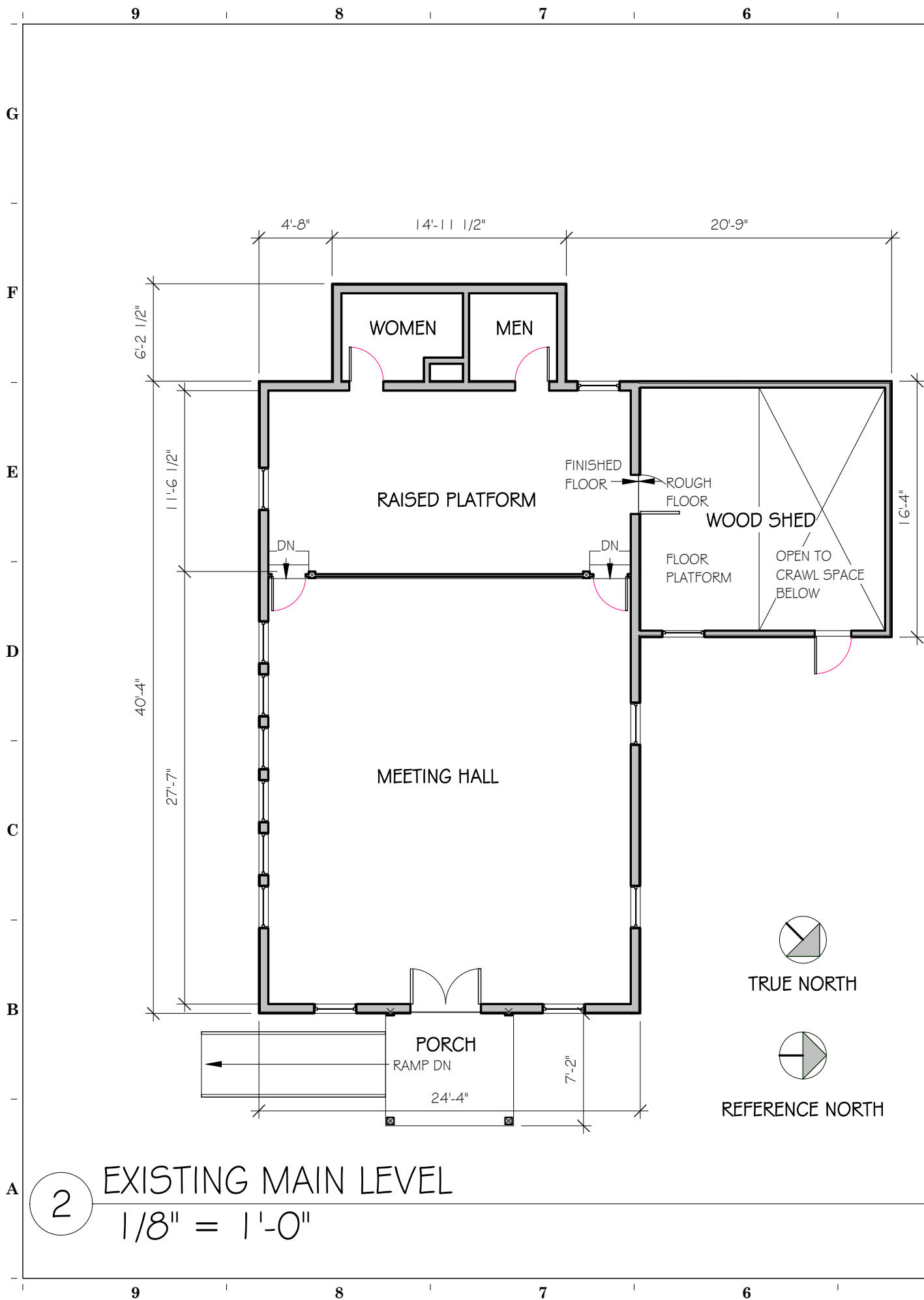
7. Chemical or physical treatments, such as sandblasting, that cause damage to historic materials shall not be used. The surface cleaning of structures, if appropriate, shall be undertaken using the gentlest means possible.
8. Significant archeological resources affected by a project shall be protected and preserved. If such resources must be disturbed, mitigation measures shall be undertaken.
9. New additions, exterior alterations, or related new construction shall not destroy historic materials that characterize the property. The new work shall be differentiated from the old and shall be compatible with the massing, size, scale, and architectural features to protect the historic integrity of the property and its environment.
10. New additions and adjacent or related new construction shall be undertaken in such a manner that if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.



**Appendix iii**

**Proposed Renovation Drawings  
CPW Architects**





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**CENTER HARBOR**  
Town of Center Harbor  
175 Daniel Webster Highway  
Center Harbor, New Hampshire

Preliminary  
**PROPOSED MAIN LEVEL PLAN**

REVISION:  
DATE: 3/31/2016  
SCALE: 1/8" = 1'-0"  
DRAWN BY: NEL  
PROJ. NO.: 1540

**A1.1**

**Appendix iv**

**Preservation Brief #10 – Exterior Paint Problems  
National Park Service**







[Home](#) > [How to Preserve](#) > [Preservation Briefs](#) > 10 Paint Problems

Some of the web versions of the Preservation Briefs differ somewhat from the printed versions. Many illustrations are new and in color; Captions are simplified and some complex charts are omitted. To order hard copies of the Briefs, see [Printed Publications](#).

## PRESERVATION BRIEFS

# 10

## Exterior Paint Problems on Historic Woodwork

Kay D. Weeks and David W. Look, AIA

[Purposes of Exterior Paint](#)

[Treating Paint Problems](#)

[Justification for Paint Removal](#)

[Paint Removal Precautions](#)

[Repainting Historic Buildings for Cosmetic Reasons](#)

[Conditions/Recommended Treatments](#)

[Selecting the Safest Method to Remove Paint](#)

[General Paint Type Recommendations](#)

[Summary and References](#)

[Reading List](#)

[Download the PDF](#)



Peeling paint on historic wood siding. Photo: ©John Leeke, 2002.

**A cautionary approach to paint removal is included in the guidelines to the *Secretary of the Interior Standards for Rehabilitation*.** Removing paints down to bare wood surfaces using harsh methods can permanently damage those surfaces; therefore such methods are not recommended. Also, total removal obliterates evidence of the historical paints and their sequence and architectural context.

This Brief expands on that advice for the architect, building manager, contractor, or homeowner by identifying and describing common types of paint surface conditions and failures, then recommending appropriate treatments for preparing exterior wood surfaces for repainting to assure the best adhesion and greatest durability of the new paint.

Although the Brief focuses on responsible methods of "paint removal," several paint surface conditions will be described which do not require any paint removal, and still others which can be successfully handled by limited paint removal. In all cases, the information is intended to address the concerns related to exterior wood. It will also be generally assumed that, because houses built before 1950 involve one or more layers of lead-based paint, the majority of conditions warranting paint removal will mean dealing with this toxic substance along with the dangers of the paint removal tools and chemical strippers themselves.

## Purposes of Exterior Paint

Paint applied to exterior wood must withstand yearly extremes of both temperature and humidity. While never expected to be more than a temporary physical shield—requiring reapplication every 5 to 8 years—its importance should not be minimized. Because one of the

main causes of wood deterioration is moisture penetration, a primary purpose for painting wood is to exclude such moisture, thereby slowing deterioration not only of a building's exterior siding and decorative features but, ultimately, its underlying structural members. Another important purpose for painting wood is, of course, to define and accent architectural features and to improve appearance.

## Treating Paint Problems in Historic Buildings

Exterior paint is constantly deteriorating through the processes of weathering, but in a program of regular maintenance—assuming all other building systems are functioning properly—surfaces can be cleaned, lightly scraped, and hand sanded in preparation for a new finish coat. Unfortunately, these are ideal conditions. More often, complex maintenance problems are inherited by owners of historic buildings, including areas of paint that have failed beyond the point of mere cleaning, scraping, and hand sanding (although much so-called "paint failure" is attributable to interior or exterior moisture problems or surface preparation and application mistakes with previous coats).

Although paint problems are by no means unique to historic buildings, treating multiple layers of hardened, brittle paint on complex, ornamental—and possibly fragile—exterior wood surfaces necessarily requires an extremely cautious approach. In the case of recent construction, this level of concern is not needed because the wood is generally less detailed and, in addition, retention of the sequence of paint layers as a partial record of the building's history is not an issue.

When historic buildings are involved, however, a special set of problems arises—varying in complexity depending upon their age, architectural style, historical importance, and physical soundness of the wood—which must be carefully evaluated so that decisions can be made that are sensitive to the longevity of the resource.

## Justification for Paint Removal

At the outset of this Brief, it must be emphasized that removing paint from historic buildings—with the exception of cleaning, light scraping, and hand sanding as part of routine maintenance—should be avoided unless absolutely essential. ***Once conditions warranting removal have been identified the general approach should be to remove paint to the next sound layer using the gentlest means possible, then to repaint.*** Practically speaking as well, paint can adhere just as effectively to existing paint as to bare wood, providing the previous coats of paint are also adhering uniformly and tightly to the wood and the surface is properly prepared for repainting—cleaned of dirt and chalk and dulled by sanding.

But, if painted exterior wood surfaces display continuous patterns of deep cracks or if they are extensively blistering and peeling so that bare wood is visible, then the old paint should be completely removed before repainting. The only other justification for removing all previous layers of paint is if doors, shutters, or windows have literally been "painted shut," or if new wood is being pieced-in adjacent to old painted wood and a smooth transition is desired.

## Paint Removal Precautions

Because paint removal is a difficult and painstaking process, a number of costly, regrettable experiences have occurred—and continue to occur—for both the historic building and the building owner. Historic buildings have been set on fire with blow torches; wood irreversibly scarred by sandblasting or by harsh mechanical devices such as rotary sanders and rotary wire strippers; and layers of historic paint inadvertently and unnecessarily removed. In addition, property owners, using techniques that substitute speed for safety, have been injured by toxic lead vapors or dust from the paint they were trying to remove or by misuse of the paint removers themselves.

Owners of historic properties considering paint removal should also be aware of the amount of time and labor involved. While removing damaged layers of paint from a door or porch railing might be readily accomplished within a reasonable period of time by one or two people, removing paint from larger areas of a building can, without professional assistance, easily become unmanageable and produce less than satisfactory results. The amount of work involved in any paint removal project must therefore be analyzed on a case-by-case basis. Hiring qualified professionals will often be a cost-effective decision due to the expense of materials, the special equipment required, and the amount of time involved. Further, paint removal companies experienced in dealing with the inherent health and safety dangers of paint removal should have purchased such protective devices as are needed to mitigate any dangers and should also be aware of State or local environmental and/or health regulations for hazardous waste disposal.



The paint on this exterior decorative feature is sound. Photo: NPS files.



When the protective and decorative paint finish was removed and an inappropriate clear finish applied, the exterior character of the building was altered. Photo: NPS files.

All in all, paint removal is a messy, expensive, and potentially dangerous aspect of rehabilitating or restoring historic buildings and should not be undertaken without careful thought concerning first, its necessity, and second, which of the available recommended methods is the safest and most appropriate for the job at hand.

## Repainting Historic Buildings for Cosmetic Reasons

If existing exterior paint on wood siding, eaves, window sills, sash, and shutters, doors, and decorative features shows no evidence of paint deterioration such as chalking, blistering, peeling, or cracking, then there is no physical reason to repaint, much less remove paint! Nor is color fading, of itself, sufficient justification to repaint a historic building.

The decision to repaint may not be based altogether on paint failure. Where there is a new owner, or even where ownership has remained constant through the years, taste in colors often changes. Therefore, if repainting is primarily to alter a building's primary and accent colors, a technical factor of paint accumulation should be taken into consideration.

When paint builds up to a thickness of approximately 1/16" (approximately 16 to 30 layers), one or more extra coats of paint may be enough to trigger cracking and peeling in limited or even widespread areas of the building's surface. This results because excessively thick paint is less able to withstand the shrinkage or pull of an additional coat as it dries and is also less able to tolerate thermal stresses. Thick paint invariably fails at the weakest point of adhesion—the oldest layers next to the wood. Cracking and peeling follow. Therefore, if there are no signs of paint failure, it may be somewhat risky to add still another layer of unneeded paint simply for color's sake (extreme changes in color may also require more than one coat to provide proper hiding power and full color). When paint appears to be nearing the critical thickness, a change of accent colors (that is, just to limited portions of the trim) might be an acceptable compromise without chancing cracking and peeling of paint on wooden siding.



When the paint on the wood windows became too thick, it was removed and the window repainted. Photo: NPS files.

If the decision to repaint is nonetheless made, the "new" color or colors should, at a minimum, be appropriate to the style and setting of the building. On the other hand, where the intent is to restore or accurately reproduce the colors originally used or those from a significant period in the building's evolution, they should be based on the results of a paint analysis.

## Identification of Exterior Paint Surface Conditions/Recommended Treatments

It is assumed that a preliminary check will already have been made to determine, first, that the painted exterior surfaces are indeed wood—and not stucco, metal, or other wood substitutes—and second, that the wood has not decayed so that repainting would be superfluous. For example, if any area of bare wood such as window sills has been exposed for a long period of time to standing water, wood rot is a strong possibility. Repair or replacement of deteriorated wood should take place before repainting. After these two basic issues have been resolved, the surface condition identification process may commence.

The historic building will undoubtedly exhibit a variety of exterior paint surface conditions. For example, paint on the wooden siding and doors may be adhering firmly; paint on the eaves peeling; and paint on the porch balusters and window sills cracking and alligatoring. The accurate identification of each paint problem is therefore the first step in planning an appropriate overall solution.

Paint surface conditions can be grouped according to their relative severity: CLASS I conditions include minor blemishes or dirt collection and generally require no paint removal; CLASS II conditions include failure of the top layer or layers of paint and generally require limited paint removal; and CLASS III conditions include substantial or multiple-layer failure and generally require total paint removal. It is precisely because conditions will vary at different points on the building that a careful inspection is critical. Each item of painted exterior woodwork (i.e., siding, doors, windows, eaves, shutters, and decorative elements) should be examined early in the planning phase and surface conditions noted.



The problem evidenced here by mossy growth and deteriorated wood must be resolved and the wood allowed to dry out before the wood is repainted. Photo: NPS files.

### CLASS I Exterior Surface Conditions Generally Requiring No Paint Removal Dirt, Soot, Pollution, Cobwebs, Insect Cocoons, etc.

#### Cause of Condition

Environmental "grime" or organic matter that tends to cling to painted exterior surfaces and, in particular, protected

surfaces such as eaves, do not constitute a paint problem unless painted over rather than removed prior to repainting. If not removed, the surface deposits can be a barrier to proper adhesion and cause peeling.

#### **Recommended Treatment**

Most surface matter can be loosened by a strong, direct stream of water from the nozzle of a garden hose. Stubborn dirt and soot will need to be scrubbed off using 1/2 cup of household detergent in a gallon of water with a medium soft bristle brush. The cleaned surface should then be rinsed thoroughly, and permitted to dry before further inspection to determine if repainting is necessary. Quite often, cleaning provides a satisfactory enough result to postpone repainting.

### **Mildew**

#### **Cause of Condition**

Mildew is caused by fungi feeding on nutrients contained in the paint film or on dirt adhering to any surface. Because moisture is the single most important factor in its growth, mildew tends to thrive in areas where dampness and lack of sunshine are problems such as window sills, under eaves, around gutters and downspouts, on the north side of buildings, or in shaded areas near shrubbery. It may sometimes be difficult to distinguish mildew from dirt, but there is a simple test to differentiate: if a drop of household bleach is placed on the suspected surface, mildew will immediately turn white whereas dirt will continue to look like dirt.

#### **Recommended Treatment**

Because mildew can only exist in shady, warm, moist areas, attention should be given to altering the environment that is conducive to fungal growth. The area in question may be shaded by trees which need to be pruned back to allow sunlight to strike the building; or may lack rain gutters or proper drainage at the base of the building. If the shady or moist conditions can be altered, the mildew is less likely to reappear. A recommend solution for removing mildew consists of one cup non-ammoniated detergent, one quart household bleach, and one gallon water. When the surface is scrubbed with this solution using a medium soft brush, the mildew should disappear; however, for particularly stubborn spots, an additional quart of bleach may be added. After the area is mildew-free, it should then be rinsed with a direct stream of water from the nozzle of a garden hose, and permitted to dry thoroughly. When repainting, specially formulated "mildew-resistant" primer and finish coats should be used.

### **Excessive Chalking**

#### **Cause of Condition**

Chalking—or powdering of the paint surface—is caused by the gradual disintegration of the resin in the paint film. (The amount of chalking is determined both by the formulation of the paint and the amount of ultraviolet light to which the paint is exposed.) In moderation, chalking is the ideal way for a paint to "age," because the chalk, when rinsed by rainwater, carries discoloration and dirt away with it and thus provides an ideal surface for repainting. In excess, however, it is not desirable because the chalk can wash down onto a surface of a different color beneath the painted area and cause streaking as well as rapid disintegration of the paint film itself. Also, if a paint contains too much pigment for the amount of binder (as the old white lead carbonate/oil paints often did), excessive chalking can result.

#### **Recommended Treatment**

The chalk should be cleaned off with a solution of 1/2 cup household detergent to one gallon water, using a medium soft bristle brush. After scrubbing to remove the chalk, the surface should be rinsed with a direct stream of water from the nozzle of a garden hose, allowed to dry thoroughly, (but not long enough for the chalking process to recur) and repainted, using a non-chalking paint.

### **Staining**

#### **Cause of Condition**

Staining of paint coatings usually results from excess moisture reacting with materials within the wood substrate. There are two common types of staining, neither of which requires paint removal. The most prevalent type of stain is due to the oxidation or rusting of iron nails or metal (iron, steel, or copper) anchorage devices. A second type of stain is caused by a chemical reaction between moisture and natural extractives in certain woods (red cedar or redwood) which results in a surface deposit of colored matter. This is most apt to occur in new replacement wood within the first 10-15 years.

#### **Recommended Treatment**

In both cases, the source of the stain should first be located and the moisture problem corrected.

When stains are caused by rusting of the heads of nails used to attach shingles or siding to an exterior wall or by rusting or oxidizing iron, steel, or copper anchorage devices adjacent to a painted surface, the metal objects themselves should be hand sanded and coated with a rust-inhibitive primer followed by two finish coats. (Exposed nail heads should ideally be countersunk, spot primed, and the holes filled with a high quality wood filler except where exposure of the nail head was part of the original construction system or the wood is too fragile to withstand the countersinking procedure.)

Discoloration due to color extractives in replacement wood can usually be cleaned with a solution of equal parts denatured alcohol and water. After the affected area has been rinsed and permitted to dry, a "stainblocking primer" especially developed for preventing this type of stain should be applied (two primer coats are recommended for severe cases of bleeding prior to the finish coat). Each primer coat should be allowed to dry at least 48 hours.

## **CLASS II Exterior Surface Conditions Generally Requiring Limited Paint Removal**

### **Crazing**

#### **Cause of Condition**

Crazing—fine, jagged interconnected breaks in the top layer of paint—results when paint that is several layers thick becomes excessively hard and brittle with age and is consequently no longer able to expand and contract with the wood in response to changes in temperature and humidity. As the wood swells, the bond between paint layers is broken and hairline cracks appear. Although somewhat more difficult to detect as opposed to other more obvious paint problems, it is well worth the time to scrutinize all surfaces for crazing. If not corrected, exterior moisture will enter the crazed surface, resulting in further swelling of the wood and, eventually, deep cracking and alligatoring, a Class III condition which requires total paint removal.



Crazing—or surface cracking—is an exterior surface condition which can be successfully treated by sanding and painting. Photo: Courtesy, National Decorating Products Association.

#### **Recommended Treatment**

Crazing can be treated by hand or mechanically sanding the surface, then repainting. Although the hairline cracks may tend to show through the new paint, the surface will be protected against exterior moisture penetration.

### **Intercoat Peeling**

#### **Cause of Condition**

Intercoat peeling can be the result of improper surface preparation prior to the last repainting. This most often occurs in protected areas such as eaves and covered porches because these surfaces do not receive a regular rinsing from rainfall, and salts from airborne pollutants thus accumulate on the surface. If not cleaned off, the new paint coat will not adhere properly and that layer will peel.

Another common cause of intercoat peeling is incompatibility between paint types. For example, if oil paint is applied over latex paint, peeling of the top coat can sometimes result since, upon aging, the oil paint becomes harder and less elastic than the latex paint. If latex paint is applied over old, chalking oil paint, peeling can also occur because the latex paint is unable to penetrate the chalky surface and adhere.

#### **Recommended Treatment**

First, where salts or impurities have caused the peeling, the affected area should be washed down thoroughly after scraping, then wiped dry. Finally, the surface should be hand or mechanically sanded, then repainted.

Where peeling was the result of using incompatible paints, the peeling top coat should be scraped and hand or mechanically sanded. Application of a high quality oil type exterior primer will provide a surface over which either an oil or a latex topcoat can be successfully used.



Here, a latex top coat was applied directly over old oil paint, resulting in intercoat peeling. The latex was unable to adhere. If latex is used over oil, an oil-base primer should be applied first. Photo: Mary L. Oehrlein, AIA.

### **Solvent Blistering**

#### **Cause of Condition**

Solvent blistering, the result of a less common application error, is not caused by moisture, but by the action of ambient heat on paint solvent or thinners in the paint film. If solventrich paint is applied in direct sunlight, the top surface can dry too quickly and, as a result, solvents become trapped beneath the dried paint film. When the solvent vaporizes, it forces its way through the paint film, resulting in surface blisters. This problem occurs more often with dark colored paints because darker colors absorb more heat than lighter ones. To distinguish between solvent blistering and blistering caused by moisture, a blister should be cut open. If another layer of paint is visible, then solvent blistering is likely the problem whereas if bare wood is revealed, moisture is probably to blame. Solvent blisters are generally small.

#### **Recommended Treatment**

Solvent-blistered areas can be scraped, hand or mechanically sanded to the next sound layer, then repainted. In order to prevent blistering of painted surfaces, paint should not be applied in direct sunlight.

### **Wrinkling**



### Cause of Condition

Another error in application that can easily be avoided is wrinkling. This occurs when the top layer of paint dries before the layer underneath. The top layer of paint actually moves as the paint underneath (a primer, for example) is drying. Specific causes of wrinkling include: (1) applying paint too thick; (2) applying a second coat before the first one dries; (3) inadequate brushing out; and (4) painting in temperatures higher than recommended by the manufacturer.

### Recommended Treatment

The wrinkled layer can be removed by scraping followed by hand or mechanical sanding to provide as even a surface as possible, then repainted following manufacturer's application instructions.



Wrinkled layers can generally be removed by scraping and sanding as opposed to total paint removal. Photo: Courtesy, National Decorating Products Association.

## CLASS III Exterior Surface Conditions Generally Requiring Total Paint Removal

If surface conditions are such that the majority of paint will have to be removed prior to repainting, it is suggested that a small sample of intact paint be left in an inconspicuous area either by covering the area with a metal plate, or by marking the area and identifying it in some way. (When repainting does take place, the sample should not be painted over). This will enable future investigators to have a record of the building's paint history.

### Peeling

#### Cause of Condition

Peeling to bare wood is most often caused by excess interior or exterior moisture that collects behind the paint film, thus impairing adhesion. Generally beginning as blisters, cracking and peeling occur as moisture causes the wood to swell, breaking the adhesion of the bottom layer.

#### Recommended Treatment

There is no sense in repainting before dealing with the moisture problems because new paint will simply fail. Therefore, the first step in treating peeling is to locate and remove the source or sources of the moisture, not only because moisture will jeopardize the protective coating of paint but because, if left unattended, it can ultimately cause permanent damage to the wood. Excess interior moisture should be removed from the building through installation of exhaust fans and vents. Exterior moisture should be eliminated by correcting the following conditions prior to repainting: faulty flashing; leaking gutters; defective roof shingles; cracks and holes in siding and trim; deteriorated caulking in joints and seams; and shrubbery growing too close to painted wood. After the moisture problems have been solved, the wood must be permitted to dry out thoroughly. The damaged paint can then be scraped off with a putty knife, hand or mechanically sanded, primed, and repainted.



Extensively deteriorated paint needs to be removed to bare wood, then primed and repainted. Photo: NPS files.

### Cracking/Alligatoring

#### Cause of Condition

Cracking and alligatoring are advanced stages of crazing. Once the bond between layers has been broken due to intercoat paint failure, exterior moisture is able to penetrate the surface cracks, causing the wood to swell and deeper cracking to take place.

This process continues until cracking, which forms parallel to grain, extends to bare wood. Ultimately, the cracking becomes an overall pattern of horizontal and vertical breaks in the paint layers that looks like reptile skin; hence, "alligatoring." In advanced stages of cracking and alligatoring, the surfaces will also flake badly.

#### Recommended Treatment

If cracking and alligatoring are present only in the top layers they can probably be scraped, hand or mechanically sanded to the next sound layer, then repainted. However, if cracking and/or alligatoring have progressed to bare wood and the paint has begun to flake, it will need to be totally removed. Methods include scraping or paint removal with the electric heat plate, electric heat gun, or chemical strippers, depending on the particular area involved. Bare wood should be primed within 48 hours then repainted.

## Selecting the Appropriate/Safest Method to Remove Paint

After having presented the "hierarchy" of exterior paint surface conditions—from a mild condition such as mildew which simply requires cleaning prior to repainting to serious conditions such as peeling and alligatoring which require total paint removal—one important thought bears repeating: if a paint problem has been identified that warrants either limited or total

paint removal, the gentlest method possible for the particular wooden element of the historic building should be selected from the many available methods.

The treatments recommended—based upon field testing as well as onsite monitoring of Department of Interior grant-in-aid and certification of rehabilitation projects—are therefore those which take three overriding issues into consideration (1) the continued protection and preservation of the historic exterior woodwork; (2) the retention of the sequence of historic paint layers; and (3) the health and safety of those individuals performing the paint removal. By applying these criteria, it will be seen that no paint removal method is without its drawbacks and all recommendations are qualified in varying degrees.

## Methods for Removing Paint

After a particular exterior paint surface condition has been identified, the next step in planning for repainting—if paint removal is required—is selecting an appropriate method for such removal.

The method or methods selected should be suitable for the specific paint problem as well as the particular wooden element of the building. Methods for paint removal can be divided into three categories (frequently, however, a combination of the three methods is used). Each method is defined below, then discussed further and specific recommendations made:

- **Abrasive**—"Abrading" the painted surface by manual and/or mechanical means such as scraping and sanding. Generally used for surface preparation and limited paint removal.
- **Thermal**—Softening and raising the paint layers by applying heat followed by scraping and sanding. Generally used for total paint removal.
- **Chemical**—Softening of the paint layers with chemical strippers followed by scraping and sanding. Generally used for total paint removal.

## Abrasive Methods (Manual)

If conditions have been identified that require limited paint removal such as crazing, intercoat peeling, solvent blistering, and wrinkling, scraping and hand sanding should be the first methods employed before using mechanical means. Even in the case of more serious conditions such as peeling—where the damaged paint is weak and already sufficiently loosened from the wood surface—scraping and hand sanding may be all that is needed prior to repainting.

## Recommended Abrasive Methods (Manual)

**Putty Knife/Paint Scraper:** Scraping is usually accomplished with either a putty knife or a paint scraper, or both. Putty knives range in width from one to six inches and have a beveled edge. A putty knife is used in a pushing motion going under the paint and working from an area of loose paint toward the edge where the paint is still firmly adhered and, in effect, "beveling" the remaining layers so that as smooth a transition as possible is made between damaged and undamaged areas.

Paint scrapers are commonly available in 1-5/16, 2-1/2, and 3-1/2 inch widths and have replaceable blades. In addition, profiled scrapers can be made specifically for use on moldings. As opposed to the putty knife, the paint scraper is used in a pulling motion and works by raking the damaged areas of paint away.

The obvious goal in using the putty knife or the paint scraper is to selectively remove the affected layer or layers of paint; however, both of these tools, particularly the paint scraper with its hooked edge, must be used with care to properly prepare the surface and to avoid gouging the wood.

**Sandpaper/Sanding Block/Sanding sponge:** After manually removing the damaged layer or layers by scraping, the uneven surface (due to the almost inevitable removal of varying numbers of paint layers in a given area) will need to be smoothed or "feathered out" prior to repainting. As stated before, hand sanding, as opposed to harsher mechanical sanding, is recommended if the area is relatively limited. A coarse grit, open-coat flint sandpaper—the least expensive kind—is useful for this purpose because, as the sandpaper clogs with paint it must be discarded and this process repeated until all layers adhere uniformly.

Blocks made of wood or hard rubber and covered with sandpaper are useful for handsanding flat surfaces. Sanding sponges—rectangular sponges with an abrasive aggregate on their surfaces—are also available for detail work that requires reaching into grooves because the sponge easily conforms to curves and irregular surfaces. All sanding should be done with the grain.

## Summary of Abrasive Methods (Manual)

- **Recommended:** Putty knife, paint scraper, sandpaper, sanding block, sanding sponge.
- **Applicable areas of building:** All areas. For use on: Class I, Class II, and Class III conditions.
- **Health/Safety factors:** Take precautions against lead dust, eye damage; dispose of lead paint residue properly.

## Abrasive Methods (Mechanical)

If hand sanding for purposes of surface preparation has not been productive or if the affected area is too large to consider hand sanding by itself, mechanical abrasive methods, i.e., power-operated tools may need to be employed; however, it should be noted that the majority of tools available for paint removal can cause damage to fragile wood and must be used with great care.

### Recommended Abrasive Methods (Mechanical)

**Orbital sander:** Designed as a finishing or smoothing tool—not for the removal of multiple layers of paint—the orbital sander is thus recommended when limited paint removal is required prior to repainting. Because it sands in a small diameter circular motion (some models can also be switched to a back-and-forth vibrating action), this tool is particularly effective for "feathering" areas where paint has first been scraped. The abrasive surface varies from about 3x7 inches to 4x9 inches and sandpaper is attached either by clamps or sliding clips. A medium grit, open-coat aluminum oxide sandpaper should be used; fine sandpaper clogs up so quickly that it is ineffective for smoothing paint.

**Belt sander:** A second type of power tool—the belt sander—can also be used for removing limited layers of paint but, in this case, the abrasive surface is a continuous belt of sandpaper that travels at high speeds and consequently offers much less control than the orbital sander. Because of the potential for more damage to the paint or the wood, use of the belt sander (also with a medium grit sandpaper) should be limited to flat surfaces and only skilled operators should be permitted to operate it within a historic preservation project.

### Not Recommended

**Rotary Drill Attachments:** Rotary drill attachments such as the rotary sanding disc and the rotary wire stripper should be avoided. The disc sander—usually a disc of sandpaper about 5 inches in diameter secured to a rubber based attachment which is in turn connected to an electric drill or other motorized housing—can easily leave visible circular depressions in the wood which are difficult to hide, even with repainting. The rotary wire stripper—clusters of metals wires similarly attached to an electric drill-type unit—can actually shred a wooden surface and is thus to be used exclusively for removing corrosion and paint from metals.

**Waterblasting:** Waterblasting above 600 p.s.i. to remove paint is not recommended because it can force water into the woodwork rather than cleaning loose paint and grime from the surface; at worst, high pressure waterblasting causes the water to penetrate exterior sheathing and damages interior finishes. A detergent solution, a medium soft bristle brush, and a garden hose for purposes of rinsing, is the gentlest method involving water and is recommended when cleaning exterior surfaces prior to repainting.

**Sandblasting:** Finally—and undoubtedly most vehemently "not recommended"—sandblasting painted exterior woodwork will indeed remove paint, but at the same time can scar wooden elements beyond recognition. As with rotary wire strippers, sandblasting erodes the soft porous fibers (spring wood) faster than the hard, dense fibers (summer wood), leaving a pitted surface with ridges and valleys. Sandblasting will also erode projecting areas of carvings and moldings before it removes paint from concave areas. Hence, this abrasive method is potentially the most damaging of all possibilities, even if a contractor promises that blast pressure can be controlled so that the paint is removed without harming the historic exterior woodwork. (For Additional Information, See Preservation Briefs 6, "Dangers of Abrasive Cleaning to Historic Buildings".)

### Summary of Abrasive Methods (Mechanical)

- **Recommended:** Orbital sander, belt sander (skilled operator only).
- **Applicable areas of building:** Flat surfaces, i.e., siding, eaves, doors, window sills.
- **For use on:** Class II and Class III conditions.
- **Health/Safety factors:** Take precautions against lead dust and eye damage; dispose of lead paint residue properly.
- **Not Recommended:** Rotary drill attachments, high pressure waterblasting, sandblasting.

## Thermal Methods

Where exterior surface conditions have been identified that warrant total paint removal such as peeling, cracking, or alligatoring, two thermal devices—the electric heat plate and the electric heat gun—have proven to be quite successful for use on different wooden elements of the historic building. One thermal method—the blow torch—is not recommended because it can scorch the wood or even burn the building down!

### Recommended Thermal Methods

**Electric heat plate:** The electric heat plate operates between 500 and 800 degrees Fahrenheit (not hot enough to vaporize lead paint), using about 15 amps of power. The plate is held close to the painted exterior surface until the layers of paint begin to soften



A heat plate was used on the cornice to remove paint. Photo: NPS files.

and blister, then moved to an adjacent location on the wood while the softened paint is scraped off with a putty knife (it should be noted that the heat plate is most successful when the paint is very thick!). With practice, the operator can successfully move the heat plate evenly across a flat surface such as wooden siding or a window sill or door in a continuous motion, thus lessening the risk of scorching the wood in an attempt to reheat the edge of the paint sufficiently for effective removal. Since the electric heat plate's coil is "red hot," extreme caution should be taken to avoid igniting clothing or burning the skin. If an extension cord is used, it should be a heavy-duty cord (with 3-prong grounded plugs). A heat plate could overload a circuit or, even worse, cause an electrical fire; therefore, it is recommended that this implement be used with a single circuit and that a fire extinguisher always be kept close at hand.

**Electric heat gun:** The electric heat gun (electric hot-air gun) looks like a hand-held hairdryer with a heavy-duty metal case. It has an electrical resistance coil that typically heats between 500 and 750 degrees Fahrenheit and, again, uses about 15 amps of power which requires a heavy-duty extension cord. There are some heat guns that operate at higher temperatures but they should not be purchased for removing old paint because of the danger of lead paint vapors.

The temperature is controlled by a vent on the side of the heat gun. When the vent is closed, the heat increases. A fan forces a stream of hot air against the painted woodwork, causing a blister to form. At that point, the softened paint can be peeled back with a putty knife. It can be used to best advantage when a paneled door was originally varnished, then painted a number of times. In this case, the paint will come off quite easily, often leaving an almost pristine varnished surface behind. Like the heat plate, the heat gun works best on a heavy paint buildup. (It is, however, not very successful on only one or two layers of paint or on surfaces that have only been varnished. The varnish simply becomes sticky and the wood scorches.)

Although the heat gun is heavier and more tiring to use than the heat plate, it is particularly effective for removing paint from detail work because the nozzle can be directed at curved and intricate surfaces. Its use is thus more limited than the heat plate, and most successfully used in conjunction with the heat plate. For example, it takes about two to three hours to strip a paneled door with a heat gun, but if used in combination with a heat plate for the large, flat area, the time can usually be cut in half. Although a heat gun seldom scorches wood, it can cause fires (like the blow torch) if aimed at the dusty cavity between the exterior sheathing and siding and interior lath and plaster. A fire may smolder for hours before flames break through to the surface. Therefore, this thermal device is best suited for use on solid decorative elements, such as molding, balusters, fretwork, or "gingerbread."



The nozzle on the electric heat gun permits hot air to be aimed into cavities on solid decorative surfaces, such as this carriage house door. After the paint has been sufficiently softened, it can be carefully removed with a scraper. Photo: NPS files.

## Not Recommended

**Blow Torch:** Blow torches, such as hand-held propane or butane torches, were widely used in the past for paint removal because other thermal devices were not available. With this technique, the flame is directed toward the paint until it begins to bubble and loosen from the surface. Then the paint is scraped off with a putty knife. Although this is a relatively fast process, at temperatures between 3200 and 3800 degrees Fahrenheit the open flame is not only capable of burning a careless operator and causing severe damage to eyes or skin, it can easily scorch or ignite the wood. The other fire hazard is more insidious. Most frame buildings have an air space between the exterior sheathing and siding and interior lath and plaster. This cavity usually has an accumulation of dust which is also easily ignited by the open flame of a blow torch. Finally, leadbase paints will vaporize at high temperatures, releasing toxic fumes that can be unknowingly inhaled. Therefore, because both the heat plate and the heat gun are generally safer to use—that is, the risks are much more controllable—the blow torch should definitely be avoided!

## Summary of Thermal Methods

- **Recommended:** Electric heat plate, electric heat gun.
- **Applicable areas of building:** Electric heat plate—flat surfaces such as siding, eaves, sash, sills, doors. Electric heat gun—solid decorative molding, balusters, fretwork, or "gingerbread."
- **For use on:** Class III conditions.
- **Health/Safety factors:** Take precautions against eye damage and fire. Dispose of lead paint residue properly.
- **Not Recommended:** Blow torch.

## Chemical Methods

With the availability of effective thermal methods for total paint removal, the need for chemical methods—in the context of preparing historic exterior woodwork for repainting—becomes quite limited. Solvent-base or caustic strippers may, however, play a supplemental role in a number of situations, including:

- Removing paint residue from intricate decorative features, or in cracks or hard to reach areas if a heat gun has not been completely effective;
- Removing paint on window muntins because heat devices can easily break the glass;
- Removing varnish on exterior doors after all layers of paint have been removed by a heat plate/heat gun if the original varnish finish is being restored;
- Removing paint from detachable wooden elements such as exterior shutters, balusters, columns, and doors by dip stripping when other methods are too laborious.

### Recommended Chemical Methods (*Use With Extreme Caution*)

Because all chemical paint removers can involve potential health and safety hazards, no wholehearted recommendations can be made from that standpoint. Commonly known as "paint removers" or "strippers," both solvent-base or caustic products are commercially available that, when poured, brushed, or sprayed on painted exterior woodwork are capable of softening several layers of paint at a time so that the resulting "sludge"—which should be remembered is nothing less than the sequence of historic paint layers—can be removed with a putty knife. Detachable wood elements such as exterior shutters can also be "dip-stripped."

**Solvent-base Strippers:** The formulas tend to vary, but generally consist of combinations of organic solvents such as methylene chloride, isopropanol, toluol, xylol, and methanol; thickeners such as methyl cellulose; and various additives such as paraffin wax used to prevent the volatile solvents from evaporating before they have time to soak through multiple layers of paint. Thus, while some solvent-base strippers are quite thin and therefore unsuitable for use on vertical surfaces, others, called "semi-paste" strippers, are formulated for use on vertical surfaces or the underside of horizontal surfaces.

However, whether liquid or semi-paste, there are two important points to stress when using any solvent-base stripper: First, the vapors from the organic chemicals can be highly toxic if inhaled; skin contact is equally dangerous because the solvents can be absorbed; second, many solvent-base strippers are flammable. Even though application out-of-doors may somewhat mitigate health and safety hazards, a respirator with special filters for organic solvents is recommended and, of course, solvent-base strippers should never be used around open flames, lighted cigarettes, or with steel wool around electrical outlets.

Although appearing to be the simplest for exterior use, a particular type of solvent-base stripper needs to be mentioned here because it can actually cause the most problems. Known as "water-rinsable," such products have a high proportion of methylene chloride together with emulsifiers. Although the dissolved paint can be rinsed off with water with a minimum of scraping, this ultimately creates more of a problem in cleaning up and properly disposing of the sludge. In addition, these strippers can leave a gummy residue on the wood that requires removal with solvents. Finally, water-rinsable strippers tend to raise the grain of the wood more than regular strippers.

On balance, then, the regular strippers would seem to work just as well for exterior purposes and are perhaps even better from the standpoint of proper lead sludge disposal because they must be hand 'scraped as opposed to rinsed off (a coffee-can with a wire stretched across the top is one effective way to collect the sludge; when the putty knife is run across the wire, the sludge simply falls into the can. Then, when the can is filled, the wire is removed, the can capped, and the lead paint sludge disposed of according to local health regulations).

**Caustic strippers:** Until the advent of solvent-base strippers, caustic strippers were used exclusively when a chemical method was deemed appropriate for total paint removal prior to repainting or refinishing. Now, it is more difficult to find commercially prepared caustic solutions in hardware and paint stores for homeowner use with the exception of lye (caustic soda) because solvent-base strippers packaged in small quantities tend to dominate the market.

Most commercial dip stripping companies, however, continue to use variations of the caustic bath process because it is still the cheapest method available for removing paint. Generally, dip stripping should be left to professional companies because caustic solutions can dissolve skin and permanently damage eyes as well as present serious disposal problems in large quantities.

If exterior shutters or other detachable elements are being sent out for stripping in a caustic solution, it is wise to see samples of the company's finished work. While some companies do a first-rate job, others can leave a residue of paint in carvings and grooves. Wooden elements may also be soaked too long so that the wood grain is raised and roughened, requiring extensive hand sanding later. In addition, assurances should be given by these companies that caustic paint



removers will be neutralized with a mild acid solution or at least thoroughly rinsed with water after dipping (a caustic residue makes the wood feel slippery). If this is not done, the lye residue will cause new paint to fail.

### Summary of Chemical Methods

- **Recommended, with extreme caution:** Solvent-base strippers, caustic strippers.
- **Applicable areas of buildings:** decorative features, window muntins, doors, exterior shutters, columns, balusters, and railings.
- **For use on:** Class III Conditions.
- **Health/Safety factors:** Take precautions against inhaling toxic vapors; fire; eye damage; and chemical poisoning from skin contact. Dispose of lead residue properly

## General Paint Type Recommendations



Decorative features were painted with a traditional oil-based paint as a part of the rehabilitation. Photo: NPS files.

Based on the assumption that the exterior wood has been painted with oil paint many times in the past and the existing top coat is therefore also an oil paint, it is recommended that for CLASS I and CLASS II paint surface conditions, a top coat of high quality oil paint be applied when repainting. The reason for recommending oil rather than latex paints is that a coat of latex paint applied directly over old oil paint is more apt to fail. The considerations are twofold. First, because oil paints continue to harden with age, the old surface is sensitive to the added stress of shrinkage which occurs as a new coat of paint dries. Oil paints shrink less upon drying than latex paints and thus do not have as great a tendency to pull the old paint loose. Second, when exterior oil paints age, the binder releases pigment particles, causing a chalky surface. Although for best results, the chalk (or dirt, etc.) should always be cleaned off prior to repainting, a coat of new oil paint is more able to penetrate a chalky residue and adhere than is latex paint. Therefore, unless it is possible to thoroughly clean a heavily chalked surface, oil paints—on balance—give better adhesion.

If however, a latex top coat is going to be applied over several layers of old oil paint, an oil primer should be applied first (the oil primer creates a flat, porous surface to which the latex can adhere). After the primer has thoroughly dried, a latex top coat may be applied. In the long run, changing paint types is more time consuming and expensive. An application of a new oil-type top coat on the old oil paint is, thus, the preferred course of action.

If CLASS III conditions have necessitated total paint removal, there are two options, both of which assure protection of the exterior wood: (1) an oil primer may be applied followed by an oil-type top coat, preferably by the same manufacturer; or (2) an oil primer may be applied followed by a latex top coat, again using the same brand of paint. It should also be noted that primers were never intended to withstand the effects of weathering; therefore, the top coat should be applied as soon as possible after the primer has dried.

## Summary and References

The recommendations outlined in this Brief are cautious because at present there is no completely safe and effective method of removing old paint from exterior woodwork. This has necessarily eliminated descriptions of several methods still in a developmental or experimental stage, which can therefore neither be recommended nor precluded from future recommendation. With the ever-increasing number of buildings being rehabilitated, however, paint removal technology should be stimulated and, in consequence, existing methods refined and new methods developed which will respect both the historic wood and the health and safety of the operator.

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Preservation Services (TPS), National Park Service prepares standards, guidelines, and other educational materials on responsible historic preservation treatments for a broad public.

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