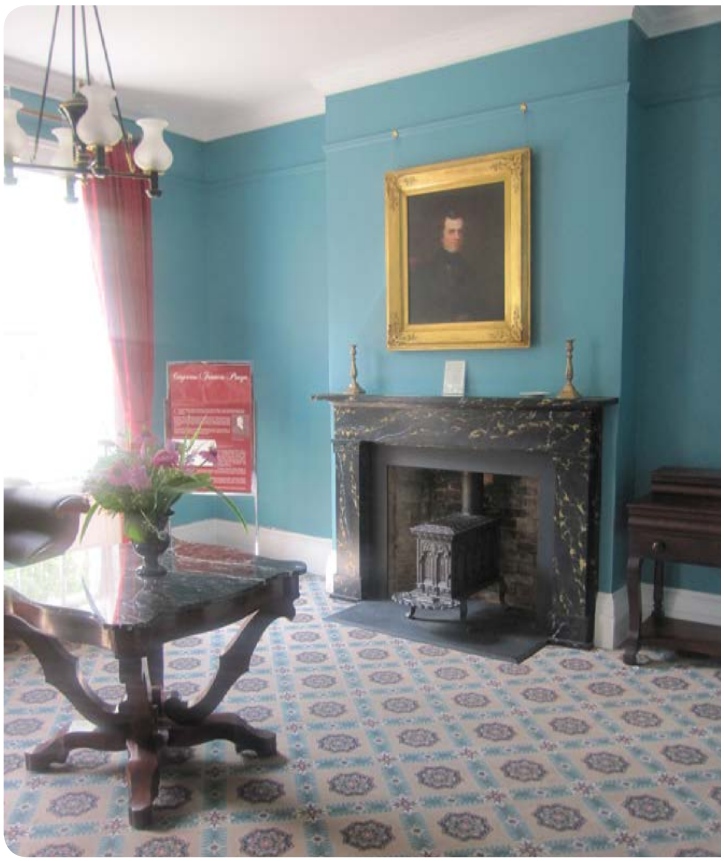

Existing Conditions Assessment

Casparus F. Pruyn House

207 Old Niskayuna Road, Town of Colonie, Albany County, New York

Prepared for:

The Friends of Pruyn House
270 Old Niskayuna Road
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edr

September 2016

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1.0 INTRODUCTION

1.1 Purpose and Goals of the Investigation

Environmental Design & Research, Landscape Architecture, Engineering, & Environmental Services, D.P.C. (EDR) was retained by The Friends of Pruyn House to conduct an existing conditions assessment for selected areas of the Casparus F. Pruyn House. located at 207 Old Niskayuna Road in the Town of Colonie, Albany County, New York. The Pruyn House, which is listed on the National Register of Historic Places, is a former country estate constructed circa 1830 by its namesake who was the business agent for the (then) Lieutenant Governor of New York, Stephen Van Rensselaer. The house currently serves as the cultural center for the Town of Colonie, and is managed by the Friends of the Pruyn House, a nonprofit corporation. The Pruyn House is at a critical point in time with significant problems that if left untreated, will accelerate deterioration causing significant financial and physical damage. The primary area of focus for this conditions assessment report is water damage, including portions of the building envelope, site, and interior. Despite repairs that have occurred to address water damage issues over the past 30 years, water is still infiltrating the building.

The National Register listed home is set back from the road on a slight rise with numerous agricultural outbuildings located downhill and east of the main house. These outbuildings are not included in this existing conditions assessment. The Pruyn House is a two-story, five-bay, rectangular brick residence exhibiting characteristics of both the Federal and Greek Revival architectural styles. The north and south end walls rise up past the east sloping roof to become parapets with integral chimneys. The central entrance portico is arrived at by a semicircular paved drive off Old Niskayuna Road. Three stories are visible at the rear of the building, due to the steep change in grade from front to back. The building retains a high degree of historic integrity and is a source of local pride. The Friends of Pruyn House and the Town of Colonie are to be commended for their dedication to the upkeep of this community gem. This report is intended to aid both groups in moving forward so that visitors are able to continue to benefit from this resource for decades to come.

1.2 Methodology

Archives and repositories consulted during EDR's research for the Project included the collections of the Pruyn House, the New York State Library, historic postcards, historic photographs, past internal Pruyn House memos and work orders, interviews with Carol Fitzgerald of the Building Committee, interviews with Town Historian Kevin Franklin, and EDR's in-house collection of reference materials.

Consideration was given to the many variables related to building-related moisture problems: visible and hidden; exterior and interior; above and below grade; liquid and vapor. A top-down, outside-to-inside, holistic investigation of the building was conducted, with deference given to the building's history, including past alterations.

EDR staff conducted multiple site visits in 2016 on May 26, July 20, July 25th and August 2. These site visits helped to identify the range of materials affected by water infiltration and to assess their general condition. Detailed inspections were made on dry days, during a rain event, and after a rain event, to identify areas of sitting water. Existing conditions findings appear in Sections 2.0 and 3.0 of this report, with recommendations in Section 4.0 in the form of a prioritized scope of repair, and maintenance plan. Appendices include captioned current and historic photographs, and sample maintenance manuals, which are referenced within the text of this report.

A site visit was not made in the winter season. Therefore, no assessment can be made in regards to interior condensation, snow loads, ice damming or the freeze/thaw cycle; all which would further inform the recommendations

made in this report, and certainly are contributing issues to the present water problems. Assessment of mechanical and electrical systems are also excluded, as are material damage created by animals.

1.3 Chronology of Development and Use

Determining a building's history of alterations is critical to understanding why water is able to infiltrate its envelope. A review of Pruyn House internal documents and photographs, discussion with Town of Colonie Historian Kevin Franklin and Pruyn House Buildings & Grounds Committee Chairperson Carol Fitzgerald, along with EDR site visits informed the chronology below. Documentation of alterations that were completed prior to the Town's purchase of the building were beyond the scope of the existing conditions assessment.

OWNERSHIP HISTORY[1]

c.1830 Pruyn House constructed.
1848 Sold to Alfred Mayell and Roger Flood
1857 Sold to Lloyd Canady, passed onto George Canady
1862 Sold to Walter Many
1865 Sold to Levi Dederick
1868 Sold to Josephine Deyo, passed onto Mary E. Fonda
1884 Sold to Francis McCann
1893 Sold to John Henkes (Appendix C, Photographs 1 and 2)
1966 Sold to Henry S. Bailley
1983 Sold to Town of Colonie (Appendix C, Photographs 3-5)

ALTERATION HISTORY UNDER TOWN OF COLONIE OWNERSHIP[2]

1984 The Town conducted a major restoration of the house following its 1983 purchase. Removals included site plantings, wall vines, deteriorated brick and mortar. Brick was replaced, and mortar was repointed including at the stone foundation. A portion of the brick wall at the northeast corner was rebuilt at the first and second floors. The entire structure was painted including the shutters. Window panes were replaced where missing. At the roof level, the roof was patched and a new roof hatch, gutters and downspout installed. A full interior restoration also occurred with new painted plaster and floors (Appendix C, Photographs 3-13).
1987 Roof leaks reported at new hatch and along parapet walls.
1988 Firestone Rubbergard roof repairs and replacement made under warranty.
1992 Low pressure brick wash, brick painting, shutter painting, portico cornice repair. Exterior lawn sprinklers installed. Repointing likely occurred at this time.
1998 Proposals and New York State Historic Preservation Office (NYSHPO) comments received for additional masonry repointing, brick replacement, and replacement flashing. Invoice found for scraping, priming and painting north and south elevations only.
1998 Rear vestibule demolition and redesign/reconstruction.
1999 Chimney cap and cricket repair.
2002 Scraped, primed and painted the north elevation, front soffit and partial south elevation.

[1] Ownership chronology provided by Carol Fitzgerald, Building & Grounds Committee Chairperson.

[2] Based on review of Pruyn House files, including historic photographs, work orders and meeting minutes. Also based on information learned via email communications with Carol Fitzgerald of the Building & Grounds Committee, and Kevin Franklin, Town of Colonie Historian.

Grounds Committee reported problems with west window sills at north elevation, and need for shutter repair.

2004 Storm windows installed.

2007 Replaced roofing, turned it up against the interior parapet walls. Installed metal coping on top of parapet walls. Removed failing mortar, pressure washed, repointed and painted exterior walls and shutters. Added brick vents, and rebuilt/primed/painted north wall parapet between chimneys.

2007 Front ramp installed. (Appendix C, Photograph 14)

2009 Underground drainage pipe failure at northeast corner downspout. Trench dug, new pipe installed. Southeast underground drainage pipe has breakage 40' away from building, no repair made at that location. (Appendix C, Photograph 15)

2012 Electrical heating cable installed at gutters and downspouts. Spray polyurethane foam and/or concrete used to fill gap between soil and foundation wall where erosion was occurring.

2014 Stone laid in former planting beds on either side of portico.

2015 New furnace and air conditioning system installed.

2.0 EXISTING CONDITIONS – EXTERIOR

The Pruyn House measures 40'-6" (north elevation) x 50'-6" (east/rear elevation) x 40'-2" (south elevation) x 50'-3" (west/front elevation). Existing conditions relative to the Pruyn House's roof system, brick masonry, stone masonry, wood, and site are described below. Photographs showing existing conditions of the exterior of the building are included in Appendix B.

2.1 Roof System

The current roof was installed in 2007 and is a 60-mil EPDM roof system, which sits atop 0.5-inch DensDeck (per 2007 installation specifications) and replaced its 1987 predecessor after an appropriate 20-year useful lifespan. A square steel hatch is located roughly at the center of the roof, providing ladder access from the second floor. The roofing membrane is turned upwards against the interior of the north and south parapet walls terminating beneath metal coping with drip edges on both faces. Metal flashing is present around the chimneys at their parapet wall intersections. The flat roof slopes east to the rear of the building with a change in the slope located at the easternmost chimney line. Water is removed via a metal gutter along the length of the rear elevation. The gutter, which slopes north, is connected to downspouts at both ends. The gutter and downspouts were installed in 1984, and are currently at the end of their useful lifespan. Historic photos show that both downspouts were missing at the time of the Town's purchase, which appears to have contributed to significant water problems on the rear elevation. Both gutters and downspouts are heated in the winter with electrical cables, though the cables were not used in the winter of 2015/16.

Dry Day Conditions:

Typical conditions on dry days were observed during EDR's site visit on July 20, 2016.

Roofing: There appear to be no breaches in the roofing membrane. Patches along the parapet wall junction have held up well. No problems around the roof hatch.

Roof Hatch: No signs of material failure.

Parapet Coping: Seams between metal coping panels appear to be a point of weakness, with past sealant repairs showing signs of deterioration.

Chimney Flashing: Seams between metal flashing and brick chimneys appear to be a point of weakness, with past caulking repairs showing signs of deterioration.

Gutters: There appear to be no breaches in the metal. There is evidence of past soldering repair. Heating cables appear to be intact.

Downspouts: There appear to be no breaches in the metal. Heating cables appear to be intact.

Downspout Drainage: There is no standing water on the ground adjacent to the downspout boots.

Wet Day Conditions:

A site visit was made was during a light rain event on July 25, 2016. During a rainstorm, the following problems would be exacerbated.

Roofing: The roof design is problematic, and probably always has been. The lower sloped section of the roof is not pitched sufficiently to empty all water into the gutter. Hence, after a weather event considerable amounts of sitting water remain adjacent to the gutter, on the roof. Although the roof was replaced in 2007, and brought up over the inside of the parapet walls, it did not solve the brick/water problems as hoped (Appendix B, Photographs 5-7).

Parapet Coping: The exterior drip edge does not always clear the brick below, either due to metal warping, bowing of the brick wall below, or a combination of both. Therefore, water that is released off the drip edge washes against the building instead of being dropped to the ground at the north and south elevations (Appendix B, Photographs, 12, 17 and 20).

Chimney Flashing: The additional caulking at the flashing seems to be watertight in the rain, as there is no reported water entering the ceiling or walls below. Another intervention, the installation of chimney caps, provided a solution to water entering the building via those shafts.

Gutters, Downspouts and Drainage: Because the gutter is sloped to the north, the water naturally moves in that direction. The gutter/downspout connection at the north was clogged with debris, backing up the water halfway across its length, and overflowing onto the roof. During a snowstorm, this situation is reported to cause ice damming, which may also involve the lifting of the roof system if ice expands underneath the sheathing (Appendix B, Photograph 16).

The southern downspout has limited functionality due to the slope of the gutter towards the north (Appendix B, Photograph 4). It removes water at a rate of roughly one drop per second. 2009 testing of the drainpipe below the southern downspout revealed that is broken or clogged, and as a result, the water overflows out of the boot and sits adjacent to the building.

At the rear elevation, following a rain event, all the roof water drains into one clogged gutter which is tipped to the northeast corner of the building. Water flows over the gutter edge, adjacent to, and occasionally along the exterior of the downspout. It also flows against the brick and stone behind the downspout (Appendix B, Photographs 13, 14 and 15). Though the below-ground northern drain pipe that connects to the downspout boot is in working order thanks to a 2009 replacement, it is not being used due to the clogged downspout/gutter connection. Even on dry days, the masonry remains wet from repeated splashing (Appendix B, Photograph 10).

2.2 Brick Masonry

The exterior brick walls of the Pruyn House are solid and load bearing, laid in American Bond (5 courses of stretchers per 1 course of headers). There is no interior cavity, nor any weep holes for interior drainage.

Brick and Mortar: Most of the original soft historic brick remains at the Pruyn House, but over time, the removed units have been replaced with a harder machined brick. Similarly, much of the soft historic lime mortar has been removed and replaced using modern mixes (Appendix C, Photograph 11). All brick surrounds at basement

window locations date to 1984. The modern replacement brick is good condition; replacement mortar varies; some has been patched multiple times in the recent past. In locations where the paint is intact, it is not possible to assess if the brick and mortar underneath is original, or replacement. The extant original soft brick and mortar vary in condition, depending on location. At best, the historic brick and masonry is completely encapsulated by intact paint. At worst, they are missing entirely, which fortunately is infrequent. Most of the brick and masonry problems fall somewhere in between, with various degrees of surface spalling and degradation.

Paint: It is unclear if the brick of the Pruyn House was originally exposed, whitewashed, or painted. The earliest known photo, circa 1910 (Appendix C, Photograph 1) shows the building with a coat of white paint. Since that time, the building has continuously been painted (Appendix C, Photographs 2 and 3). Visual inspection revealed that there are roughly three to four layers of paint on the brick, all shades of white, and some assumed to contain lead (Appendix C, Photograph 12). Past and current paint brands are unknown.

Historically, soft porous brick required a coating to protect it against the rain, sleet, snow and ice. In the early and mid-nineteenth century, this paint would have been a breathable lime-based whitewash, which is entirely different than today's paints which have been used on the building in the recent past. The paint at the Pruyn House has failed at least 4 times since the Town's purchase (1992, 1998, 2002, 2007). The building last received a coat of paint in October of 2007 (Appendix C, Photograph 14). The autumn scheduling may have contributed to early delamination due to a cold weather application.

Front (west) elevation: Peeling paint below first floor windows is likely from water coming off the window sills, and splashing up from landscaping rocks (Appendix B, Photographs 1 and 20). Brick plinths are located beneath the portico columns. Their mortar joints are now entirely open due to excessive sitting water shed from the portico roof.

South and North elevations: At the time of the building's purchase, the north and south elevations exhibited brick problems, much of it due to the lack of roofing along the inside face of the parapet wall which was later corrected. (Appendix C, Photographs 5 and 10).

Currently at the south elevation, peeling paint is correlated with the roof failures above at the coping, drip edge, chimney flashing, and seams. Water sheds down, lands on the stone sills, then drips down, and/or settles into the brick and windows. Where this has entirely saturated the masonry, the brick has popped out of place.

Substantial brick repair and reconstruction to solve water problems has occurred on the north elevation above the second floor window level in the past 30 years, without success. The north elevation suffers from driving rains and winds, with its northwest frontage. This is evidenced by its condition, which is worse than any other elevation. At is parapet, the brick is bulging and cracking, because it gets washed by water from the failed coping and drip edge above. This water continues downwards into the second story window head, and into the interior of the building. A more detailed explanation is provided in Figure 1.

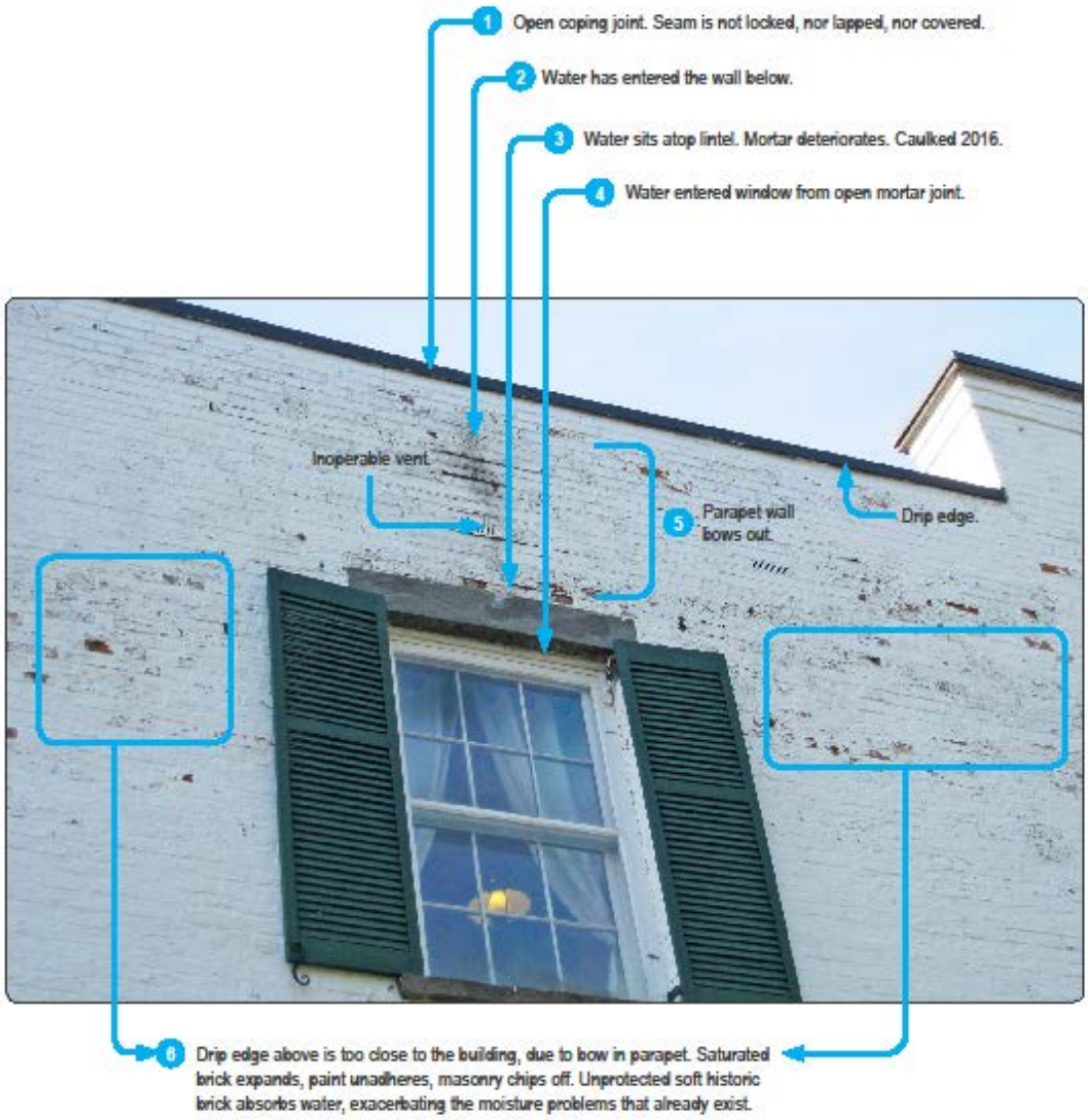

Figure 1. Illustration of water related problems at second floor parapet, north elevation.
Mortar joints around the north elevation attic vent are moving outward as water is likely sitting in the vent, remaining trapped at that location.

Rear (east) elevation: At the time of the building's purchase, the rear (east) elevation exhibited significant brick problems, due to failure of the roof to properly eliminate water (Appendix C, Photograph 4). As referenced earlier, this is in part due to a design flaw, where the lower slope of the roof is too shallow to move all the water into the gutter. Also, in 1983, downspouts lacked entirely. The historic pattern of paint deterioration as shown in historic photographs in suggests that the gutter had become detached from house at certain locations, where water washed down the wall until it reached grade.

Unfortunately, history has repeated itself and water problems have recurred at this elevation, this time due to inappropriate brick and mortar replacement in combination with an overflowing gutter (Appendix B, Photographs 4, 14, 15). The brick deterioration is focused at the location of the northern downspout where there is spalling

and loss of brick, as well as behind the entire lengths of the downspout and gutter, where there is also substantial mortar loss. Though minimal, there is some biological growth on the brick behind the northern downspout. Otherwise, the brick of the rear elevation is in good condition, save one stain that extends down from a first floor sill, presumably originating from a rusted anchor (Appendix B, Photograph 4).

Reconstruction and Venting: Portions of the brick walls in various locations were reconstructed during the Town's ownership and include the northern parapet (Appendix C, Photograph 10) and the northern edge of the rear elevation from foundation to roofline (Appendix C, Photograph 9). In 2007, the area between the chimneys above the second floor windows were reconstructed with additional vents with the idea that moisture within the wall would have a space to escape (Appendix B, Photograph 3). Vents are typically reserved for cavity wall construction that have airspace behind veneer brick, and weep holes near the foundation, allowing for air circulation to assist water out of the envelope. In the case of a solid brick wall, vents are likely serving as entranceways for water to get into the parapet wall, without a means to escape.

2.3 Stone Masonry

Stone is the secondary masonry feature at the Pruyn House, used at the foundation, window sills and lintels, horizontal banding and as a water table.

Rubble Foundation: The Pruyn House has a rubble stone foundation, which at the front elevation just peeks above grade, but at the rear elevation is exposed for roughly three feet due to a grade change (Appendix B, Photographs 1-4). As compared to brick, fieldstone is a far harder material, and hence has not suffered as much over the past 180 years. However, the soft historic mortar around the stone has eroded considerably due the natural decline of lime, and accelerated by the amount of water washing over, splashing back onto, and seeping into, the foundation. The exterior stone that has suffered is at the location of downspouts, and where the foundation meets grade. At these locations, some of the foundation stone has already been replaced, and both the historic and the new stones were repointed with modern cementitious mortar. Much like historic brick, historic stone is more porous than modern foundation materials like concrete block, which were designed to be glued together with the modern mortar. However, despite the cementitious mortar, there is no current evidence that foundation stone has shifted out of place, nor is there any exterior stone spalling. The only staining is located below the spigot on the north elevation, and is related to dripping water. At the time of this report, most of the rear elevation foundation, and roughly 50% of the south elevation foundation, have been repointed with cementitious materials.

Sandstone Window Sills, Lintels and Water Table: Front elevations have purple-red sandstone window lintels and sills. This stone is also used as a water table course on that side of the building. Historic photos from 1984 show that all sandstone was painted the same color as the brick (Appendix C, Photograph 3). Sandstone sills and lintels are generally in good condition, while the water table is losing its face bedding, likely from the splash-back it receives from the landscaping rocks and the water that drips off the window sills. The water table appears to be in sound condition in a 2007 photograph, prior to the installation of the rocks (Appendix C, Photograph 14).

Stone Window Sills, Lintels and Band Course: The north, south and rear elevations all have dark grey stone window lintels and sills, possibly slate. This stone is also used for a horizontal band course atop the foundation on those same elevations. Historic photos from 1984 show that the slate was painted the same color as the

brick (Appendix C, Photograph 5), but were left exposed following that year's restoration (Appendix C, Photo 12).

Most of the slate sills exhibit signs of deterioration on their outer faces, which may have been previously protected by the paint. This is due to a design flaw; the sills are not sloped outwards so that water can sit on them indefinitely, until it flows over the edge, or creeps into the window units. The window sill at the northwest corner of the foundation is buried under grade, allowing moisture to penetrate.

The lintels are losing some of their face bedding due to water flowing over them from the drip edge above.

The band course above the foundation also receives water from the drip edge (Appendix B, Photograph 12). In places where a significant amount of water flow over the slate, such as the northeast corner (Appendix B, Photograph 13), the stone is beginning to show signs of deterioration.

2.4 Wood

Wood is found at the entrance portico, windows, cornice, fascia board, and shutters. The rear addition is a wood-framed structure.

Entrance Portico: There has been no architectural work executed at the portico in the past decade at minimum, and likely dates back to 1992. At the front elevation (Appendix B, Photograph 1), water shedding is a problem at the portico roof, whose metal drip edge releases rain water so close to the wood columns, that splash-back has eroded the paint at their bases, and is now causing wood deterioration (Appendix B, Photo 18). This is a similar condition to what is found at the upper corners of the portico, where some water is not being dripped off the edge, and instead washes down the wood fascia (Appendix B, Photo 19).

Windows: The Pruyn House retains almost all of its painted, rectangular, wood six-over-six double hung windows at first and second story levels. Within the foundation, where it is significantly above grade, square, wood, eight-over-two double hung windows can be found. Smaller rectangular windows are located at the western sides of the north and south foundation walls. The window at the furnace rooms has been breached by multiple mechanical penetrations. Universally, the bottom rail and interior sill of all wood windows have water related damage from sitting water or cascading water from above, which occurred prior to the installation of exterior storm windows in 2004. This same water also adversely affected the interior wood sills which are stained. Installation of exterior storm windows has protected against further damage. Glass is mostly intact, excepting a pane at the northeast corner basement window. Painted wood storm windows are installed on the exterior face of the masonry rough opening, fixed in place, having lost a considerable amount of their finish.

Front elevation cornice: The white-painted cornice and frieze board of the east elevation have been in place, and painted, since at least the early twentieth century (Appendix C, Photograph 2). Today they appear much the same (Appendix B, Photograph 1.) There is no evidence of wood deterioration, thanks to the drip edge which extends beyond the wood.

Wood Shutters: Wood shutters have existed at the building since at least the early twentieth century (Appendix C, Photograph 2). Most recently they were removed and painted in 2007. In locations the paint has delaminated.

This could be because of the cold weather paint application, water cascading over them due to reasons listed above, animal damage, or a combination.

Rear Vestibule: A wood framed, two-story vestibule was constructed in 1998, replacing an earlier vestibule (Appendix C, Photograph 4; Appendix B, Photographs 4 and 11). It is in good condition.

2.5 Site

The Pruyn House sits atop a small hill, just east of Old Niskayuna Road. The highest point is located just west of the house, at the crown of the U-shaped entrance drive, at the front of the portico (Appendix B, Photograph 1). From the entrance drive, the site slopes east to the back of the house, providing drainage in that direction at the north and south ends of the house (Appendix B, Photographs 2 and 3). However, without trench drains to remove this water, it remains in the ground, saturating both the former planting beds adjacent to the portico, and the areas adjacent to the downspouts at the rear elevation (Appendix B, Photograph 10).

Drainage Daylighting: The northern downspout drainpipe daylights at the base of a small embankment near the brick smokehouse behind the building (Appendix C, Photograph 15). It is unclear where the southern downspout drainpipe daylights. It is not in use due to an underground clog as determined by testing in 2009.

Entrance Ramp: In 2007, a steel framed, handicapped-accessible, concrete and brick ramp was installed atop the original brickwork beneath the entrance portico. No water-related damage to the brick or ramp is evident (Appendix B, Photographs 1, 8 and 9).

Entrance Drive: The entrance drive was altered in 2007 due to the ramp project. The scope included raising the drive by a few inches to meet the ramp, and installing an adjacent brick walkway (Appendix B, Photograph 1,8 and 9).

Planting Beds: Before 2014, the front areas of the house to each side of the portico were covered in very large weeds and dying shrubs. In the decades before that, plantings were always present in those locations (Appendix C, Photographs 2,3, and 14). In 2014 the areas were graded, landscape fabric laid, and large landscaping stones installed (Appendix B, Photographs 1,8,9, and 20).

Sprinklers: Sprinkler heads are situated close to the house, but are no longer in use. It is unclear if they are still pressurized and potentially contributing to groundwater problems through leakage.

Exterior Foundation Insulation – Spray polyurethane foam can be found bridging the gap between the fieldstone foundation wall and grade at the rear and south elevations of the building (Appendix B, Photograph 15). It is unclear if it was installed for insulation purposes, or as a stop gap measure for erosion due to water shedding off the building.

3.0 EXISTING CONDITIONS – INTERIORS

Most interior walls, excepting a select few in the basement, have been furred out with gypsum wall construction, making analysis of the interior brick wall a difficult task at these locations. Historic photographs from the 1984 restoration (Appendix C) do give some indication of where past interior problems were located and have informed the following analysis. Where the masonry is not visible from the interior, water problems are identified based on the location of deteriorated surfaces. In the basement, where stone is exposed, problems are more obvious.

There are no moisture related odors present inside the house, at any level. This is quite remarkable, as the interior is entirely sealed up, without any fresh air exchange. Nor is there any dehumidification or mechanical ventilation capability. Per Town Historian Kevin Franklin, an informal dew point test was conducted in 2015 during an 8-person meeting in the northeastern room of the first floor. At the outset of the meeting, the humidity percentage was in the 40s, and raised to about 50% one hour later, by the end of the meeting. After a rainstorm on August 2, 2016, humidity in this room was measured at 56% which is at the upper limit of the appropriate range for relative humidity for a historic house museum.

Interior components evaluated include walls, windows, ceilings, and floors.

3.1 Basement

The basement of the Pruyn House is used as interpretive space for the public, houses a private office and kitchen, storage areas, and a mechanical room.

Perimeter walls in the basement are a combination of gypsum wallboard build-outs over the stone foundation, or exposed field stone foundation with historic mortar. Interior walls are painted, load-bearing, brick.

> *Stone Walls:* At the west foundation wall, one of the few locations where the stone is exposed, plastic was installed over the upper portion of the wall in 1984 during the renovation as the crumbling mortar was depositing sand onto the floor. The plastic sheet has remained in place since, trapping moisture behind it. There is evidence of historic whitewash on the stone, though most of it has powdered off. Mortar has also disintegrated drastically, leaving piles of sand sitting on the floor adjacent to the foundation (Figure 2).

Figure 2. Interior face of west elevation foundation.
Southwest corner of basement storage room, view facing west. The adjacent brick wall has absorbed some of the exterior moisture as evidenced by its own loss of paint and mortar.

Furred Out Gypsum Walls: Most of the perimeter foundation wall has been built out. Peeling and/or cracking paint is typically located around windows, especially at the wood aprons below them (Figure 3).

Figure 3. Lower wall, northeast corner of basement.
The crazing of the paint below the window indicates that the wood behind it is swelling due to exterior moisture.

Brick Walls: The brick wall in the equipment room is in worse condition than the other brick walls. Earlier furnace equipment, and the moisture it gave off, are to blame (Figure 4). Not only is there loss of paint and mortar, but in this case, loss of the brick face itself. A brick chimney is exposed in the mechanical room, in poor condition, with substantial past patching.

Figure 4. Southeast corner of the Furnace Room.
The brick wall (left) and the brick chimney (right) have absorbed the moisture from the stone foundation (center).

Floors: Basement floors have a variety of finishes including wood, stone, brick and vinyl, depending on the use of the room. Most are in good condition. Problems are located at the northeast corner of the house, where the wood floor shows signs of warping and rotting (Figure 5).

Figure 5. Northeast corner, basement floor.
Water which sits in the ground from the overflowing gutter has seeped through to the floor which has buckled.

Windows: Just above the location of the rotted floor, a window pane is broken which is unfortunate as it is located at the wettest part of the building, allowing moisture to reside in the sill (Figure 6). Generally speaking, basement windows do not receive the same degree of protection as their upstairs counterparts due to a lack of exterior storm windows and flat exterior stone sills which do not shed water. Interior storm windows prevent dripping into the room, but water still gets down behind the wall as evidenced by the crazing in the wall finish below it (Figure 3). Other basement windows have interior wood window sills, and they too show signs of past water infiltration (Figure 7). Historic photographs show that exterior storms used to protect these windows (Appendix C, Photograph 4).

Figure 6. Window at northeast corner of basement.
Not only is the pane broken, but there is separation of the stile and rail, and rot.

Figure 7. Basement window sill.
Note the staining of the interior sill, and crazing of the paint on the bottom rail of the window sash.

Ceilings: Painted gypsum ceilings are in good condition.

3.2 First Floor

The first floor of the Pruyn House is used as interpretive space for the public.

Walls: During the 1984 renovation, throughout the first and second stories, the historic plaster was removed, and new plaster and or gypsum board was installed over wall studs (Appendix C, Photograph 8). Any new interior plaster was painted or wallpapered, and has been in place since (Appendix C, Photograph 13). Overall, the first floor walls and their finishes are in good condition. There are discrete locations where water has entered the wall from the exterior. One example is in the dining room (again, at the problematic northeast corner of the house) along the north elevation (Figure 8).

Figure 8. North wall of Dining Room.
When water from the brick masonry moves towards the interior of the house, the plaster expands and tears through wall finish.

Water problems in the wall below the windows have plagued the Pruyn House, as early as 1983. The image in Appendix C, Photograph 8 shows evidence of water entering the brick beneath the windows. This brick butts up directly against the interior wood panels which would explain their cracking and crazing throughout the house (Figure 9).

Figure 9. Wood panel below window, typical condition.
Not only has the center panel separated from the edge trim, but there is also bubbling of the panel paint.

Windows: Historic six-over-six wood windows that were restored in 1984 have external storm sashes that are attached to a security system. Hence it is a fixed system, with no operability. Windows have been protected by the exterior storms, and are in good condition.

Floor: The floor has a hardwood finish. Integral vents are located at the perimeter of rooms, typically beneath windows. Floors are in good condition. Floor vents are installed at the periphery, below windows. They are in good condition.

Ceilings: Ceilings are in good condition.

3.3 Second Floor

The second floor of the Pruyn House is used as interpretive space for the public, and for private offices.

The history, treatment, and materials of the second floor are generally similar to the first floor. Water has been a problem at the northeast corner of the second floor since at least 1983 (Appendix C, Photograph 6). The main difference

between the first and second floors is the ceiling which slopes east, and is more susceptible due to roof deficiencies above. Evidence of some past water problems at the ceiling seem to be solved by the 2007 replacement roof, though new cracking as occurred since. The single most troubled spot is the north elevation window, and wall above.

Walls: During the 1984 renovation, throughout the first and second stories, the historic plaster was removed, and new plaster installed over wall studs (Appendix C, Photograph 8). Any new interior plaster was painted or wallpapered, and has been in place since (Appendix C, Photograph 13). Most walls of the second floor seem to have no water problems. But given the missing mortar in the brick behind the downspout and gutter (Appendix B, Photograph 15), there is likely moisture trapped in those walls.

In the office located at the center of the north elevation, active water problems within the wall have persisted at and above the window. The amount of wall clearance above the window is less than one foot on the interior, but the small amount of wall is assumed to be saturated based on the condition of the exterior masonry (Figures 1 and 10 and Appendix B, Photograph 14).

Figure 10. Wall above north elevation window.
The dark color of the paint makes it difficult to determine if there are water stains, however some are present on the adjacent ceiling, making it likely that the wall is wet as well.

Windows: Historic six-over-six wood windows that were restored in 1984 have external storm sashes that are attached to a security system. Hence it is a fixed system, with no operability. Windows have been protected by

the exterior storms, and are in good condition. The one exception is the window at the north elevation, where water is seeping from the head of the window (Figure 11). Recently, the exterior head has been caulked which has provided a temporary solution (Figure 1).

Figure 11. Lower sash of north office window.
Because of the chronic moisture problems at this location, there is a mold problem, and during the winter, condensation on the window

Floor: The floor has a hardwood finish. Integral vents are located at the perimeter of rooms, typically beneath windows. Floors are in good condition. Floor vents are installed at the periphery, below windows. They are in good condition.

Ceilings: The second floor ceiling slopes to the east, following the slope of the roofline. Past water problems, evidenced by stains, were solved by the installation of a new roof in 2007. However, sitting water on the roof, adjacent to the gutter has resulted in the formation of two new ceiling cracks in the northeast and southeast rooms (Figures 12 and 13).

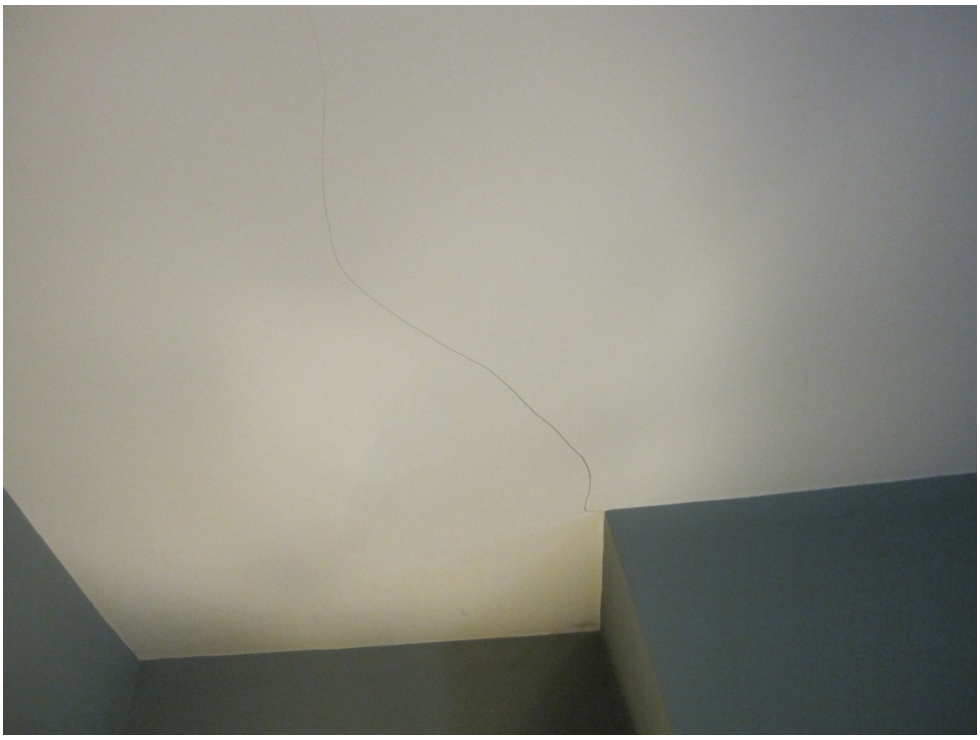

Figure 12. Ceiling Crack in northeast room.
There is no associated water damage.

Figure 13. Ceiling Crack in southeast room.
This this crack has associated water damage as indicated by the staining.

4.0 RECOMMENDATIONS

4.1 Summary

The Pruyn House, approaching 200 years of age, is a testament to good construction materials and methods. As described herein, the natural deterioration processes of brick, mortar, stone and wood are often accompanied by modern interventions which can accelerate the decline of a historic building, if not executed correctly. It is helpful to understand the nature of architectural deterioration, in order to inform appropriate maintenance and/or repair strategies, which will extend the life of the Pruyn House.

Buildings are designed to withstand intermittent and chronic water events such as seasonal rain, sleet and snow. An important goal of architectural detailing is to control the entrance of moisture into a building, not eliminate it (which is simply not possible). This must be done in conjunction with human comfort and in the case of the Pruyn House, protection of its collections. Unfortunately, the frequency of rare, severe water events such as the overflow of the gutter and downspout; failure of the coping drip edge to adequately shed roof water away from the building; and the lack of site drainage, has compromised the building's ability to protect itself against even intermittent and chronic water events. Even if the Pruyn House was brand new, these problems would cause associated architectural deterioration. Add to this, a building which has compromised integrity of materials due to age (e.g. soft brick, sandy mortar), and the water problems quickly become a building-wide issue.

The brick, representing the largest masonry component at the Pruyn House, is of considerable concern. Prior to any past repainting project, the brick should have been properly prepared to receive a new coat of paint. The preparation process includes removal of loose paint, and cleaning the brick. The variety of methods and materials that were used to prepare the brick walls during previous painting episodes are undocumented. Soft brick requires gentle methods. Luckily there is no evidence of abrasive treatment. The historic photographs show that vines were removed from the brick by unknown means during the 1984 restoration, which may have increased the porosity of the brick and/or mortar if they were not carefully cut off and allowed to die naturally. Specialized paints for historic buildings exist which are breathable to allow for moisture to exit the walls, but it is assumed that these types of paints have not been used for any of the repainting projects.

Seasonal expansion of masonry is to be expected, and is accounted for during its construction. The soft brick was paired with soft mortar just for this purpose. However today, the historic materials can no longer expand when placed adjacent to the newer, harder, brick and mortar, causing them first to flake paint due to vapor pressure, then to spall and pop out of place. These spalled bricks are then removed and replaced with modern brick and mortar, and the cycle continues over many decades, causing the overall problems that have plagued the Pruyn House since its purchase by the Town (Appendix C, Photographs 10, 13 and 15).

The paint and masonry problems are exacerbated in conjunction with failures at the roof level. Roof water is supposed to be removed from the building using gutters, downspouts, and drip edges thereby avoiding direct water contact with the masonry envelope. In this case, due to failure of all three systems, water is washing over the walls, driving moisture into masonry walls which are already susceptible to failure, from the parapet level all the way down to the ground. The older brick is naturally more porous, but once the brick has spalled or fallen out altogether, the water has a direct route into the wall, and via capillary action, to the interior of the building. This is true even with historic solid masonry walls,

despite their thickness. The north elevation is particularly problematic. Above the second story, its parapet wall is beginning to fail, as is the eastern corner at the location of the failed downspout (both which were rebuilt in 2007).

Historically, all windows were operable and critical for cooling and warming the house, in addition to providing ventilation. At the Pruyn House all windows are entirely fixed, with exterior storm windows attached to a security system, which is not likely to change. This results in not allowing the house to breathe, thereby trapping moisture within the building and walls, and raising the internal dewpoint. Dewpoint is the measure of interior moisture, and the Pruyn House interior levels are bordering on high. Water not only enters the building from the exterior, it also originates inside the building. People give off moisture in the form of respiration and perspiration. It moves into the plaster, which is already disadvantaged due to the moist brick behind it. Once inside the brick, it cannot move out because of the modern exterior paint that is not breathable. Add to these circumstances a rain event along with a large group gathered for an extended period of time, and this would likely raise the dewpoint to unsafe levels. High dewpoints risk damage to artifacts within the historic house museum, and also creates condensation on the interior faces of the windows. Interior moisture levels are certainly a problem, but based on visual assessment and due to the limited portions of plaster bubbling, interior humidity is not the main cause of moisture retention within the brick.

In 2015, a new, efficient, combination gas furnace and air conditioning system was installed in the southwest corner of the basement, which serves the entire house. Though equipped with a humidifier (which is turned off during the summer months), it lacks dehumidification and ventilation capabilities that would help lower the dewpoint. The corresponding air conditioning equipment adjacent to the furnace room at the exterior of the south elevation is quite close to the house, which may also be contributing to material deterioration.

The site contributes to water problems as well. The natural slope of groundwater drainage from the face of the house towards Old Niskayuna Road (Appendix C, Photograph 14) was interrupted by the elevation of the entrance drive at the time that the ramp was installed. Now, water near the west elevation of the building has nowhere to go but downwards against the foundation (Appendix B, Photographs 10 and 20). Due to the age of the building, there is no waterproof barrier on the outside of the foundation, nor is there a trench drain to remove excess ground water away from the building. Unfortunately, the change from plantings to stone on either side of the entrance portico has also altered the natural drainage patters at the front of the house. Plant roots used to absorb rain water, which now instead flows downward between the rocks, and sits against the building foundation. Deterioration of the interior face of the masonry walls in the basement is due to the water sitting against the exterior of the foundation, which has traversed through the stone to the interior, making the face of the foundation damp to the touch.

Together, roofing system failure, replacement machined brick, replacement cementitious mortar, inappropriate masonry preparation and paint, and changes to site drainage have resulted in unintentional damage to the building which has allowed water to penetrate the envelope. In the past, the Friends of the Pruyn House have solicited the New York State Historic Preservation Office for their expertise in restoration methods, but contractors have not always complied. Regular maintenance has lacked at the site, with past repairs offering only a short term fix for long term problems. As a result, moisture remains in the brick walls causing extensive deterioration that has resulted in significant costly repairs for the Town about once every 5-10 years, which is far too often as compared to other buildings. A thoughtful approach to holistic repairs is presented in Section 4.2.

Historic buildings do not fix themselves. Especially in the case of a building this old, which is still serving the public, there needs to be a seasonal maintenance plan in place, with dedicated staff to execute it. It should be considered to be a preventative healthcare plan for the building, and is discussed in Section 4.3.

4.2 Prioritized Scope of Repair

Based on the above conclusions, the following prioritized scope of repairs can serve as a guide for the appropriate preservation, rehabilitation, restoration and repair at the Pruyn House, in accordance with the National Park Service Secretary of the Interior's Standards for the Treatment of Historic Properties[3].

With deference given to financial realities, the work can be phased over time. A piecemeal approach will gradually improve conditions, but water problems are expected to continue as long any portion of the below work is left unfinished. In the meantime, it is recommended that interior dehumidifiers are run, and routinely emptied, while the building is open to the public.

There is an efficiency in overhead costs for building owners, architects and contractors in doing the work as a single rehabilitation project, which should be considered if at all possible. Costs may be offset by using Town personnel or volunteers if qualified to complete historic restoration work through education or experience.

In the past, contractors have been hired directly to make repairs, overlooking the importance of the architect. When moving forward with this work, it is highly recommended that a historic preservation architect is retained to manage the project including cost estimation and phasing; design of appropriate detailing to redirect water; creation of construction documents and specifications, composing the RFP, locating suitable contractors who have experience with historic buildings; and construction oversight to ensure that the work is completed accurately. Preservation architects are specifically trained to handle the challenges inherent in historic buildings materials and can guide the Town and Friends through a successful project, which will last many decades, saving money in the long run. The State Historic Preservation Office can provide a list of qualified professionals.

The work list below appears in order of priority, and can be phased by numerical groupings. It has been written to guide a preservation architect in his or her work, and should not be used as specifications for a contractor.

1. <u>WATER MANAGEMENT</u>

1a. REAR ELEVATION GUTTER AND DOWNSPOUTS

Remove existing failed gutter and downspouts. Remove/replace/repoint brick behind them using appropriate methods as outlined in Task 3 of this list. Install new gutters and downspouts, sized to accommodate 100% of the rainfall, directed both to the north and south downspouts. Repair the break in the underground drainage pipe and daylight away from the building.

There exists an alternative, that can be investigated by an architect. The building was not designed with gutters and downspouts, both which have failed multiple times at the building by means of ice damming and backups both above and below ground. Remove all gutters and downspouts, and instead extend the roof slope (correcting the existing slope which is too shallow) by adding a fascia and soffit so that a new drip edge

[3]National Park Service. 1995. *The Secretary of the Interior's Standards for the Treatment of Historic Properties.* Kay D. Weeks, Washington, D.C. Available at https://www.nps.gov/tps/standards/four-treatments/treatment-guidelines.pdf.

clears the rear wall. The water shed from the drip edge would need to be removed from the site via a French drain (see Task 1b).

1b. SITE DRAINAGE

Install a French drain (designed by licensed landscape architect and/or civil engineer) around the entire building to remove and redirect water away from around the foundation. A structural engineer should assess the west elevation wall to determine if moisture and/or the weight of the landscaping stone has had an adverse effect on the integrity of the foundation. Sprinkler heads should be removed as should spray polyurethane foam.

2. ROOF REPAIRS

2a. NORTH PARAPET

Deconstruct north parapet down to the roof deck level at minimum, removing all bowed, cracked, saturated and spalled bricks and mortar, all attic vents, and the second floor lintel and window. A new window (to match existing) is to be installed, with new lintel, and the parapet is to be rebuilt using historic brick and mortar mixes. A contractor who specializes in historic restorations should be able to locate brick to match. Rubber roofing should be reinstalled over the inside face of the parapet. Attic vents do not need to be reinstalled.

2b. METAL PARAPET COPING

Remove failed parapet coping on both north and south walls. Replace coping with attention paid to closing all seams, including chimney intersections. An alternative design may be considered to slope the coping towards the roof so that water drains to the rear of the building instead of washing down the face of the brick.

3. BRICK REPAIR

3a. BRICK PREPARATION

Though some paint remains adhered, it is only a matter of time until it too flakes off. It is recommended that existing paint is removed in order to provide a clean surface for repair and repointing, and to allow brick to dry. A light natural bristle brush is the preferred tool for removing peeling paint and dirt from historic brick. Due to the saturation of the brick and failed mortar joints, water washing is not recommended. If a poultice is preferred, Dumond's Peel Away 1 is recommended.

3b. REPLACEMENT / REPOINTING

Remove deteriorated brick and mortar using hand held mallets and chisels, rather than power grinders.

At the time of this report, it is estimated that 50% of the bricks are damaged to some degree. Spalled unit counts include: 175 on north elevation; 62 on rear elevation; 135 on south elevation; and 80 on west elevation. Additional units are likely spalled beneath loose paint. These numbers are to be verified by an architect for construction documents. Replace spalled brick with alternate that matches historic size (2.25" x 8"), color, texture and hardness.

Joints shall be cleaned of deteriorated and/or cementitious mortar to 2- 2.5 times the width of the joint. Mortars for repointing should be softer or more permeable than the masonry units and no harder or more impermeable than the original historic mortar to prevent damage to the masonry units. Edison Coatings is a company which formulates mortar for to match that found in historic masonry, and should be brought in to consult about mortar

selection for both brick and stone. Mortar analysis may be required. Finished joint shall match the historic in size (7/16”), color, texture, profile and tooling.

3c. REPAINTING

Do not use modern paints that seals in moisture. Edison Coatings is a company which formulates paint for historic masonry, and should be brought in to consult about paint selection.

4. WINDOWS

Inventory should be taken of each window individually. Where moderate damage has occurred, remove failed paint, repair sash and frame, reglaze broken panes, weatherstrip and repaint. Where severe damage has occurred to the wood, those portions can be patched, built-up, or consolidated before painting. One window should be replaced in kind at the second story of the north elevation, due to repeated saturation. Exterior storms should be installed at basement level to protect them from additional water damage, so that interior storms may be removed. Exterior slate sills should be reset to have a negative slope away from the building. Caulk around window openings to ensure no water can infiltrate. Shutters can be scraped and repainted.

5. FRONT PORTICO

Following inspection, reroof, or replace drip edge as required so that water drains away from the portico columns. To repair wood, scrape loose paint, remove any deteriorated boards and replace, caulk gaps, fill nail holes, prime and paint with latex. Point brick bases using methods in Task 3 above.

6. INTERIORS

The interiors should be completed last, after water has been successfully managed at the exterior of the building, and an internal dehumidifier run. In the basement this includes repointing the masonry. At the upper levels this includes making repairs to upper level walls and floors and ceilings that have suffered from water damage, and measuring dewpoint to determine if mechanical ventilation will be required once the brick walls are dried out.

4.3 Maintenance Recommendations

Of the many processes used to “preserve” an historic building, maintenance is almost always the most effective and least destructive. Although most people recognize this fact, the vast majority of historic preservation efforts in this country focus on saving buildings once they begin to fail, rather than preventing the failure from occurring in the first place. Lack of funding is the most common reason for this neglect; however, there are many no- or low- cost activities building owners can perform to greatly increase the lifecycle of an historic building. to common problems of typical building systems.

The cycle of neglect and restoration is one of the biggest challenges facing historic buildings today. Few people notice when a building is properly maintained, but they can’t help but notice when the opposite is true. Despite this fact, most are discouraged from performing regular maintenance due to cost concerns and the lack of dramatic improvement that is associated with a full scale restoration project. For the most part, limited monies are used to repair damage from years of deferred maintenance, rather than being used more efficiently to avoid the need for such costly and intense work. Nevertheless, the cost of performing regular maintenance is generally lower and can be spread over a longer time period than a typical restoration project. Simply put, planned maintenance is proactive while restoration is reactive. The good news about preventative maintenance is that, of the problems that can arise in a building, most manifest

themselves visually. Therefore, a watchful eye goes a long way in identifying problems as they start, thereby reducing the amount of damage caused over time.[4]

Currently, no routine preventative care exists at the Pruyn House. It is critical that the investment of time, funds and manpower be made to ensure that the building is enjoyed for generations to come through the creation and implementation of a cyclical maintenance plan.

A maintenance plan can be as simple as a checklist for seasonal inspection, or be more complex, such as a computer-based spreadsheet which is updated yearly. Most importantly, it is designed in a user-friendly way so that it is executed and not ignored. The plan should also call for inspection after incidents that are not routine, such as extreme weather or accidental damage. With regular maintenance, it will become evident which parts of the building are at-risk, thereby limiting the opportunity for building material failure through addressing problems in a timely manner. At a minimum, the National Park Service recommends the following:[5]

Roofing/ guttering: Make weather-tight and operational; inspect and clean gutters as necessary depending on number of nearby trees, but at least twice a year; inspect roofing at least once a year, preferably spring; repair flashing; repair or replace cracked downspouts and gutters.

Walls: Repair damaged surface materials; repoint masonry with appropriately formulated mortar; prime and repaint wooden, metal, or masonry elements or surfaces; remove efflorescence from masonry with non-metallic bristle brushes.

Window and door openings: Eliminate cracks or open joints; caulk or repoint around openings or steps; repair or reset weatherstripping; check flashing; repaint, as necessary.

Grade: Eliminate low spots around building foundations; clean out existing downspout boots twice a year or add extension to leaders to carry moisture away from foundation; do a hose test to verify that surface drains are functioning; reduce moisture used to clean steps and walks; eliminate the use of chlorides to melt ice which can increase freeze/thaw spalling of masonry; check operation of irrigation systems, hose bib leaks, and clearance of air conditioning condensate drain outlets.

Foliage: Keep foliage and vines off buildings; trim overhanging trees to keep debris from gutters and limbs from rubbing against building; remove moisture retaining elements, such as firewood, from foundations.

Equipment: Check dehumidifiers, sump pump, vent fans, and water detection or alarm systems for proper maintenance as required; check battery back-up twice a year.

Piping/ductwork: Check for condensation on pipes and insulate/seal joints, if necessary.

Plumbing pipes: Add insulation to plumbing or radiator pipes located in areas subject to freezing, such as along outside walls, in attics, or in unheated basements.

Mechanical equipment: Check condensation pans and drain lines to keep clear; insulate and seal joints in exposed metal ductwork to avoid drawing in moist air.

Cleaning: Routinely dust and clean surfaces to reduce the amount of water or moist chemicals used to clean building; caulk around tile floor and wall connections; and maintain floor grouts in good condition.

[4] Humphries Poli Architects. 2006. Preservation Maintenance: A Universal Manual for Developing Conservation Maintenance Plans. See Appendix E.

[5] National Park Service. 1996. Technical Preservation Brief #39. Holding the Line: Controlling Unwanted Moisture in Historic Buildings.

Ventilation: Reduce household-produced moisture, if a problem, by increasing ventilation; vent clothes driers to the outside; install and always use exhaust fans in restrooms, bathrooms, showers, and kitchens, when in use.

Publications have been written on this very topic for the benefit of historic building owners. *Technical Preservation Brief #47: Maintaining the Exteriors of Small and Medium Size Historic* Buildings[6] (Appendix D) and *Preservation Maintenance: A Universal Manual for Developing Conservation Maintenance Plans*[7] (Appendix E) should guide a cooperative effort between the Town of Colonie and the Friends of the Pruyn House to achieve the goal of creating and implementing a cyclical maintenance plan, which includes agreeing upon who is responsible for the endeavor and how it is funded in terms of manpower and time.

[6] National Park Service. 2007. *Technical Preservation Brief #47: Maintaining the Exterior of Small and Medium Size Historic Buildings*. Sharon Park, FAIA, Washington, D.C. Available at https://www.nps.gov/tps/how-to-preserve/briefs/47-maintaining-exteriors.htm.

[7] Humphries Poli Architects, P.C. 2006. *Preservation Maintenance: A Universal Manual for Developing Conservation Maintenance Plans.* Denver, Colorado. April 2006.

Appendix A:
Photo Key

Pruyn House

207 Old Niskayuna Road, Town of Colonie, Albany County, New York

Appendix A: Photo Locations

September 2016

Appendix B:
Existing Conditions Photographs

Photo 1

Front Elevation, view to the northeast.

Photo 2

South Elevation, view to the northwest.

Photo 3

North Elevation, view to the southwest.

Photo 4

Rear Elevation, view to the southeast.

Photo 5

Wet conditions. Roof, view to the south.

Photo 6

Wet conditions. Roof, view to the west.

Photo 7

Wet conditions. Roof, view to the north.

Photo 8

Entrance Drive, view to the northwest.

Photo 9

Entrance Drive, view to the southeast.

Photo 10

Grade at north elevation, view to the southwest.

Photo 11

Rear Addition, view to the southeast.

Photo 12

Rainy conditions. North elevation detail.

Photo 13

Rainy conditions. Northeast corner detail.

Photo 14

Wet conditions. Downspout detail.

Photo 15

Wet conditions. Downspout detail.

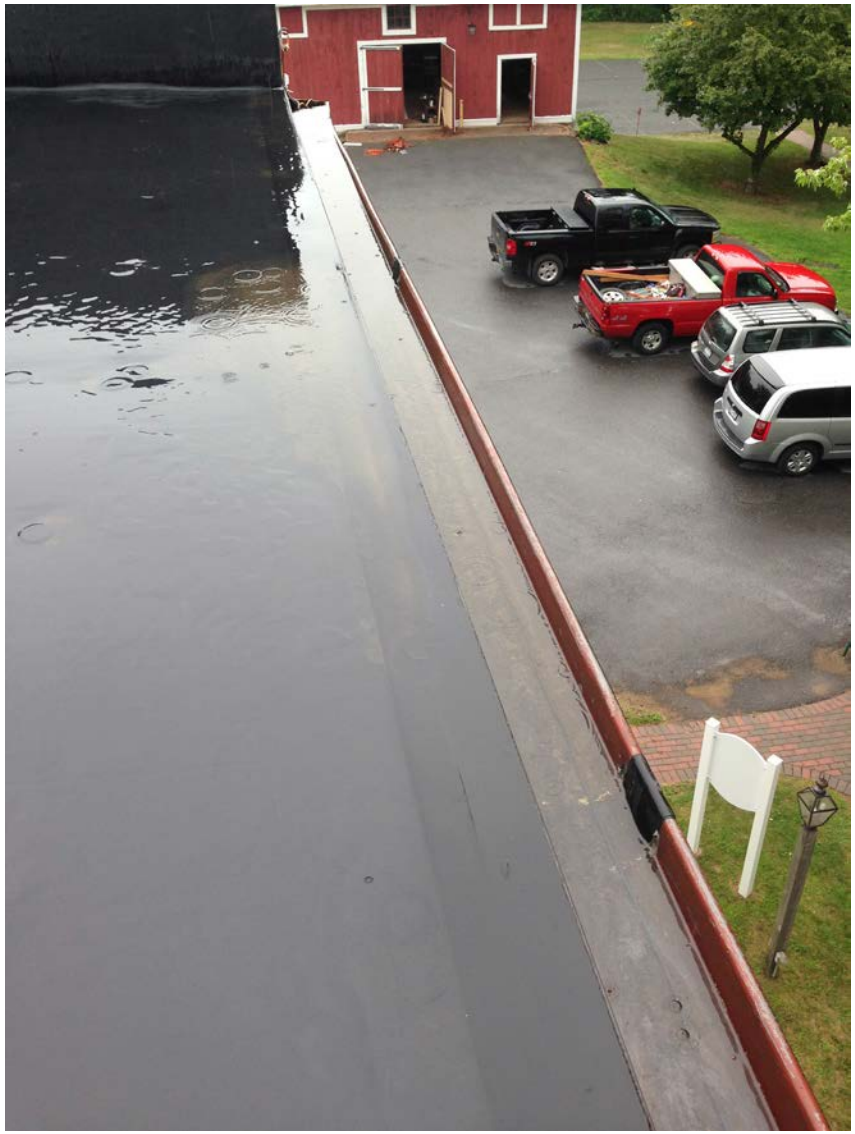

Photo 16

Rainy conditions. Gutter detail.

Photo 17

Rainy conditions. Coping detail.

Photo 18

Rainy conditions. Lower portico detail.

Photo 19

Rainy conditions. Upper portico detail.

Photo 20

Rainy conditions. West elevation detail.

Photo 21

Rainy conditions. South elevation detail.

Appendix C:
Historic Photographs

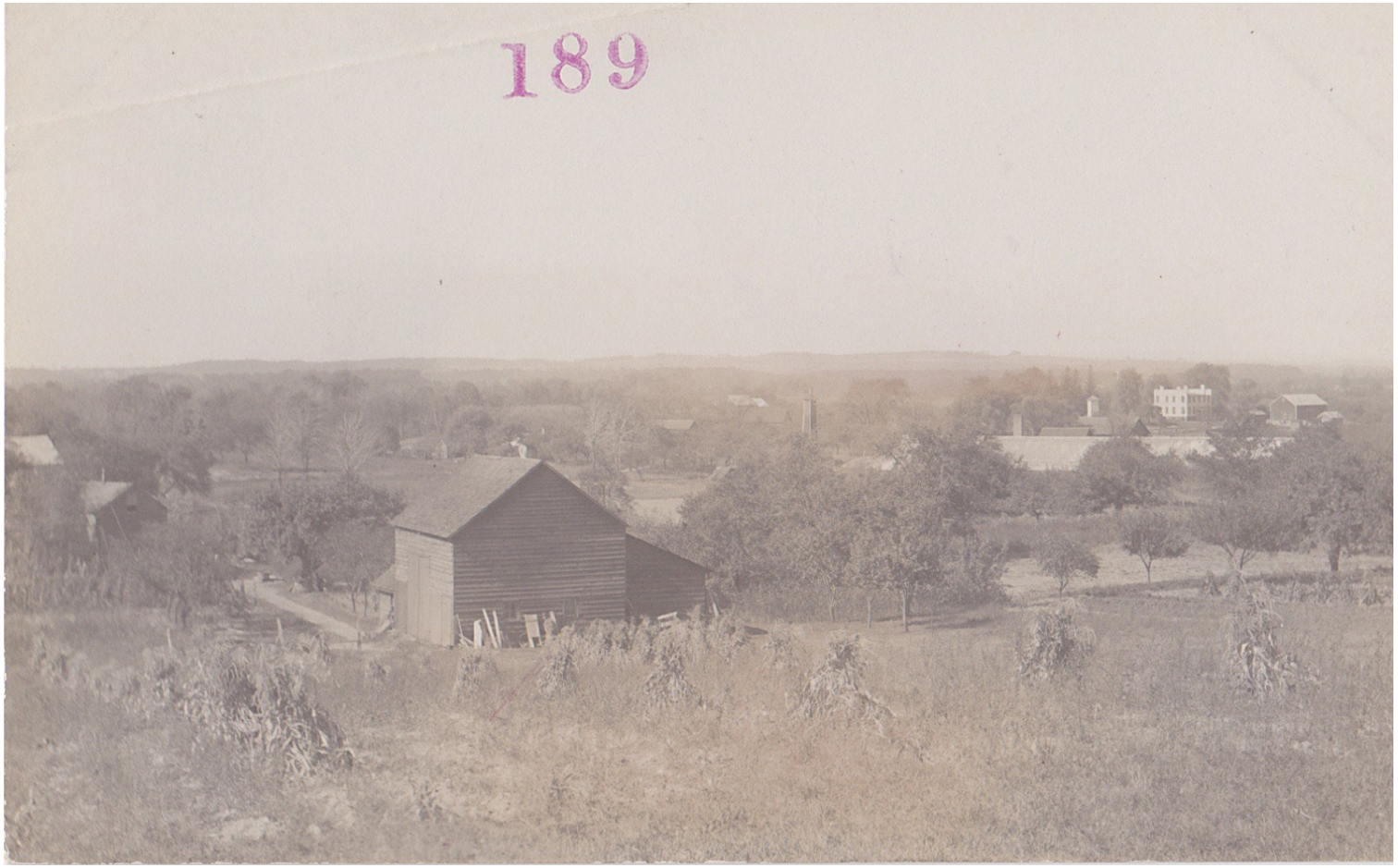

Photo 1

Undated photograph, circa 1910. View to the NE from Maxwell Road. Rear of Pruyn House at right side of image.

Photo 2

Undated photograph, circa 1930.
Source: Friends of Pruyn House.

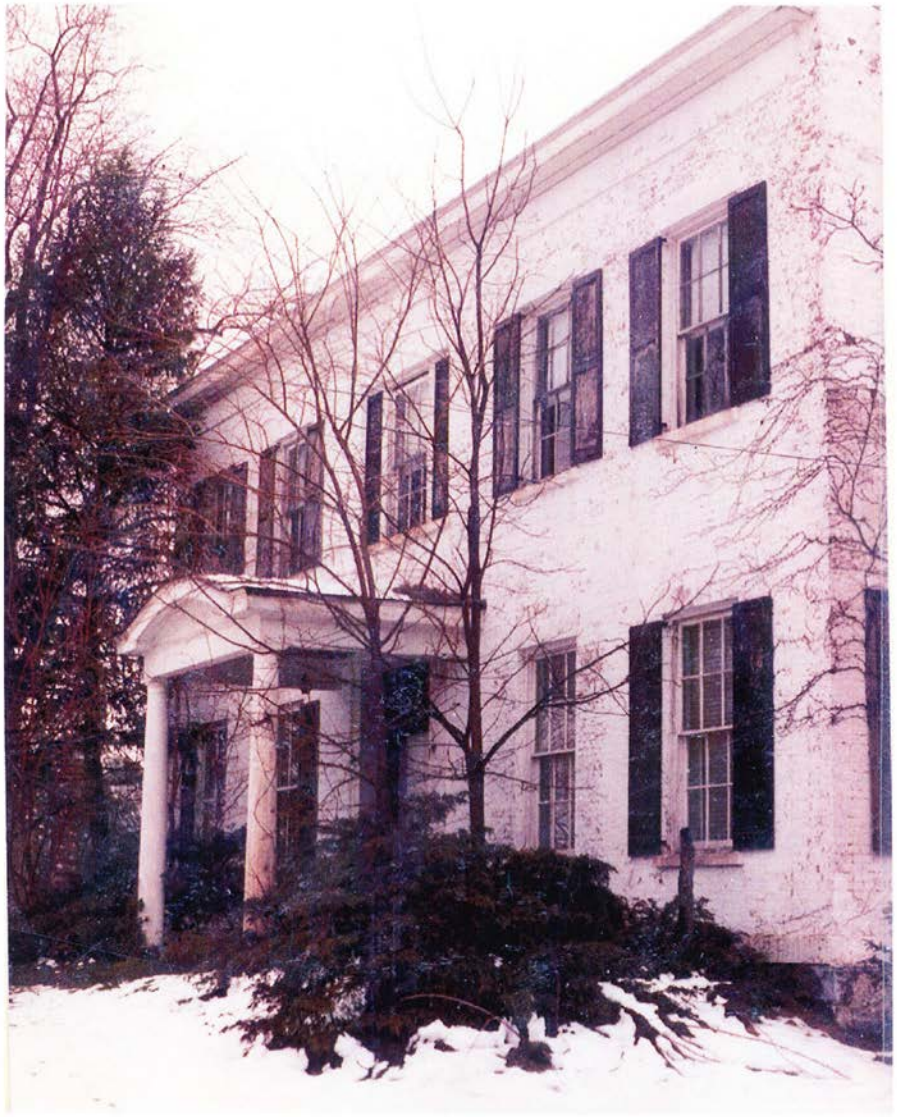

Photo 3

1983 Photograph. Front elevation.

Photo 4

1983 Photograph. Rear and North elevations.

Photo 5

1983 Photograph. South elevation.

Photo 6

1983 Photograph. Interior, Second Floor, northeast corner.

Photo 7

1983 Photograph. Typical interior window surround.

Photo 8

1983 Photograph. Interior, Second Floor, southeast room.

Photo 9

1984 Photograph. Demolition of deteriorated brick, northeast corner.

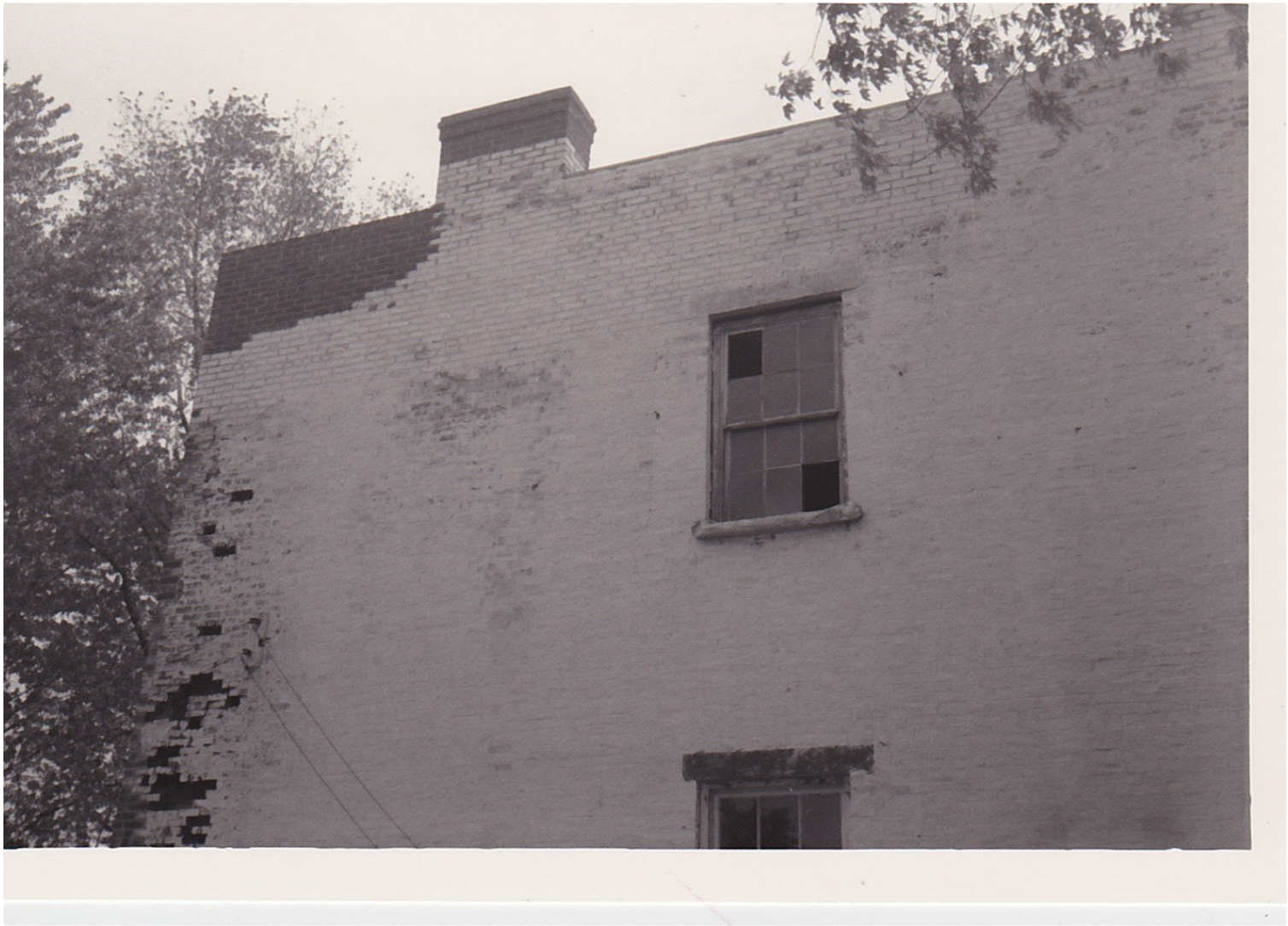

Photo 10

1984 Photograph. Reconstruction of parapet, northeast corner.

Photo 11

1984 Photograph. Portland cement repointing. South side of rear elevation.

Photo 12

1984 Photograph. Pruyn House, exterior restored.

Photo 13

1984 Photograph. Pruyn House, interior restored.

Photo 14

2007 Photograph. Entrance portico, prior to ramp installation.

Photo 15

2009 Photograph. New drainpipe installed at rear of building.

Appendix D:

Technical Preservation Brief #47:

Maintaining the Exteriors of Small and Medium Size Historic Buildings

47 PRESERVATION BRIEFS

Maintaining the Exteriors of Small and Medium Size Historic Buildings

Sharon C. Park, FAIA

National Park Service
U.S. Department of the Interior
Heritage Preservation Services

Preservation is defined as "the act or process of applying measures necessary to sustain the existing form, integrity, and materials of an historic property. Work, including preliminary measures to protect and stabilize the property, generally focuses upon the *ongoing maintenance and repair* of historic materials and features rather than extensive replacement and new construction."[1]

Maintenance helps preserve the integrity of historic structures. If existing materials are regularly maintained and deterioration is significantly reduced or prevented, the integrity of materials and workmanship of the building is protected. Proper maintenance is the most cost effective method of extending the life of a building. As soon as a building is constructed, restored, or rehabilitated, physical care is needed to slow the natural process of deterioration. An older building has already experienced years of normal weathering and may have suffered from neglect or inappropriate work as well.

Decay is inevitable but deterioration can accelerate when the building envelope is not maintained on a regular basis. Surfaces and parts that were seamlessly joined when the building was constructed may gradually become loose or disconnected; materials that were once sound begin to show signs of weathering. If maintenance is deferred, a typical response is to rush in to fix what has been ignored, creating additional problems. Work done on a crisis level can favor inappropriate treatments that alter or damage historic material.

There are rewards for undertaking certain repetitive tasks consistently according to a set schedule. Routine and preventive care of building materials is the most effective way of slowing the natural process of deterioration. The survival of historic buildings in good condition is primarily due to regular upkeep and the preservation of historic materials.

Well-maintained properties tend to suffer less damage from storms, high winds, and even small earthquakes. Keeping the roof sound, armatures and attachments such as shutters tightened and secured, and having joints and connections functioning well, strengthens the ability of older buildings to withstand natural occurrences.

Over time, the cost of maintenance is substantially less than the replacement of deteriorated historic features and involves considerably less disruption. Stopping decay before it is widespread helps keep the scale and complexity of work manageable for the owner.

This *Preservation Brief* is designed for those responsible for the care of small and medium size historic buildings, including owners, property administrators, in-house maintenance staff, volunteers, architects, and maintenance contractors. The Brief discusses the benefits of regular inspections, monitoring, and seasonal maintenance work; provides general guidance on maintenance treatments for historic building exteriors; and emphasizes the importance of keeping a written record of completed work.

Getting Started

Understanding how building materials and construction details function will help avoid treatments that are made in an attempt to simplify maintenance but which may also result in long-term damage. It is enticing to read about "maintenance free" products and systems, particularly waterproof sealers, rubberized paints, and synthetic siding, but there is no such thing as maintenance free when it comes to caring for historic buildings. Some approaches that initially seem to reduce maintenance requirements may over time actually accelerate deterioration.

Exterior building components, such as roofs, walls, openings, projections, and foundations, were often constructed with a variety of functional features, such as overhangs, trim pieces, drip edges, ventilated cavities, and painted surfaces, to protect against water infiltration, ultraviolet deterioration, air infiltration, and

Figure 1. Maintenance involves selecting the proper treatment and protecting adjacent surfaces. Using painter's tape to mask around a brass doorknocker protects the painted door surface from damage when polishing with chemical compounds. On the other hand, hardware with a patinated finish was not intended to be polished and should simply be cleaned with a damp cloth.

Cautions During Maintenance Work

All maintenance work requires attention to safety of the workers and protection of the historic structure. Examples include the following:

• Care should be taken when working with historic materials containing lead-based paint. For example, damp methods may be used for sanding and removal to minimize air-borne particles. Special protection is required for workers and appropriate safety measures should be followed.

• Materials encountered during maintenance work, such as droppings from pigeons and mice, can cause serious illnesses. Appropriate safety precautions need to be followed. Services of a licensed contractor should be obtained to remove large deposits from attics and crawlspaces.

• Heat removal of paint involves several potential safety concerns. First, heating of lead-containing paint requires special safety precautions for workers. Second, even at low temperature levels, heat removal of paint runs the risk of igniting debris in walls. Heat should be used only with great caution with sufficient coverage by smoke detectors in work areas. Work periods need to be timed to allow monitoring after completion of paint removal each day, since debris will most often smolder for a length of time before breaking out into open flame. The use of torches, open flames, or high heat should be avoided.

• Many chemical products are hazardous and volatile organic compounds (VOC) are banned in many areas. If allowed, appropriate respirators and other safety precautions are essential for use.

• Personal protection is importan and may require the use of goggles, gloves, mask, closed-toed shoes, and a hard hat.

• Electrical service should be turned off before inspecting a basement after a flood or heavy rain, where there is high standing water.

pest infestation. Construction assemblies and joints between materials allow for expansion and contraction and the diffusion of moisture vapor, while keeping water from penetrating the building envelope. Older buildings use such features effectively and care must be taken to retain them, avoiding the temptation to reduce air infiltration or otherwise alter them.

Monitoring, inspections, and maintenance should all be undertaken with safety in mind. Besides normal safety procedures, it is important to be cognizant of health issues more commonly encountered with older buildings, such as lead-based paint, asbestos, and bird droppings, and to know when it is necessary to seek professional services (see sidebar).

Original building features and examples of special craftsmanship should be afforded extra care. The patina or aging of historic materials is often part of the charm and character of historic buildings. In such cases, maintenance should avoid attempts to make finishes look new by over-cleaning or cladding existing materials. As with any product that has the potential to harm historic materials, the selection of a cleaning procedure should always involve testing in a discreet location on the building to ensure that it will not abrade, fade, streak, or otherwise damage the substrate (Fig 1).

Maintenance Plan, Schedules and Inspection

Organizing related work into a written set of procedures, or a Maintenance Plan, helps eliminate duplication, makes it easier to coordinate work effort, and creates a system for prioritizing maintenance tasks that takes into account the most vulnerable and character-defining elements.

The first time a property owner or manager establishes a maintenance plan or program, it is advisable to have help from a preservation architect, preservation consultant, and/or experienced contractor. Written procedures should outline step-by-step approaches that are custom- tailored to a building. No matter how small the property, every historic site should have a written guide for maintenance that can be as simple as:

1) Schedules and checklists for inspections;
2) Forms for recording work, blank base plans and elevations to be filled in during inspections and upon completion of work;
3) A set of base-line photographs to be augmented over time;
4) Current lists of contractors for help with complex issues or in case of emergencies;
5) Written procedures for the appropriate care of specific materials, including housekeeping, routine care, and preventive measures;
6) Record-keeping sections for work completed, costs, warranty cards, sample paint colors, and other pertinent material.

This information can be kept in one or more formats, such as a three-ring binder, file folders, or a computer database. It is important to keep the files current with completed work forms to facilitate long-term evaluations and planning for future work (Fig 2).

Proper maintenance depends on an organized plan with work prescribed in manageable components. Regular maintenance needs to be considered a priority both in terms of time allotted for inspections and for allocation of funding.

Maintenance work scheduling is generally based on a variety of factors, including the seriousness of the problem, type of work involved, seasonal appropriateness, product manufacturer's recommendations, and staff availability. There are other variables as well. For example, building materials and finishes on southern and western exposures will often weather faster than those on northern or eastern exposures. Horizontal surfaces facing skyward usually require greater maintenance than vertical ones; in regions with moderate or heavy rainfall, wood and other materials in prolonged shadow are subject to more rapid decay.

Maintenance costs can be controlled, in part, through careful planning, identification of the amount of labor required, and thoughtful scheduling of work. Maintenance schedules should take into account daily and seasonal activities of the property in order to maximize the uninterrupted time necessary to complete the work. Institutions generally need to budget annually between 2 and 4 percent of the replacement value of the building to underwrite the expense of full building maintenance.[2] Use of trained volunteers to undertake maintenance can help reduce costs.

Exterior inspections usually proceed from the roof down to the foundation, working on one elevation at

Cyclic Building Inspection Checklist: Horse Stable			**Inspection date: 04/24/05**	
Building Feature	*Material(s)*	*Condition Description*	*Maintenance Action Required*	*Work Done*
ROOF:				
Covering	Clay tile Painted metal standing seam	Two slipped tiles Slight corrosion; blistering paint on metal roof section	Reattach tiles Sand and repaint area that is peeling	5/4/05 6/8/05
Flashing	Painted metal	Flashing in good condition	N/A	N/A
Gutters/ Downspouts	6" half round galvanized metal	Gutter sagging; downspouts OK	Realign gutter and put on new hanger strap Flush out downspouts	5/4/05 5/5/05
Chimneys	No masonry chimney	N/A	N/A	N/A
Attachments/ Penetrations	Metal vent stack and weathervane	Vent stack hood has some peeling paint; vane OK	Sand and repaint vent stack	6/8/05

Figure 2. All personnel associated with a historic structure need to become acquainted with how existing building features should appear and during their daily or weekly routines look for changes that may occur. This will help augment the regular maintenance inspection that will occur at specified intervals based on seasonal changes, use, and other factors. A segment of an inspection form showing the roof elements of a horse stable is shown. The inspection report should be kept along with the maintenance plan and other material in notebook, file or electronic form.

a time, moving around the building in a consistent direction. On the interior, the attic, inside surfaces of exterior walls, and crawlspaces or basements should be examined for signs of potential or existing problems with the building envelope.

The following chart lists suggested inspection frequencies for major features associated with the building's exterior, based on a temperate four-season climate and moderate levels of annual rainfall. For areas of different climate conditions and rainfall, such as in the more arid southwest, the nature of building decay and frequency of inspections will vary. For buildings with certain inherent conditions, heavy use patterns, or locations with more extreme weather conditions, the frequency of inspections should be altered accordingly.

Note: All building features should be inspected after any significant weather event such as a severe rainstorm or unusually high winds.

INSPECTION FREQUENCY CHART		
Feature	Minimum Inspection Frequency	Season
Roof	Annually	Spring or fall; every 5 years by roofer
Chimneys	Annually	Fall, prior to heating season; every 5 years by mason
Roof Drainage	6 months; more frequently as needed	Before and after wet season, during heavy rain
Exterior Walls and Porches	Annually	Spring, prior to summer/fall painting season
Windows	Annually	Spring, prior to summer/fall painting season
Foundation and Grade	Annually	Spring or during wet season
Building Perimeter	Annually	Winter, after leaves have dropped off trees
Entryways	Annually; heavily used entries may merit greater frequency	Spring, prior to summer/fall painting season
Doors	6 months; heavily used entry doors may merit greater frequency	Spring and fall; prior to heating/ cooling seasons
Attic	4 months, or after a major storm	Before, during and after wet season
Basement/ Crawlspace	4 months, or after a major storm	Before, during and after rain season

Survey observations can be recorded on a standardized report form and photographs taken as a visual record. All deficient conditions should be recorded and placed on a written schedule to be corrected or monitored.

BUILDING COMPONENTS

For purposes of this discussion, the principal exterior surface areas have been divided into five components and are presented in order from the roof down to grade. While guidance for inspection and maintenance is provided for each component, this information is very general in nature and is not indeed to be comprehensive in scope. Examples have been selected to address some typical maintenance needs and to help the reader avoid common mistakes.

Roofs/chimneys

The roof is designed to keep water out of a building. Thus one of the principal maintenance objectives is to ensure water flows off the roof and into functional gutters and downspouts directly to grade and away from the building—and to prevent water from penetrating the attic, exterior walls, and basement of a building. (Note: Some buildings were designed without gutters and thus assessments must be made as to whether rain water is being properly addressed at the foundation and perimeter grade.) Keeping gutters and downspouts cleared of debris is usually high on the list of regular maintenance activities (Fig 3). Flashing around chimneys, parapets, dormers, and other appendages to the roof also merit regular inspection and appropriate maintenance when needed. The material covering the roof—wood shingles, slate, tile, asphalt, sheet metal, rolled roofing—requires maintenance both to ensure a watertight seal and to lengthen its service life; the type and frequency of maintenance varies with the roofing material. Older chimneys and parapets also require inspection and maintenance. With the exception of cleaning and minor repairs to gutters and downspouts, most roof maintenance work will necessitate use of an outside contractor.

Inspection:

The functioning of gutters and downspouts can be safely observed from the ground during rainy weather and when winter ice has collected. Binoculars are a useful tool in helping to identify potential roofing problems from the same safe vantage point. Careful observation from grade helps to identify maintenance needs between close-up inspections by an experienced roofer. Observation from the building interior is also important to identify possible leak locations. When access can be safely gained to the roof, it is important to wear shoes with slip-resistant soles and to use safety ropes.

Figure 3. Keeping gutters clean of debris can be one of the most important cyclical maintenance activities. On this small one-story addition, a garden hose is being used to flush out the trough to ensure that the gutter and downspouts are unobstructed. Gutters on most small and medium size buildings can be reached with an extension ladder and a garden hose. Photo: Bryan Blundell.

Depending on the nature of the roof, some common conditions of concern to look for are:

- sagging gutters and split downspouts;
- debris accumulating in gutters and valleys;
- overhanging branches rubbing against the roof or gutters
- plant shoots growing out of chimneys;
- slipped, missing, cracked, bucking, delaminating, peeling, or broken roof coverings;
- deteriorated flashing and failing connections at any intersection of roof areas or of roof and adjacent wall;
- bubbled surfaces and moisture ponding on flat or low sloped roofs;
- evidence of water leaks in the attic;
- misaligned or damaged elements, such as decorative cresting, lightning rods, or antennas; and
- cracked masonry or dislodged chimney caps.

Maintenance:

• Remove leaves and other debris from gutters and downspouts. Utilize a ladder with a brace device, if necessary, to keep the ladder from crushing the gutter. Use a garden hose to flush out troughs and downspouts. Patch or repair holes in gutters using products such as fiberglass tape and epoxy adhesive in metal gutters. Avoid asphalt compounds since acidic material can cause further deterioration of metal gutters.

• Correct misaligned gutters and adjust, if necessary, so that water flows to drains and does not pond. If gutter edges sag, consider inserting wooden wedges between the fascia board and the back of the gutter to add support. Seal leaking seams or pinholes in gutters and elbows.

• Broom sweep branch or leaf debris away from shingles, valleys, and crickets, particularly around chimneys and dormers.

• Where mechanical equipment is mounted on flat or low-sloped roofs, ensure that access for maintenance can be provided without damaging the roof. Clean out trapped leaves and debris from around equipment base and consider adding a protective walkway for access.

• Remove biological growth where it is causing erosion or exfoliation of roofing. Use low-pressure garden hose water and a natural or nylon scrubbing brush to remove such growth, scraping with a plastic putty knife or similar wood or plastic tool as needed on heavier buildup. Most growth is acidic and while there are products designed to kill spores, such as diluted chlorine bleach, they should be avoided. Even fairly weak formulas can still cause unexpected color changes, efflorescence, or over-splash damage to plantings or surfaces below the roof. Where appropriate, trim adjacent tree branches to increase sunlight on the roof since sunlight will deter further biological growth.

• Re-secure loose flashing at the dormers, chimneys or parapets. Clean out old mortar, lead, lead wool, or fastening material and make sure that flashing is properly inserted into reglet (slot) joints, taking care not to damage the substrate. Avoid installing new step flashing as a single metal component where multiple pieces are required to provide proper waterproofing. Also avoid attaching step flashing with mastic or sealant. Properly re-bed all step flashing. Use appropriate non-ferrous flashing metal or painted metal if needed. Since cap, step, valley, cricket, and apron flashings each have specific overlap and extension requirements, replacement flashing should match the existing material unless there has been a proven deficiency.

Figure 4. Damage to roofs often requires immediate attention. As a temporary measure, this damaged roof tile could be replaced with a brown aluminum sheet wedged between the existing tiles. Photo: Chad Randl.

Figure 5. The use of a sealant to close an exposed joint is not always an effective long-term solution. Where this decorative wood element connects to the slate roof, the sealant has failed within a short time and a proper metal flashing collar is being fitted instead. Photo: Bryan Blundell.

• Repoint joints in chimneys, parapet, or balustrade capping stones using a hydraulic lime mortar or other suitable mortar where the existing mortar has eroded or cracked, allowing moisture penetration. In general, a mortar that is slightly weaker than the adjacent masonry should be used. This allows trapped moisture in the masonry to migrate out through the mortar and not the masonry. Spalled masonry is often evidence of the previous use of a mortar mix that was too hard.

• Use professional services to repair chimneys and caps. Avoid the use of mortar washes on masonry since they tend to crack, allowing moisture to penetrate and promoting masonry spalling. Repoint masonry with a durable mortar that is slightly weaker than the adjacent masonry. Slope the masonry mortar cap to insure drainage away from the flue. If a chimney rain cap is installed, ensure adequate venting and exhaust.

• As a temporary measure, slip pieces of non-corrosive metal flashing under or between damaged and missing roofing units until new slate, shingles, or tile can be attached. Repair broken, missing or damaged roofing units with ones that match. Follow roofing supplier and industry guidance on inserting and attaching replacement units (Fig 4). Avoid using temporary asphalt patches as it makes a proper repair difficult later on.

• For long-term preservation of wooden shingle roofs coated with a preservative, recoat every few years following the manufacturer's recommendations. Be aware of environmental considerations.

• Scrape and repaint selected areas of coated ferrous metal roofing as needed; repaint on a regularly scheduled basis. Ferrous metal roofs can last a long time if painted regularly. Alkyd coatings are generally used on metal roofs; be sure to wash and properly prepare the area beforehand. Environmental regulations may restrict the use of certain types of paints. Apply the coating system in accordance with manufacturer's recommendations. Prepare the surface prior to application to obtain good adhesion with the prime coat. Apply both a prime coat and a topcoat for good bonding and coverage; select primer and topcoat products from the same manufacturer.

• Re-secure loose decorative elements, such as finials and weathervanes. Seek professional advice if decorative elements exhibit considerable corrosion, wood rot, or structural instability. Small surface cracks may benefit from a flexible sealant to keep moisture out; sealants have a limited life and require careful inspection and periodic replacement (Fig 5).

Exterior Walls

Exterior walls are designed to help prevent water infiltration, control air infiltration, and serve as a barrier for unwanted animals, birds and insects. The primary maintenance objective is to keep walls in sound condition and to prevent water penetration, insect infestation, and needless decay (Fig 6). Depending on the materials and construction methods, walls should have an even appearance, free from unwanted cracks, and should be able to shed excess moisture. Where surfaces are significantly misaligned or where there are bulging wall sections

or cracks indicative of potential structural problems, seek professional guidance as to the cause of distress and appropriate corrective measures. Wood-frame construction generally will require more frequent maintenance than buildings constructed of brick, stone, or terra cotta (Fig 7).

Inspections:

It is best to inspect walls during dry as well as wet weather. Look for moisture patterns that may appear on the walls after a heavy or sustained rainfall or snow, recording any patterns on elevation drawings or standard recording forms. Monitoring the interior wall for moisture or other potential problems is important as well. Look for movement in cracks, joints, and around windows and doors and try to establish whether movement is seasonal in nature (such as related to shrinkage of wood during dry weather) or signs of an ongoing problem. For moderate size buildings, a ladder or mechanical lift may be necessary, though in some cases the use of binoculars and observations made from windows and other openings will be sufficient. When examining the walls, some common conditions of concern to look for are:

- Misaligned surfaces, bulging wall sections, cracks in masonry units, diagonal cracks in masonry joints, spalling masonry, open joints, and nail popping;
- Evidence of wood rot, insect infestation, and potentially damaging vegetative growth;
- Deficiencies in the attachment of wall mounted lamps, flag pole brackets, signs, and similar items;
- Potential problems with penetrating features such as water spigots, electrical outlets, and vents;
- Excessive damp spots, often accompanied by staining, peeling paint, moss, or mold; and
- General paint problems (Fig 8).

Maintenance:

• Trim tree branches away from walls. Remove ivy and tendrils of climbing plants by first cutting at the base of the vine to allow tendrils to die back, and later using a plastic scraper to dislodge debris and an appropriate digging tool to dislodge and remove root systems. Be cautious if using a commercial chemical to accelerate root decay; follow safety directions and avoid contact of chemicals with workers and wall materials.

• Wash exterior wall surfaces if dirt or other deposits are causing damage or hiding deterioration; extend

Figure 6. Stucco applied to an exterior wall or foundation was intended to function as a watertight surface. Unless maintained, rainwater will penetrate open joints and cracks that may occur over time. A spalled section of stucco indicates some damage has occurred and a wooden mallet is being used to tap the surface to determine whether the immediate stucco has lost adhesion. Photo: Bryan Blundell.

Figure 7. One of the advantages of wood shingles as a wall covering is that individual shingles that are damaged can easily be replaced. On this highly exposed corner, worn shingles have been selectively replaced to help safeguard against water damage. The new shingles will be stained to match the existing shingles.

Figure 8. The paint on the siding of this south-facing wall needs to be scraped, sanded, primed and repainted. Postponing such work will lead to further paint failure, require greater preparatory costs, and could even result in the need to replace some siding. Photo: Charles Fisher.

Figure 9. To help extend a repainting cycle, dirt and spider webs should be removed before permanent staining occurs. In this case, a natural bristle brush and a soft damp cloth are being used to remove insect debris and refresh the surface appearance.

scheduled times for cleaning for cosmetic purposes to reduce frequency (Fig 9). When cleaning, use the gentlest means possible; start with natural bristle brushes and water and only add a mild phosphate-free detergent if necessary. Use non-abrasive cleaning methods and low-pressure water from a garden hose. For most building materials, such as wood and brick, avoid abrasive methods such as mechanical scrapers and high-pressure water or air and such additives as sand, natural soda, ice crystals, or rubber products. All abrasives remove some portion of the surface and power-washing drives excessive moisture into wall materials and even into wall cavities and interior walls. If using a mild detergent, two people are recommended, one to brush and one to prewet and rinse. When graffiti or stains are present, consult a preservation specialist who may use poultices or mild chemicals to remove the stain. If the entire building needs cleaning other than described above, consult a specialist.

• Repoint masonry in areas where mortar is loose or where masonry units have settled. Resolve cause of cracks or failure before resetting units and repointing. Rake out joints by hand, generally avoiding rotary saws or drills, to a depth of 2 ½ times the width of the joint (or until sound mortar is encountered), to make sure that fresh mortar will not pop out. Repointing mortar should be lime-rich and formulated to be slightly weaker than the masonry units and to match the historic mortar in color, width, appearance, and tooling. Off-the-shelf pre-mixed cement mortars are not appropriate for most historic buildings. Avoid use of joint sealants in place of mortar on vertical masonry wall surfaces, as they are not breathable and can lead to moisture-related damage of the adjacent masonry (Fig 10).

• Correct areas that trap unwanted moisture. Damaged bricks or stone units can sometimes be removed, turned around, and reset, or replaced with salvaged units. When using traditional or contemporary materials for patching wood, masonry, metal, or other materials, ensure that the materials are compatible with the substrate; evaluate strength, vapor permeability, and thermal expansion, as well as appearance.

• When patching is required, select a compatible patch material. Prepare substrate and install patch material according to manufacturer's recommendations; respect existing joints. Small or shallow surface defects may not require patching; large or deep surface defects may be better addressed by installation of a dutchman unit than by patching.

• Where a damaged area is too large to patch, consider replacing the section with in-kind material. For stucco and adobe materials, traditional patching formulas are recommended.

• When temporarily removing wood siding to repair framing or to tighten corner boards and loose trim, reuse the existing siding where possible. Consider using stainless steel or high strength aluminum nails as appropriate. Putty or fill nail holes flush with siding prior to repainting. Back-prime any installed wood with

Figure 10. Repointing of masonry should usually be approached as repair rather than maintenance work in part because of the need for a skilled mason familiar with historic mortar. In this case, a moisture condition was not corrected and the use of a waterproof coating and off-the-shelf Portland cement mortar trapped water and resulted in further damage to these 19th century bricks. Photo: NPS files.

one coat of primer and coat end grain that might be exposed with two coats of primer.

• Prepare, prime, and spot paint areas needing repainting. Remember that preparation is the key to a successful long lasting paint job. Ensure beforehand the compatibility of new and existing paints to avoid premature paint failure. Remove loose paint to a sound substrate; sand or gently rough surface if needed for a good paint bond; wipe clean; and repaint with appropriate primer and topcoats. Follow manufacturer's recommendations for application of coatings, including temperature parameters for paint application. Use top quality coating materials. Generally paint when sun is not shining directly onto surfaces to be painted.

• Remove deteriorated caulks and sealants, clean, and reapply appropriate caulks and sealants using backer rods as necessary. Follow manufacturer's instructions regarding preparation and installation.

• Correct deficiencies in any wall attachments such as awning and flag pole anchors, improperly installed electrical outlets, or loose water spigots.

Openings

Exterior wall openings primarily consist of doors, windows, storefronts, and passageways. The major maintenance objectives are to retain the functioning nature of the opening and to keep in sound condition the connection between the opening and the wall in order to reduce air and water infiltration.

Inspection:

Wall openings are typically inspected from inside as well as out. Examinations should include the overall material condition; a check for unwanted water penetration, insect infiltration, or animal entry; and identification of where openings may not be properly functioning. Frames should be checked to make sure they are not loose and to ascertain whether the intersection between the wall and the frame is properly sealed. Secure connections of glazing to sash and between sash and frames are also important. Particular attention should be placed on exposed horizontal surfaces of storefronts and window frames as they tend to deteriorate much faster than vertical surfaces. Inspections should identify:

- loose frames, doors, sash, shutters, screens, storefront components, and signs that present safety hazards;
- slipped sills and tipped or cupped thresholds;
- poorly fitting units and storm assemblies, misaligned frames, drag marks on thresholds from sagging doors and storm doors;
- loose, open, or decayed joints in door and window frames, doors and sash, shutters, and storefronts;
- loose hardware, broken sash cords/chains, worn sash pulleys, cracked awning, shutter and window hardware, locking difficulties, and deteriorated weatherstripping and flashing;
- broken/cracked glass, loose or missing glazing and putty;
- peeling paint, corrosion or rust stains; and
- window well debris accumulation, heavy bird droppings, and termite and carpenter ant damage.

Maintenance:

• Replace broken or missing glass as soon as possible; in some cases cracked glass may be repaired using specialty glues. For historic crown glass and early cylinder glass, a conservation approach should be considered to repair limited cracks. Where panes with a distinct appearance are missing, specialty glass should be obtained to match, with sufficient inventory kept for future needs. Avoid using mechanical devices to remove old putty and match historic putty bevels or details when undertaking work.

• Reputty window glazing where putty is deteriorated or missing. Take care in removing putty so as not to crack or break old glass or damage muntins and sash frames. Re-glaze with either traditionally formulated

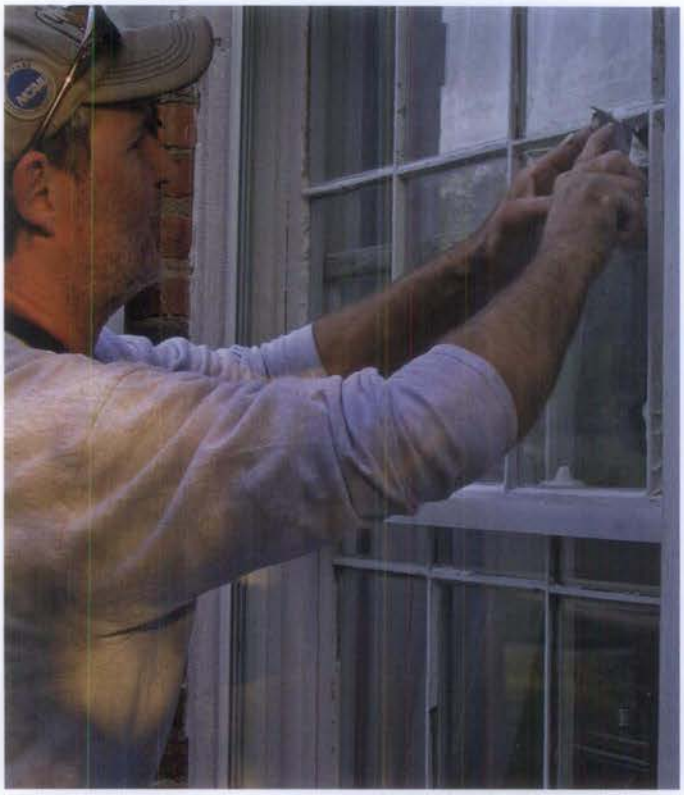

Figure 11. Glazing putty should be maintained in sound condition to prevent unwanted air infiltration and water damage. New glazing putty should be pulled tight to the glass and edge of the wood, creating a clean bevel that matches the historic glazing.

oil putties or modern synthetic ones, making sure to properly bed the glass and secure with glazing points (Fig 11).

• Clean window glass, door glazing, storefronts, transom prism lights, garage doors, and storm panels using a mild vinegar and water mixture or a non-alkaline commercial window cleaner. Be cautious with compounds that contain ammonia as they may stain brass or bronze hardware elements if not totally removed. When using a squeegee blade or sponge, wipe wet corners with a soft dry cloth. Avoid high-pressure washes.

• Clean handles, locks and similar hardware with a soft, damp cloth. Use mineral spirits or commercial cleaners very sparingly, as repeated use may remove original finishes. Most metal cleaners include ammonia that can streak and stain metal, so it is important to remove all cleaning residue. Polished hardware subject to tarnishing or oxidation, particularly doorknobs, often benefits from a thin coat of paste wax (carnauba), hand buffed to remove extra residue. Avoid lacquer finishes for high use areas, as they require more extensive maintenance. Patinated finishes should not be cleaned with any chemicals, since the subtle aged appearance contributes to the building's character.

• Remove and clean hardware before painting doors and windows; reinstall after the paint has dried.

• Tighten screws in doorframes and lubricate door hinges, awning hardware, garage door mechanisms, window sash chains, and pulleys using a graphite or silicone type lubricant.

Contracting Maintenance and Repair Work

Many contractors are very proficient in using modern construction methods and materials; however, they may not have the experience or skill required to carry out maintenance on historic buildings. The following are tips to use when selecting a contractor to work on your historic building:

1. Become familiar with work done on similar historic properties in your area so that you can obtain names of possible preservation contractors.

2. Be as specific as possible in defining the scope of work you expect to undertake.

3. Ask potential contractors for multiple references (three to five) and visit previous work sites. Contact the building owner or manager and ask how the job proceeded; if the same work crew was retained from start to finish; if the workers were of a consistent skill level; whether the project was completed in a reasonable time; and whether the person would use the contractor again.

4. Be familiar with the preservation context of the work to be undertaken. Use the written procedures in your maintenance plan to help define the scope of work in accordance with preservation standards and guidelines. Always request that the gentlest method possible be used. Use a preservation consultant if necessary to ensure that the work is performed in an appropriate manner.

5. Request in the contract proposal a detailed cost estimate that clearly defines the work to be executed, establishes the precautions that will be used to protect adjoining materials, and lists specific qualified subcontractors, if any, to be used.

6. Insure that the contractor has all necessary business licenses and carries worker compensation.

• Check weather stripping on doors and windows and adjust or replace as necessary. Use a durable type of weather stripping, such as spring metal or high quality synthetic material, avoiding common brush and bulb or pile weather stripping that require more frequent replacement.

• Adjust steel casement windows as needed for proper alignment and tight fit. Avoid additional weather stripping as this may lead to further misalignment, creating pathways for air and water infiltration.

• Check window sills for proper drainage. Fill cracks in wood sills with a wood filler or epoxy. Follow manufacturer's instructions for preparation and installation. Do not cover over a wood sill with metal panning, as it may trap moisture and promote decay.

• Repair, prime, and repaint windows, doors, frames, and sills when needed. Clean out putty debris and paint chips from windows using a wet paper towel and dispose of debris prior to repair or repainting. Take appropriate additional precautions when removing lead-based paint. Sand and prepare surfaces and use material-specific patching compounds to fill any holes or areas collecting moisture (Fig 12). Avoid leaving exposed wood unpainted for any length of time, as light will degrade the wood surface and lead to premature failure of subsequent paint applications. Immediately prime steel sash after paint is removed and the substrate prepared for repainting.

Figure 12. Good surface preparation is essential for long lasting paint. Scraping loose paint, filling nail holes and cracks, sanding, and wiping with a damp cloth prior to repainting are all important steps whether touching up small areas or repainting an entire feature. Always use a manufacturer's best quality paint. Windows and shutters may need repainting every five to seven years, depending on exposure and climate.

• Adjust wood sash that bind when operated. Apply beeswax, paraffin, or similar material to tracks or sash runs for ease of movement. If sash are loose, replace worn parting beads. Sash runs traditionally were unpainted between the stop and parting bead; removing subsequent paint applications will often help improve sash operation.

• Correct perimeter cracks around windows and doors to prevent water and air infiltration. Use traditional material or modern sealants as appropriate. If fillers such as lead wool have been used, new wool can be inserted with a thin blade tool, taking care to avoid damage to adjacent trim. Reduce excess air infiltration around windows by repairing and lubricating sash locks so that windows close tightly.

Figure 13. Window air conditioning units can cause damage to surfaces below when condensation drips in an uncontrolled manner. Drip extension tubes can sometimes be added to direct the discharge.

• Remove debris beneath window air conditioning units and ensure that water from units does not drain onto sills or wall surfaces below (Fig 13). Removal of air conditioning units when not in season is recommended.

• Adjust storm panels and clean weep holes; check that weep holes at the bottom of the panels are open so water will not be trapped on the sill. Exterior applied storm windows are best attached using screws and not tightly adhered with sealant. Use of sealant makes storm units difficult to remove for maintenance and can contribute to moisture entrapment if weep holes become clogged.

• Remove weakened or loose shutters and store for later repair. Consider adding a zinc or painted metal top to shutters as a protective cap to cover the wood's exposed end grain. This will extend the life of the shutters.

Figure 14. When inspecting connections between projections and the main building, look for areas where birds, bees and pests may enter or nest. Birds have been nesting in this porch roof and the area is being cleaned of their debris. Where an opening exists, it may be necessary to cover it with a trim piece, screening, or sealant. Photo: Bryan Blundell.

Projections

Numerous projections may exist on a historic building, such as porches, dormers, skylights, balconies, fire escapes, and breezeways. They are often composed of several different materials and may include an independent roof. Principal maintenance objectives include directing moisture off these features and keeping weathered surfaces in good condition. Secondary projections may include brackets, lamps, hanging signs, and similar items that tend to be exposed to the elements.

Inspection:

In some cases, projections are essentially independent units of a building and so must be evaluated carefully for possible settlement, separation from the main body of the building, and materials deterioration. Some electrical features may require inspection by a electrician or service technician. Common conditions of concern to look for are:

- damaged flashing or tie-in connections of projecting elements;
- misaligned posts and railings;
- deteriorated finishes and materials, including peeling paint, cupped and warped decking, wood deterioration, and hazardous steps;
- evidence of termites, carpenter ants, bees, or animal pests (Fig 14);
- damaged lamps, unsafe electrical outlets or deteriorated seals around connections;
- loose marker plaques, sign, or mail boxes; and
- rust and excessive wear of structural, anchorage, and safety features of balconies and fire escapes.

Maintenance:

• Selectively repair or replace damaged roofing units on porches and other projections. Ensure adequate drainage away from the building. Repair flashing connections as needed; clean and seal open joints as appropriate.

• Secure any loose connections, such as on porch rails or fire escapes.

• Maintain ferrous metal components by following manufacturer's recommendation for cleaning and repainting. Remove rust and corrosion from porch handrails, balconies, fire escapes, and other metal features; prepare, prime, and repaint using a corrosion-inhibitive coating system. Apply new primer before new corrosion sets in, followed by new topcoat. Take appropriate safety measures when dealing with existing lead-based paint and in using corrosion-removal products (Fig 15).

• Reattach loose brackets, lamps, or signs. With electrical boxes for outlets or lighting devices, ensure that cover plates are properly sealed. Prime and paint metal elements as needed.

• Keep porch decks and steps free from dust, dirt, leaf debris, and snow as soon at it accumulates using a broom or plastic blade shovel.

• Repair areas of wood decay or other damage to railings, posts, and decorative elements. Repair with wood dutchman, wood putty, or epoxy filler, as appropriate; replace individual elements as needed.

Figure 15. Metal projecting elements on a building, such as sign armatures and railings, are easily subject to rust and decay. Proper surface preparation to remove rust is essential. Special metal primers and topcoats should be used.

Prime and repaint features when necessary and repaint horizontal surfaces on a more frequent basis.

• Sand and repaint porch floorboards to keep weather surfaces protected. The exposed ends of porch floorboards are especially susceptible to decay and may need to be treated every year or two.

• Carefully cut out damaged or buckled porch flooring and replace with wood to match. Back-prime new wood that is being installed; treat end grain with wood preservative and paint primer. Ensure that new wood is adequately kiln or air-dried to avoid shrinkage and problems with paint adherence.

• Repair rotted stair stringers; adjust grade or add stone pavers at stair base to keep wooden elements from coming into direct contact with soil.

• Consider durable hardwoods for replacement material where beading, chamfering, or other decorative work is required in order to match existing features being replaced. Although appropriate for certain applications, pressure treated lumber is hard to tool and may inhibit paint adherence if not allowed to weather prior to coating application.

• Clean out any debris from carpenter bees, ants, termites, and rodents, particularly from under porches. Replace damaged wood and add screening or lattice to discourage rodents. Consider treating above ground features with a borate solution to deter termites and wood rot and repaint exposed surfaces.

Foundations and Perimeter Grades

The foundation walls that penetrate into the ground, the piers that support raised structures, and the ground immediately around a foundation (known as grade) serve important structural functions. To help sustain these functions, it is important that there is good drainage around and away from the building. The maintenance goal is to prevent moisture from entering foundations and crawl spaces and damaging materials close to the grade, and to provide ventilation in damp areas.

Inspection:

Inspections at the foundation should be done in conjunction with the inspection of the downspouts to ensure that water is being discharged a sufficient distance from the building perimeter to avoid excessive dampness in basements or crawl spaces. In addition, crawl spaces should be adequately vented to deter mold and decay and should be screened or otherwise secured against animals. Look for:

- depressions or grade sloping toward the foundation; standing water after a storm;

Figure 16. This chronically wet area has a mildew bloom brought on by heat generated from the air-conditioning condenser unit. The dampness could be caused be a clogged roof gutter, improper grading, or a leaking hose bibb.

Sealants and Caulks

Using sealants and caulks has become a familiar part of exterior maintenance today. As the use of precision joinery and certain traditional materials to render joints more weathertight has waned in recent years, caulks and more often elastomeric sealants are used to seal cracks and joints to keep out moisture and reduce air infiltration. Where cracks and failing joints are indicators of a serious problem, sealants and caulks may be used as a temporary measure. In some cases they may actually exacerbate the existing problem, such as by trapping moisture in adjacent masonry, and lead to more costly repairs.

Manufacturer's recommendations provide instructions on the proper application of caulks and sealants. Special attention should be placed on ensuring that the subsurface or joint is properly prepared and cleaned. Backer rods may be necessary for joints or cracks. Tooling of the caulk or sealant is usually necessary to ensure contact with all edge surfaces and for a clean and consistent appearance.

Caulks generally refer to older oil resin-based products, which have relatively limited life span and limited flexibility. Contemporary elastomeric sealants are composed of polymer synthetics. Elastomeric sealants are more durable than caulks and have greater flexibility and wider application. Caulks and sealants can become maintenance problems, as they tend to deteriorate faster than their substrates and must be replaced periodically as a part of cyclical maintenance of the structure.

The selection criteria for caulks and sealants include type of substrate, adhesion properties, size and configuration of joint, intended appearance/color and paintability, movement characteristics, and service life. Both one-part and two-part sealants are available; the latter require mixing as part of the application process. Sealants are commonly used for a variety of places on the exterior of a building such as around windows and doors, at interfaces between masonry and wood, between various wood features or elements, and at attachments to or through walls or roofs, such as with lamps, signs, or exterior plumbing fixtures. Their effectiveness depends on numerous factors including proper surface preparation and application. Applications of sealants and caulks should be examined as part of routine maintenance inspection, irrespective of their projected life expectancy.

Installation of caulks and sealants often can be undertaken by site personnel. For large and more complex projects, a contactor experienced in sealant installation may be needed. In either case, the sealant manufacturer should be consulted on proper sealant selection, preparation, and installation procedures.

- material deterioration at or near the foundation, including loss of mortar in masonry, rotting wood clapboards, or settlement cracks in the lower sections of wall;
- evidence of animal or pest infestation;
- vegetation growing close to the foundation, including trees, shrubs and planting beds;
- evidence of moisture damage from lawn and garden in-ground sprinkler systems;
- evidence of moss or mold from damp conditions or poorly situated downspout splash blocks (Fig 16); and
- blocked downspout drainage boots or clogged areaway grates.

Maintenance:

• Remove leaves and other debris from drains to prevent accumulation. Detach drain grates from paved areas and extract clogged debris. Flush with a hose to ensure that there is no blockage. Use a professional drain service to clear obstructions if necessary.

• Conduct annual termite inspections. Promptly address termite and other insect infestations. Use only licensed company for treatment where needed.

• Keep the grade around the foundation sloping away from the building. Add soil to fill depressions particularly around downspouts and splash blocks. Make sure that soil does not come too close to wooden or metal elements. A 6" separation between wooden siding and the grade is usually recommended.

• Avoid use of mulching material immediately around foundations as such material may promote termite infestation, retain moisture or change existing grade slope.

• Reset splash blocks at the end of downspouts or add extender tubes to the end of downspouts as necessary (Fig 17).

• Lubricate operable foundation vent grilles to facilitate seasonal use; paint as needed.

• Manage vegetation around foundations to allow sufficient air movement for wall surfaces to dry out during damp periods. Trim plantings and remove weeds and climbing vine roots. Be careful not to scar foundations or porch piers with grass or weed cutting equipment. If tree roots appear to be damaging a foundation wall, consult an engineer as well as a tree company.

• Wash off discoloration on foundations caused by splash-back, algae, or mildew. Use plain water and a soft natural or nylon bristle brush. Unless thoroughly researched and tested beforehand on a discreet area of the wall, avoid chemical products that may discolor certain types of stone. If cleaning products are used, test beforehand in a discreet area; and avoid over splash to plantings and adjacent building materials.

• Selectively repoint unit masonry as needed. Follow guidance under the wall section in regard to compatible mix, appearance, and texture for pointing mortar.

• Avoid using salts for de-icing and fertilizers with a high acid or petro-chemical content around foundations, as these materials can cause salt contamination of masonry. Use sand or organic materials without chloride additives that can damage masonry. Where salt is used on icy walks, distribute it sparingly and sweep up residual salt after walks have dried.

• Use snow shovels and brooms to clean snow from historic paths and walkways. Avoid blade-type snow removers as they may chip or abrade cobblestones, brick, or stone paving. Note that use of steel snow removal tools in areas where salt-containing snow melters are used may result in rust staining from steel fragments left on the paving.

Figure 17. Extending downspouts at their base is one of the basic steps to reduce dampness in basements, crawl spaces and around foundations. Extensions should be buried, if possible, for aesthetics, ease of lawn care, and to avoid creating a tripping hazard. Photo: NPS files.

Conclusion

Maintenance is the most important preservation treatment for extending the life of a historic property. It is also the most cost effective. Understanding the construction techniques of the original builders and the performance qualities of older building materials, using traditional maintenance and repair methods, and selecting in-kind materials where replacements are needed will help preserve the building and its historic character.

Maintenance can be managed in small distinct components, coordinated with other work, and scheduled over many years to ensure that materials are properly cared for and their life span maximized. A written maintenance plan is the most effective way to organize, schedule, and guide the work necessary to properly care for a historic building. The maintenance plan should include a description of the materials and methods required for each task, as well as a schedule for work required for maintenance of different building materials and components.

Historic house journals, maintenance guides for older buildings, preservation consultants, and preservation maintenance firms can assist with writing appropriate procedures for specific properties. Priorities should be established for intervening when unexpected damage occurs such as from broken water pipes or high winds.

Worker safety should always be paramount. When work is beyond the capabilities of in-house personnel and must be contracted, special efforts should be made to ensure that a contractor is both experienced in working with historic buildings and utilizes appropriate preservation treatments.

A well-maintained property is a more valuable property and one that will survive as a legacy for generations to come.

Endnotes

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Acknowledgements

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Appendix E:

Preservation Maintenance:

A Universal Manual for Developing Conservation Maintenance Plans

PRESERVATION MAINTENANCE:

A UNIVERSAL MANUAL FOR DEVELOPING CONSERVATION MAINTENANCE PLANS

April 2006

ACKNOWLEDGMENTS:

The City of Steamboat Springs commissioned the architectural firm of Humphries Poli Architects, P.C. of Denver, Colorado to prepare maintenance plans for five historic buildings administered by the City. The resulting maintenance manual and individual building plans are intended to serve as a model for other communities across the state of Colorado. Research for this project was conducted nationwide and examined successful building maintenance programs for both large and small historic buildings. Humphries Poli Architects is known for its expertise in performing Historic Structure Assessments of buildings throughout the state of Colorado. Principal consultants in preparing the maintenance plan are Jane Crisler and Erika Warzel.

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Importance of Maintenance

Of the many processes used to "preserve" an historic building, maintenance is almost always the most effective and least destructive. Although most people recognize this fact, the vast majority of historic preservation efforts in this country focus on saving buildings once they begin to fail, rather than preventing the failure from occurring in the first place. Lack of funding is the most common reason for this neglect; however, there are many no- or low-cost activities building owners can perform to greatly increase the lifecycle of an historic building. The purpose of this manual is to inform owners about techniques for maintaining existing historic buildings and alert them to common problems of typical building systems.

Maintenance is the best way to avoid serious and costly damage to historic buildings.

The cycle of neglect and restoration is one of the biggest challenges facing historic buildings today. Few people notice when a building is properly maintained, but they can't help but notice when the opposite is true. Despite this fact, most are discouraged from performing regular maintenance due to cost concerns and the lack of dramatic improvement that is associated with a full scale restoration project. For the most part, limited monies are used to repair damage from years of deferred maintenance, rather than being used more efficiently to avoid the need for such costly and intense work. Nevertheless, the cost of performing regular maintenance is generally lower and can be spread over a longer time period than a typical restoration project. Simply put, planned maintenance is proactive while restoration is reactive. The good news about preventative maintenance is that, of the problems that can arise in a building, most manifest themselves visually. Therefore, a watchful eye goes a long way in identifying problems as they start, thereby reducing the amount of damage caused over time. However, skilled and/or professional personnel should be used for inspections and maintenance as appropriate. Utilization of a maintenance plan will help owners determine and plan for the need for such personnel.

How to Use This Plan

A long term maintenance strategy involves several key components for proper planning and budgeting. This document is an overarching discussion about historic building maintenance and is intended to work with a more detailed maintenance checklist

tailored to the needs of an individual building. This broad overview provides a summary of historic building systems and maintenance principles while the associated building checklist is focused on the specific systems and characteristics of a particular historic building. The checklist also provides a schedule for performing maintenance activities and should be used in the field when evaluating building conditions. Items on the list should be checked off and dated following review. Tying the schedule of maintenance activities into an electronic calendar program could be helpful in ensuring that the schedule is followed.

Building features such as these cornice dentils are important to maintain in order to avoid losing character-defining elements.

Maintenance as a Strategy for Preservation

Buildings are not static; therefore repair and/or replacement of historic building fabric is inevitable over the lifecycle of a building. However, regular maintenance generally reduces the need for such modifications through early detection of potential problems. In addition, repairs made as a result of regular maintenance inspections tend to be smaller in scope, therefore retaining greater amounts of original fabric in an historic building. In most cases, the historic significance of a building is directly linked to the integrity of its original fabric. *As such, the goal of any conservation maintenance plan is to maintain, rather than replace, historic building features.* Replacement of original fabric should be made using "in-kind" materials and only take place as a last resort for selected building elements damaged beyond repair. Regular inspection and cleaning of both interior and exterior building components is the cornerstone of any successful maintenance agenda. In general, visual inspections of the building should be carried out at regular intervals so that gradual deterioration and future maintenance needs can be recorded. As shown in the attached building checklists, inspection intervals may be weekly, monthly, quarterly, semi-annually, annually, or following a major weather event. To support such regular inspections, the following activities also should be carried out in order to ensure successful conservation maintenance planning.

- Gather the following background information:
  - Plans showing building elements, easements and construction details.
  - Original date(s) of construction.
  - Local, state, and national listings in historic registers.
  - Local council/commission review requirements.

    - Review requirements for any letter of agreement, covenant or easement holder.
    - Details of previous conservation work.
- Create a separate file for all maintenance information.
- Designate a location for all maintenance manuals, manufacturer's instructions and service representative contact information for mechanical equipment such as boilers, furnaces, water heaters, etc…
- Inventory building components and their associated maintenance tasks (see checklist).
- Record all services and repairs in a log book.
- Use a camera to record visual information/conditions.
- Prioritize a list of long-term preservation activities for major building components, such as roof replacement or exterior painting. Tie this list to yearly operating budgets.
- Keep a list of emergency phone numbers for contacts such as gas and electric company, boiler/furnace repair, fire department, insurance provider, etc...

Cleaning:

Regular cleaning of building components is an integral part of any maintenance strategy and will increase the lifecycle of a building. For example, removal of dirt on hard surfaces prevents deterioration due to abrasion. Perhaps more importantly, removal of dirt and debris from exterior building elements such as gutters and downspouts allows drainage systems to function properly, thus preventing the damaging effects of water infiltration. Regular cleaning also can help prevent the infestation of bugs or rodents on both the interior and exterior of the building. In addition, keeping dirt and grime away from building elements allows for easier and more productive visual inspections of the building. Routine cleaning should be viewed as integral for managing an historic property and is a convenient way to carry out regular inspection and monitoring activities. Although regular cleaning is important, it is essential to use the gentlest cleaning methods possible to preserve not only the historic fabric of the building, but also the health of its inhabitants. Be sure to research

Destructive cleaning techniques such as sandblasting can damage masonry and other materials and should not be used.

any chemical cleaning methods prior to their application to determine whether or not single or repeated applications may cause harm to any historic fabric. It is important to remember that historic buildings are not renewable resources, and therefore methods such as sandblasting and other destructive cleaning techniques should not be used.

Building Maintenance and Operation Issues

Specific maintenance topics are addressed in the following pages. These topics cover a range of building types and systems and therefore will not all be applicable to every historic building. The information provided below is not intended to cover rehabilitation or restoration techniques, but rather methods to avoid the necessity of implementing those strategies. Additional information about specific maintenance, rehabilitation and restoration techniques appropriate for historic buildings may be found on the National Park Service's Technical Preservation Services Web Site at the following address: http://www.cr.nps.gov/hps/tps/briefs/presbhom.htm. A list of these Preservation Briefs and the subjects they cover can be found in the attached Appendix. In addition to these technical documents, a familiarity with the Secretary of Interior's Standards for the treatment of historic buildings is a useful tool. Please refer to the Appendix for a list of and links to these nationally applied standards.

Ground that slopes towards the building foundation will bring unwanted moisture and should be addressed.

Site Conditions:

The surrounding environment of an historic building may affect the overall condition of the building as much as the building's structure itself. Examination of site conditions should be included in any preventative maintenance plan and address both the natural and built environments. Building owners and/or managers must determine the frequency and level of maintenance of grounds and landscape features. For example, grass should be cut once or twice a week during peak growing seasons and less so or not at all during the winter. Sidewalks, parking lots, and retaining walls should be examined for cracks due to root action, standing water, or general freeze/thaw cycles. It is best to treat the cause of these problems, such as plant growth or incorrect ground slopes, rather than engage in the cyclical repair of the cracking, which is the symptom of the problem. Such treatments must seek to avoid solutions that compromise historically significant elements of the building, landscape, and any known or potential archaeological properties that may be present on the site. Discoloration or corrosion of sidewalks, retaining walls, and even foundation walls can be the result of chemical reactions (such as with ice melt) and should be monitored. Rinsing or cleaning can help to prevent or retard these reactions. Vegetation growing

on the building, including vines that can enter windows and cracks in the building should be removed. Branches that rub the building in the wind also should be trimmed.

Foundation Systems:

Drainage conditions should be monitored to prevent moisture penetration at the building foundation. This includes inspecting the exterior as well as the interior of the building, such as a basement and/or an accessible crawl space. Any existing gutters, downspouts and/or sump pumps should be kept clear of debris and in working order. This includes looking for parts that may be disconnected or damaged. Make sure any existing downspouts deposit water more than 3 feet from the foundation of the building. If this is impractical, methods such as splash-blocks or sidewalk drainage channels can help to effectively shed water away from the building. Visual inspection of the landscape also should ensure that exterior grades slope away from the foundation on all sides of the building. Fall, when deciduous trees lose their leaves, and rainy seasons are the most critical times for inspecting and cleaning drainage systems.

Sources of moisture, such as snow piles, should not be allowed to collect against foundation walls.

Concrete, masonry, or stucco foundation materials should be examined for signs of spalling, corrosion of reinforcing, moisture penetration, or chemical reaction between soil and cement. Chemical reactions most often result in discoloration and corrosion. Mortar joints on masonry systems also are susceptible to spalling and cracking and must be examined regularly. Cracking or deflection in general may be a sign of uneven settlement caused by subsoil conditions including expansion and contraction. Such circumstances should be carefully monitored. If cracking or other signs of movement appear to be active, a skilled professional should be consulted. Deteriorated mortar joints should be repointed with an in-kind mortar compound to prevent moisture damage to masonry systems. Steel or other ferrous materials may also corrode due to contact with water or acidic soils. Wood systems should be examined for signs of decay due to moisture, dry-rot, weathering, and/or insect infestation.

Structural Systems:

The primary structural systems encountered in historic buildings include concrete, masonry, steel, and wood. It is possible to detect failures in these systems through visual inspection of surface materials, however, further inspection may be necessary to determine whether problems exist on the surface or within the structural system itself. The following paragraphs summarize typical maintenance issues associated with each of these materials.

Concrete columns, walls, and slabs should be checked to ensure that structural elements are in overall alignment and that unusual deflection or sagging is not visible. Such conditions are usually due to changes in use that require increased loads, multiple renovations resulting in subtraction or addition of materials, or general deficiency of the original material. These kinds of stresses as well as environmental conditions such as temperature change or mechanical damage may result in cracks, scaling, spalls, pop-outs, stains, joint separation or exposed reinforcing. Changes and repairs are not performed as easily to concrete as they are to other modular systems, such as brick or wood frame, since it is more difficult to address individual areas of concern. It is therefore important to monitor condition changes in concrete systems so that problems may be detected and corrected before more costly replacement is required.

Efflorescence, a white chalky surface residue, indicates the presence of moisture and can cause significant deterioration of masonry.

Brick and Stone load-bearing masonry also require regular examination to prevent unnecessary deterioration. The mortar joint or pointing between individual bricks and stones is the most vulnerable element of these systems. Loose or damaged mortar should be repointed as needed. It is important to make sure replacement mortar closely matches the properties of the existing mortar in color, texture, and strength. Moisture problems in stonework may be evidenced by areas of discoloration. Such problems should be addressed to prevent eventual breakdown of the mortar or stone. Brick also may become discolored from moisture, but the more common symptom is efflorescence, which is a white, chalky, surface residue. In either case, moisture problems may lead to cracking, spalling, and disintegration of the masonry. Loose stones and bricks, as well as sagging and/or buckling in a masonry wall may indicate the early signs of failure. A skilled professional should evaluate the need for repairs if any of the above conditions are documented in an historic masonry building.

Steel is used in structural members and their connections. As with concrete, the overall alignment of steel members should be inspected regularly for signs of deflection or cracking. Corrosion due to chemical reactions, failure of protective coatings, and excessive moisture exposure or wear also affects the durability of this system. Special attention should be paid to the physical condition of the connections between steel members. Steel structural systems may or may not be exposed to open air and therefore may be difficult to visually inspect. In such cases particular attention should be paid to signs of failure in finish materials and to environmental conditions affecting the structure. Again, multiple renovations resulting in subtraction or addition of materials or general deficiency of the original material are circumstances that should be noted during any maintenance inspection. Steel is also susceptible to fatigue due to excessive vibration or impacts, therefore more frequent monitoring should take place under these circumstances.

Wood systems also should be examined for general material failure and construction technique, particularly when uses and therefore loading conditions have changed over time. More so than any other material, wood is susceptible to deterioration when exposed to moisture. Moisture damage in wood is evidenced by rot and/or decay. Rotting or decaying wood is indicated by unusually soft or brittle areas that easily flake or crumble when prodded by a blunt tool. Unlike masonry, concrete and steel, wood may be damaged by rodents and termites as well. Wood systems should be checked for signs of deflection, cracking, weathering and rot at regular inspection intervals. Fortunately, wood does not hide its deterioration like other materials and in most cases problems can easily be detected through visual examination. Because wood structural systems are made up of many individual pieces of lumber, only those pieces that are damaged should be repaired or replaced in kind. Wholesale replacement of materials in an historic building is not recommended.

Masonry parapet walls are prone to moisture damage, such as deteriorated mortar joints, and should be examined regularly.

Exterior Walls and Appendages:

Maintaining exterior wall finishes is critical to preserving an historic building since they are the first line of defense against unwanted moisture and other environmental threats. Exterior finishes are in most cases the easiest building surface to inspect and tend to wear more immediately. It is a good idea to maintain the exterior walls of a building not just for aesthetic reasons but also to protect the structural and other historic elements of the building. However, not all structural concerns are visible on a building's exterior. When performing cleaning and maintenance activities it is

important to make sure that such well intentioned activities don't hasten the deterioration of exterior cladding systems, such as sandblasting brick and stone or applying inappropriate sealants. Such radical activities should be discussed with an historic preservation professional.

Brick and Stone finishes may be part of a load-bearing masonry wall system or incorporated as a veneer surface on an historic building. Whether these materials are used structurally or as a veneer, the signs of deterioration are generally very similar. Historic masonry buildings typically do not include expansion joints to prevent cracking due to settlement and/or freezing and thawing cycles. Though dependant on the age and quality of construction of the building, there is an extreme likelihood that historic masonry walls will develop cracks over time. As mentioned previously, a mortar joint is the most vulnerable portion of a masonry wall finish since it is intended to be weaker than the stone or brick it binds together. In this way the soft mortar acts as an expansion joint. Because the strength of modern mortar is typically stronger than historic mortar, brick or some soft stones, it is important that any replacement mortar be of a similar strength as the original so that stresses are not transferred to the masonry itself, rather than the joints. It is much easier to replace cracked or missing mortar on an historic building than it is to match and replace a damaged stone or brick. Surface deterioration, staining and mineral deposits also should be recorded during regular inspections. Since these typically indicate the presence of unwanted moisture, steps should be taken to prevent water from coming into contact with the wall surface. This may include gutter cleaning and repair, proper snow removal, or flashing repair. Masonry parapets are particularly prone to such damage and should be regularly examined.

Cracks in stucco should be repaired to avoid moisture entering and enlarging them.

Wood exterior wall finishes are common on historic buildings and typically consist of shingles, weatherboard or clapboard siding, or plywood. Visual examination of such elements should focus on loose, cracked, warped, or broken boards and shingles. Repair of such elements should encompass only those parts that are damaged so that as much original fabric as possible is retained. Other signs of moisture penetration also should be identified, such as discoloration, rot, and decay. In general, wood features should not be covered or sealed in a way that inhibits the natural breathability of the wood. Painting is the most generally accepted treatment for protecting wood against environmental factors. Exterior wood finishes should only be painted if historically done so and any new painting should match the historic colors original to the specific element or feature of the building.

Stucco, like mortar, was historically a lime-based material until the popularization of Portland cement in the early 20th century changed its composition to a harder material. Like all exterior finishes, stucco is prone to deterioration from moisture, settlement, and surface damage due to impact. The most important rule of thumb for maintaining stucco is the timely repair of cracks and chipping. Moisture will enter these breaks in the surface and enlarge them by freezing and thawing. This action eventually will develop into erosion and/or peeling away of the stucco from the wall surface, leaving the wall structure exposed. When repairing cracks in stucco finish it is important to match the texture, consistency, and strength of the original stucco to avoid problems in the future. Active cracking or bulging may be a sign of structural problems as well and should be monitored and evaluated by a skilled professional.

Porches, Chimneys Stoops, etc… also must be included in regular maintenance inspections. Porches should be examined for signs of foundation problems evidenced by sagging, cracking, or buckling. Associated stairs ought to be inspected for these issues and to determine whether stair treads are level and sound. Porch columns also should be examined for indications of structural instability such as deflection, deterioration or loose connections. Porches that lean or peel away from the building usually suffer from settlement problems that should be monitored for further activity. Porch roofs may be examined as part of the overall roof systems as described below.

Dirt and debris should be removed promptly from all roof drainage systems.

Chimneys should be capped appropriately and inspected for structural stability. Chimneys that appear out of alignment or have loose or damaged building elements must be addressed immediately to prevent serious safety risks and preserve remaining historic fabric. As with all roof openings, chimneys should incorporate well adhered flashing. Because exterior architectural elements like chimneys, porches, porticos, and other entry conditions are character defining features, their maintenance is essential to preserving the historic significance of a building.

Roofing and Waterproofing:

Although the following items are often the least visible characteristics of a building, their maintenance is crucial for ensuring the successful preservation of an historic building. Gaining access to these building elements can be the most challenging aspect of a regular maintenance program, although using binoculars or "zoomed-in" photographs can help in visual inspections. Keeping the roof and associated waterproofing systems in good condition is one of the most important factors in extending the lifecycle of and preventing catastrophic damage to any building. The key to

keeping a roof in good condition is the timely removal of water from the surface and substructure. All leaks and standing water issues should be addressed as soon as possible to prevent the problems from escalating into a more costly crisis. The source of a leak may not be readily located. Water may come in one place and travel along a roofing member some distance from the actual leak before becoming apparent. In such cases, careful examination of the leak area is required and may involve the removal of some roofing material. In such cases a skilled professional should be consulted. Even if a roof is recently replaced, failure to inspect it on a regular basis can result in the manufacturer invalidating the warranty.

Metal Roofing is typically a very durable roofing system, nevertheless it is subject to deterioration from exposure to the extreme climate conditions all roof systems encounter. Metal roofing is characteristically laid in sheets that are adhered to one another, thus creating seams. These seams generally experience leaking or failure more quickly than other areas and should be paid particular attention in all visual inspections of the roof. The metal itself may be damaged by impact or being walked on, therefore inspections should be carried out carefully. Such damage may result in bows, cracks or even holes. Corrosion found on metal roofs also should be addressed before spreading. Newer metal roofs may possess a protective coating, however historic metal roofs generally are not treated. The typical lifespan of a metal roof is approximately 60-100 years.

Wood Shingle Roofing is found on many historic buildings. Wood shingle roofs are relatively easy to maintain, however they can wear quickly and are subject to fire and hail damage. Because of their susceptibility to fire many historic wood shingle roofs have been replaced over the years with more fire resistant materials. Today, synthetic shingles that replicate the appearance of wood shingles are available and can be used in instances when the original wood shingles have previously been removed and in-kind installation is impractical. However, historic wood shingles should be replaced in-kind whenever feasible. In addition to fire and hail damage, wood shingles may be prone to drying, warping, and cracking. Any loose shingles that are not damaged should be refastened and missing shingles should be replaced as soon as possible. The typical life span of a wood shingle roof is approximately 20-50 years.

Missing or damaged shingles should be replaced as soon as possible.

Clay Tiles are another long-lasting roofing system that has been used for hundreds of years. Like wood shingles, tiles are susceptible to damage from hail and other impacts such as being walked on. High profile pantiles are extremely fragile. Visual inspections of tiles should be carefully undertaken and focus on identifying cracked or broken tiles that may lead to leaking. One of the most difficult aspects of repairing or replacing a damaged clay tile is to avoid breaking the ones around it. Loose tiles should be refastened and missing tiles should be replaced. However, new machine-made clay tile or concrete

tiles should generally not be used to patch roofs of old, handmade tile because of obvious differences in appearance. Despite the fragility of individual clay tiles, the tiles themselves often outlast their fastening system. Should tiles need to be refastened it should be done using corrosion-resistant fasteners. The typical lifespan of a clay tile roof is approximately 80-120 years.

Asphalt Shingles were introduced to the roofing market in the late 1800s. However, they were not commonly installed on building until the 1940s. Asphalt shingles should be inspected for signs of brittleness, drying, loss of shape and/or covering. Once an asphalt shingle begins to deteriorate it is likely that the disintegration will cause the corners of the shingle to curl upward. Once this occurs, the shingles become particularly susceptible to wind damage and usually result in loose or missing shingles. Although the method for manufacturing asphalt shingles has varied over the life of the material, it is relatively easy to replace damaged portions. The typical lifespan of an asphalt shingle roof is approximately 20 years.

The failure of this built-up roof has allowed moisture to infiltrate along the parapet edge.

Built-up Roofing also has been used for more than 100 years. The main difference between a built-up roof and the roof systems discussed above is that a built-up roof must be water tight while the other systems are designed to be water shedding. As such, a built-up roof possesses some unique maintenance issues. It is crucial to avoid punctures or cuts in a built-up roofing system. Early signs of trouble may include "alligatoring" or a general brittleness in the membrane. Other defects in the membrane may include blisters, splits, or ridges. Since built-up roofs rely on a protective covering such as asphalt surfacing, gravel, or aluminum coating, it is particularly important to identify and prevent the erosion of these surfaces. Appropriately installed and maintained flashing is also crucial to preserving a built-up roof. The typical lifespan of a built up roof is approximately 20 years.

Drainage Systems vary from building to building but generally should be kept clear of debris and other obstructions. Particularly at the start of a rainy or snow season, the operation of drainage systems should be checked to ensure that water is being carried down

and away from the building. Gutters and downspouts should be checked for corrosion, holes, and/or faulty connections. In addition to these elements, flashing should be inspected to identify signs of deterioration as well. As a general rule, buildings should possess well-adhered flashing to all intersections of the walls and roof. Joints between vertical and horizontal surfaces should have both flashing and counter-flashing. Because not all historic buildings include such systems it is particularly important that associated drainage features function properly. In some cases flashing may be added to historic buildings so long as it does not compromise the historic fabric of the building or adversely affect its visual appearance.

Windows and Doors:

In addition to providing an important function, windows and doors are usually one of the most significant character-defining features of an historic building. Because windows and doors are such a recognizable building feature and often are used in determining the age and style of a particular historic building, it is not advisable to replace these elements unless they are damaged or weathered beyond repair. In addition to being exposed to the elements, windows and doors are one of the most used features of a building and may require maintenance more often than other building elements. When determining the appropriate treatment for an historic window or door it is important to remember that their appearance may be worse than their actual condition, therefore examination of these features should not be based on visual appearance alone. Repair and selective replacement of parts is always preferable to wholesale replacement.

Lack of maintenance painting has caused this window to weather severely.

In addition to the overall appearance of an historic window or door, its operation and associated hardware also must be examined as part of a regular maintenance inspection. Historic windows and doors may be made more energy efficient by adding or repairing caulking, weather stripping, and putty. These solutions generally are more desirable than adding storm doors or windows to achieve better energy efficiency because such additions will affect the overall appearance of the building. If the use of storm doors or windows is required they should be installed in a way that does not physically alter the original fabric of the window, door, or any other building material.

When inspecting historic windows and doors it is important to look for water damage or deterioration around the entire frame but particularly at the window sill and door threshold. All of the joints around the frame should be tight to prevent water or air from entering. Loose or open joints should be caulked. The existing caulking, weather stripping, and putty should be inspected and repaired or replaced as needed. Finally, historically painted

windows should be scraped and repainted regularly to prevent weathering of the original wood or metal frames.

Interior Finishes:
Interior spaces of historic buildings possess varying levels of historic significance because these spaces are the most prone to change over the years. This is due to the fact that many historic buildings experience changes in use, which necessitate alteration of the interior space. Regardless of the historic significance of the interior, materials should be maintained to preserve the overall lifecycle of the building. Remaining historic finishes should be paid particular attention to in order to prevent eventual replacement due to deterioration. In general, finishes should be kept free of dirt which will accelerate wear and tear from continued use. Cleaning processes should be designed to minimize wear or harm to finished surfaces throughout the building.

Wall Surfaces may consist of several different kinds of finishes, including plaster, wood, brick, paint and wallpaper. Plaster walls were commonly used in construction in the United States until the end of World War II and were painted or covered with wallpaper; they are typically found in public and residential historic buildings. Historic buildings may also employ "unfinished" interiors, including wood or exposed brick or stone. Historic adobe construction usually features a smooth stucco finish that also may be painted. No matter the wall surface, dust and dirt should be removed regularly using a soft duster, damp cloth or soft, tacky wallpaper cleaner as appropriate. Harsh chemicals should be avoided.

Plaster and exposed masonry should be inspected for cracks and spalling. Such damage may be indicative of water infiltration or settlement and therefore should be monitored closely for activity. Once the root problem is diagnosed, appropriate patching or tuckpointing should take place. Old chipped paint should be removed and replaced with new paint matching the historic color palette, if knowable. If pre-treatment for repainting requires stripping historic paint layers, paint samples should be carefully removed and archived for future examination. Most buildings constructed before the 1970s with painted interiors likely will contain lead-based paints. Lead-based paints should be kept away from children in particular and encased in modern paint rather than removed from the building in most cases.

Wood ought to be inspected for signs of rot, drying, splitting, termites, and any other damage. Should elements need to be replaced, it should be done using the same species of wood to match the original. Historic wood millwork including moldings, trim, and wainscoting should be examined regularly for signs of deterioration or damage. Historic millwork is an important character-defining feature of historic buildings and should not be replaced unless damaged beyond repair. Replaced sections should accurately match the profile of the original millwork, which likely will require custom production.

Ceiling Surfaces vary widely based on the type and date of construction of historic buildings. In general, ceiling finishes fall under one of two categories; exposed systems or suspended/applied systems. Those found in historic buildings include exposed wood or

metal framing (typically in secondary or commercial spaces), pressed tin panels, and more commonly, applied plaster. Exposed wood or metal framing may be painted or unpainted, and in the case of metal framing may include a protective coating, such as a spray-on fire-proofing layer. Such systems should be examined for signs of cracks, surface deterioration, missing or damaged elements, or adhesion of sprayed-on surfaces. Applied systems such as plaster and pressed tin should be inspected for water stains or corrosion, cracking, sagging, and missing units in the case of panel systems. Problems observed in both systems should be investigated immediately to determine the source of the problem and whether or not it affects the overall structure of the building.

Tin ceilings should be checked for corrosion, staining, and other damage.

Floor Surfaces in an historic building also cover a wide range of finishes, including dirt, masonry, concrete, wood, carpet, and resilient surfaces such as linoleum or, more recently, vinyl tile. Dirt floors are most typically found on basement levels but may also be found throughout the ground level of a vernacular historic building. Masonry floors, including brick and stone, concrete floors, and terrazzo finishes, ought to be examined for cracks, stains, and deterioration of joints and other elements. The condition of any sealants used on these systems also should be checked for wear and tear. Failure of such sealants will lead to accelerated decline of the flooring system. The same is true for wood floor finishes. These finishes also are prone to shrinkage, warping, unevenness, and decay. These symptoms, as well as excessive wear, should be documented and addressed in regular maintenance inspections. Because carpeting is relatively easy and inexpensive to replace, it is less common to find original carpeting in historic buildings today. Nevertheless, it is important to assess the condition of any existing historic carpets. Stains, holes, tears, discoloration, and excessive wear are typical maintenance problems for carpets. These problems should be addressed and hopefully prevented, however, it is important to preserve even damaged carpeting if it is original to the building. Linoleum and vinyl tiles are generally very durable surfaces. Inspection of these surfaces ought to look for broken or loose tiles as well as lifting or fading of the surface. Tiles may contain hazardous materials such as asbestos. As with other areas where hazardous materials are often employed, such as insulation and paint, it is important to determine whether or not such materials are present and if so, the proper course of action for addressing the situation. A skilled professional should be consulted for determining a solution to such circumstances.

Prominent elements of historic mechanical systems, such as radiators, should be retained.

Mechanical Systems:

The condition and complexity of the mechanical systems in an historic building depend on several factors, including age, use, and climate. Hot water and steam were commonly used to heat buildings prior to World War II. These systems rely on the use of a boiler and associated radiators throughout the building. Forced-air heating systems using furnaces to heat the air were developed in the early 20th century. These systems incorporated ductwork and small registers throughout the building to distribute the heated air. By the mid-20th century, forced-air systems and their associated ductwork were used to distribute heated and cooled air through the same system. This breakthrough revolutionized how buildings are designed today. Historic buildings are not easily adapted to modern mechanical systems, therefore, maintenance of both old and new systems in an historic building can be particularly challenging. However, a well-maintained mechanical system is most often the best way to achieve energy efficiency in an historic building. At a minimum, heating and air conditioning equipment should be inspected by a skilled professional on an annual basis. Records should be kept on such maintenance examinations as well as on the hours of operation and fuel use of equipment. Changes or upgrades to systems may be made if they do not compromise historic building fabric. Because elements of historic mechanical systems such as radiators and decorative register covers are often times character-defining features of an historic interior, such elements should be retained even if equipment upgrades render their use obsolete.

Electrical Systems:

Electrical equipment, like mechanical systems, is often updated in historic buildings. The visible decorative features of an electrical system, such as light fixtures, room switches, and switch plates, are important components of any historic building. It is important to maintain both the visible decorative elements and the overall functioning of the system on a regular basis. As with mechanical systems, skilled professionals should be called on to evaluate and repair electrical equipment, and records of these activities should be kept. Because the use of an historic building is the best way to ensure its continued preservation, upgrades in electrical services

and equipment can be undertaken to achieve this goal. However, such upgrades should never cause harm to historic fabric nor should it cause the removal of historic character-defining features such as light fixtures, switch plates, etc. If historic elements are inadequate for modern use, they should be supplemented rather than replaced by modern fixtures. At a minimum, equipment should be cleaned and evaluated annually.

Original fixtures should be retained when updating electrical systems.

Appendix

Secretary of Interior's Standards for the Treatment of Historic Properties found at http://www.cr.nps.gov/hps/tps/standards_guidelines.htm:

The Secretary of Interior's Standards promote consistent preservation practices and are in non-technical, common sense language. In addition to outlining the standards for the four treatment approaches (Preservation, Rehabilitation, Restoration, and Reconstruction), this website provides information on how to choose a treatment type, as well as illustrated guidelines on applying the Standards. As a conceptual framework, the Standards cannot direct the decisions regarding what features of a historic property should be retained or changed, but they can help to maintain a consistent philosophy towards a project once those decisions are made. The four treatment approaches are thus summarized:

Preservation: focuses on the maintenance and repair of existing historic materials and retention of a property's form as it has evolved over time.

Rehabilitation: acknowledges the need to alter or add to a historic property to meet continuing or changing uses while retaining the property's historic character.

Restoration: depicts a property at a particular period of time in its history, while removing evidence of other periods.

Reconstruction: re-creates vanished or non-surviving portions of a property for interpretive purposes.

Preservation Briefs found at http://www.cr.nps.gov/hps/tps/briefs/presbhom.htm:

01: **Assessing Cleaning and Water-Repellent Treatments** for Historic Masonry Buildings

02: **Repointing Mortar Joints** in Historic Masonry Buildings

03: **Conserving Energy** in Historic Buildings

04: **Roofing** for Historic Buildings

05: The Preservation of Historic **Adobe** Buildings

06: **Dangers of Abrasive Cleaning** to Historic Buildings

07: The Preservation of Historic Glazed Architectural **Terra-Cotta**

08: **Aluminum and Vinyl Siding** on Historic Buildings: The Appropriateness of Substitute Materiasl for Resurfacing Historic Wood Frame Buildings

09: The Repair of Historic **Wooden Windows**

10: Exterior **Paint Problems** on Historic Woodwork

11: Rehabilitating Historic **Storefronts**

12: The Preservation of Historic Pigmented **Structural Glass (Vitrolite and Carrara Glass)**

13: The Repair and Thermal Upgrading of Historic **Steel Windows**

14: New **Exterior Additions** to Historic Buildings: Preservation Concerns

15: Preservation of Historic **Concrete**: Problems and General Approaches

16: The Use of **Substitute Materials** on Historic Buildings Exteriors

17: **Architectural Character** – Identifying the Visual Aspects of Historic Buildings as an Aid to Preserving Their Character

18: Rehabilitating **Interiors** in Historic Buildings – Identifying Character-Defining Elements

19: The Repair and Replacement of Historic **Wooden Shingle Roofs**

20: The Preservation of Historic **Barns**

21: Repairing Historic **Flat Plaster** – Walls and Ceilings

22: The Preservation and Repair of Historic **Stucco**

23: Preserving Historic **Ornamental Plaster**

24: **Heating, Ventilating, and Cooling** Historic Buildings: Problems and Recommended Approaches

25: The Preservation of Historic **Signs**

26: The Preservation and Repair of Historic **Log Buildings**

27: The Maintenance and Repair of Architectural **Cast Iron**

28: **Painting** Historic Interiors

29: The Repair, Replacement, and Maintenance of Historic **Slate Roofs**

30: The Preservation and Repair of Historic **Clay Tile Roofs**

31: **Mothballing** Historic Buildings

32: Making Historic Properties **Accessible**

33: The Preservation and Repair of Historic **Stained and Leaded Glass**

34: Applied Decoration for Historic Interiors: Preserving Historic **Composition Ornament**

35: Understanding Old Buildings: The Process of Architectural **Investigation**

36: Protecting **Cultural Landscapes**: Planning, Treatment and Management of Historic Landscapes

37: Appropriate Methods of Reducing **Lead-Paint Hazards** in Historic Housing

38: Removing **Graffiti from Historic Masonry**

39: Holding the Line: Controlling Unwanted **Moisture** in Historic Buildings

40: Preserving Historic **Ceramic Tile** Floors

41: The **Seismic Retrofit** of Historic Buildings: Keeping Preservation in the Forefront

42: The Maintenance, Repair and Replacement of **Historic Cast Stone**

43: The Preparation and Use of **Historic Structure Reports**

44: The Use of **Awnings** on Historic Buildings: Repair, Replacement and New Design

45: Upcoming Brief on maintaining the exterior of historic buildings