



# 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.

Additional acknowledgment and gratitude must be extended to Laureen Schaffer and to numerous other City staff, including members of the City's Intergovernmental Services and Maintenance departments. James Stratis served as the project manager for the Colorado State Historical Fund and was an invaluable resource in his guidance and reviews of the drafts of this document.

The preparation of this conservation maintenance plan was funded by a grant from the State Historical Fund from the State of Colorado.

## 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.

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.



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

### 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.

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.



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

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.

**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



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

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.

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.



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

Stucco, like mortar, was historically a lime-based material until the popularization of Portland cement in the early 20<sup>th</sup> 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.

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



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

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.

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 “alligating” 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.

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

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



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

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.

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

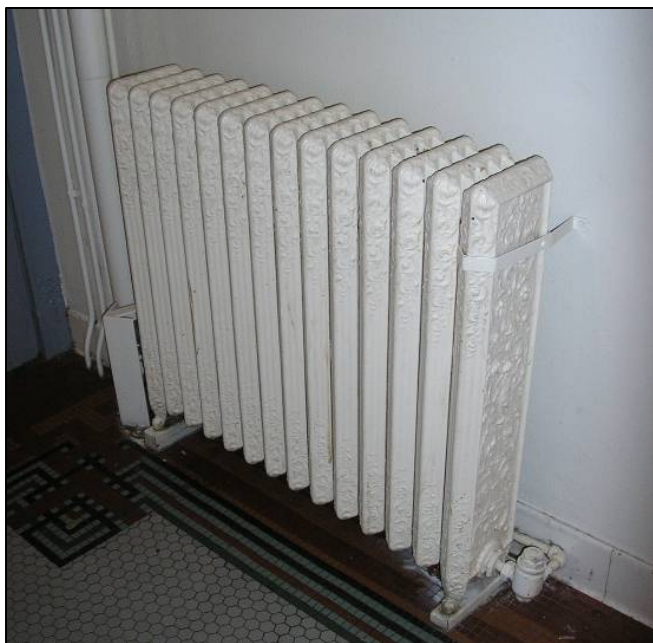
metal framing (typically in secondary or commercial spaces), pressed tin panels, and more commonly, applied plaster. Exposed wood or metal framing may be painted or unpainted, and in the case of metal framing may include a protective coating, such as a spray-on fire-proofing layer. Such systems should 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.

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.



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





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 20<sup>th</sup> century. These systems incorporated ductwork and small registers throughout the building to distribute the heated air. By the mid-20<sup>th</sup> 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](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 Materials 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*