CHAPTER 5 – HISTORIC BUILDING MATERIALS & TREATMENTS

The treatment of historic building materials is an important part of any maintenance, rehabilitation, or restoration project and should be reviewed for appropriateness in the same way as the design of a new building feature for historic properties throughout Wellesley. Common exterior building materials used in residential architecture include wood, brick, stone, stucco, and metals, each of which is discussed below.

The quality of different building materials varied over time as the methods used in their production improved. In the eighteenth and early nineteenth centuries, building materials tended to be locally produced. Wood was cut from local forests and shaped into building materials at saw mills and by hand onsite. Wood was not always properly cured and dried as it is today, and the assorted wood species and quality of lumber varied by project. Bricks were molded and baked using clays from local clay pits, and the use of field stone was common in wall construction. Lime and sand for mortar was locally obtained and varied in quality; cement was not available.

Construction systems and technologies changed with time as well. Interestingly, construction systems tended to decline in quality during the mid and late nineteenth centuries, as larger and increased numbers of buildings were attempted through sometimes experimental and expedient means. It wasn't until the late nineteenth and early twentieth centuries that professional standards in building material production and building systems began to be developed and implemented.

Consequently, it is important that the quality and condition of materials and systems be evaluated on a case by case basis as projects involving historic buildings are undertaken. Appropriate treatments must be determined based upon the specific conditions observed. General guidelines for the treatment of historic building materials are outlined below.

WOOD

Wood is the predominant material used in the construction of residences in Wellesley's historic neighborhoods. Most of the Town's historic residences are built with wood structural systems; wood exterior coverings; wood detailing; and wood features such as doors, windows, porches, railings, and steps. Wood is also present in the Town's historic masonry residences (as well as many commercial buildings) for interior structural framing as well as doors, windows, and architectural detailing. Since most of the Town's historic buildings contain a significant amount of wood, it is important to understand the general characteristics of wood as a building material.

When used as an exterior building material, wood is vulnerable to weathering and deterioration. The ongoing condition of a wood building and its elements is highly dependent upon the extent and quality of regular maintenance. As versatile as it is, wood can only perform satisfactorily when it is protected from the natural forces that weaken and deteriorate it: weathering, rot, animals, and insects. The capacity of wood to resist these forces depends on periodic inspection and immediate response to warning signs. Without routine inspection and prompt remedial action, wood deterioration will accelerate rapidly on a building's interior and exterior. Early detection and repair thus avoids more extensive and costly repair later.

Rehabilitation projects need to anticipate the need for ongoing maintenance, address vulnerable situations, and avoid creating conditions that will be susceptible to deterioration.

Historically, wood was used extensively for its structural and aesthetic value. In particular, historic wood siding and wood details are highly visible and significant features of a building's exterior. In Wellesley's historic neighborhoods, these wood features include clapboard, shingles, porches, columns, balustrades, shutters, cornices, trim, windows, and doors. Wood was the primary building material used during successive historic periods in Massachusetts and is characteristic of eighteenth century buildings as well as the late-nineteenth century vernacular Victorian and early-twentieth century revival styles found in many of the Town's residential neighborhoods.

Condition and Causes of Wood Deterioration

Exterior wood conditions for residential buildings in Wellesley's historic neighborhoods are generally very good. Only a small number of buildings exhibit significant areas of deferred maintenance. Problems such as wood deterioration, water penetration, peeling paint, and weathered surfaces are common in buildings where preventative maintenance is not routine. In Wellesley's residential buildings such conditions tend to be of limited extent and located in particularly vulnerable locations – seldom a threat to the entire building.

Wood is the predominant material used in the construction of residences in Wellesley's historic neighborhoods.

Wood buildings of all eras were historically painted – wood finishes exposed to the exterior should be protected from the weather with paint. When properly maintained, wood can be durable and serviceable for many years. Painted surfaces that are damaged or deteriorating may be cause for concern.

The most prevalent problem affecting architectural wood is water penetration from poorly maintained roof drainage systems. Conditions in roof valleys and around chimneys can be difficult to see and monitor. Clogged gutters overflowing with debris, sagging and loose gutters, inadequate downspouts, and damaged eaves, soffits, and fascias can rot wood and cause interior water damage. Large shrubs and trees in close proximity to buildings contribute to wood deterioration and failure by trapping moisture and slowing the evaporative process.

Decay and Rot – Peeling paint can be an early sign of high moisture content in the underlying wood. Rot is caused by water penetration that softens and breaks down the fibrous structure of wood and supports the growth of various types of fungi. In the forest, rotting is a natural, healthy process, but it can be fatal to buildings. The growth of fungi is a clear sign that rotting is occurring. To survive, fungi usually require wood to have a moisture content of at least twenty percent as well as the correct temperature range.

Keeping wood dry is the best way to prevent rot. Fungi can substantially weaken the structural integrity of wood, diminishing its capacity to carry loads or its ability to withstand crushing. Without these capabilities, a building's wooden frame can be rendered useless.

The presence of rot indicates that moisture is present. Simply attending to the rotted wood is inadequate unless it also addresses the source of the moisture. If this source is not discovered and eliminated, rot will recur and spread.

Moisture penetration most often occurs for one of the reasons listed below:

- Leaking roof or gutters;
- Inadequate or deteriorated flashing;
- Peeling paint;
- Unventilated spaces;
- Improper insulation or lack of a vapor barrier;
- Poor drainage or rainwater removal around the foundation;
- High watertable or rising damp; or
- Plumbing leaks.

This siding shows some indication of peeling. A small metal vent has been installed to allow interior moisture to escape, rather than allowing it to move through the wood causing the paint to fail.

The fascia and soffit boards of this cornice have rot due to moisture drawn from contact with the roofing. The hole in the soffit on the underside of the cornice is probably an entranceway for squirrels.

Animals – A common problem associated with wood buildings is their attractiveness to animals for nesting. Birds, squirrels, mice, and rats are of particular concern, though other species can also be a problem. Birds and squirrels frequently enter the building through small holes in eaves and gables and at other locations where materials come together. The holes are generally visible from the exterior. Older mid-nineteenth century buildings constructed close to the ground over crawl spaces are particularly susceptible to mice and rat infestation.

Insects – Some types of insects are natural enemies of wood and can quietly but dramatically destroy the structural stability of wood members in a short period of time. These insects include termites, powder post beetles, and carpenter ants.

This hole in historic wood siding may have been intentionally cut as a vent, but it has been widened by chewing animals and nesting material can be seen inside.

Wood Treatment

Rehabilitation projects should address issues of water penetration, decay, and rot when they are present. The sections on roofs and wood siding in Chapter 6 address many of the issues related generally to wood. But for every proposed project:

a. **Building Assessment:** In conjunction with any new project, undertake an assessment of the building looking for signs of water penetration and decay. Repair conditions that are identified.

b. **Causes of Deterioration:** Where deterioration, decay, or rot are observed, determine and address the source and cause of the condition – do not simply repair the deteriorated wood without addressing its cause. Monitor the condition after repairs to assure that the right cause was identified.

c. **Selective Repair:** In general, rotted wood should be removed and replaced, particularly if it is structural. It is usually not necessary, however, to remove an entire wood element but only the rotted portion.

d. **Use of Consolidants:** Where limited rot has occurred, commercially available epoxy consolidants can be used to give strength to the existing wood and no removal is necessary.

e. **Dutchmen:** For more extensive repairs, the deteriorated portion of the wood element can be removed and a small piece of new wood (called a *dutchman*) installed as a patch in the original wood feature, limiting the amount of authentic fabric removed.

f. **Structural Assessment:** For wood structural elements, a structural engineer should be consulted for the nature and extent of the repair required.

g. **Painting:** Wood finish material exposed to the exterior should be protected with properly applied paint. A good paint job should last twelve to fifteen years. Basic guidelines for painting are included in Chapter 6 in the discussion of wood siding, details, and trim.

h. **Bird and Squirrel Holes:** Once identified, birds and squirrels should be chased out and the holes repaired. Extensive damage can be caused by the animals inside the structure, and the holes allow moisture inside the walls causing rot.

i. **Mice and Rats:** Mice and rats generally enter through holes at grade level and live in basements, crawlspaces, and floor structure. They nest in hidden locations, chewing wood and wiring. Mice and rats should be controlled through periodic inspections by professional pest treatment services.

j. **Insects:** A professionally qualified firm should be retained to inspect and treat vulnerable buildings.

The presence and good condition of original wood features on so many historic residences in Wellesley after many decades of service is proof that wood is an economic long-term material.

BRICK MASONRY

Brick is sparingly present in Wellesley's Cottage Street Historic District but is more common in the Town's other historic neighborhoods. Although brick is a material of substantial longevity, it is still vulnerable to deterioration. To remain in good condition, brick must maintain its structural stability and its ability to deal with moisture. Bricks are baked. Like a loaf of bread, they are comprised of an outer crust and a softer inner core. Without the outer crust, the inner core of the brick is vulnerable to rapid deterioration. Bricks are also porous. Like a sponge, they absorb moisture. Brick walls must be allowed to dry out if they are to remain in good condition.

The quality of the bricks used in historic buildings varies considerably depending upon the quality of the materials being used and the quality of manufacture. Mid-nineteenth century bricks were often produced locally without suitable technological expertise or supervision. Different quality brick was used for different purposes. Often the interior portions of a wall were laid with inexpensive, poor quality brick. Higher quality brick was reserved for the exterior surface. When stressed or exposed to weathering or deterioration, the poor quality brick on the interior can be a threat to the structural integrity of the wall and the building.

By the early twentieth century, manufacturing standards and techniques had improved, and brick was being produced in large volume by competent manufacturers and shipped long distances by railroad. Issues of poor quality were less common. When undertaking rehabilitation projects, brick walls should be carefully inspected for signs of deterioration. Bricks perform best when they are laid with bricks of a similar type, and when the mortar recipe is carefully matched to the appropriate type of brick.

Condition and Causes of Brick Masonry Deterioration

Moisture penetration and improper maintenance are the most common causes of the deterioration of brick masonry. When water gets into a wall it can freeze, causing cracking in the wall and spalling of the face of the brick. Moisture penetration can be caused by leaking roofs, flashing, and gutters; deteriorated window sills; wall cracks; missing mortar; and rising damp. Improper maintenance can also damage brick and can include sandblasting or the use of hard pointing and bedding mortars. These conditions are discussed further below.

The treatment and repair of deteriorated brick masonry is an important part of any rehabilitation project involving a brick building or brick feature in a wood framed building.

This building is one of the few brick residences within the Cottage Street Historic District. Brick buildings are more numerous in other historic Wellesley neighborhoods.

Rising Damp – Rising damp is a common and serious problem in humid environments and where there is poor drainage. Dampness in the soil or on paving is absorbed by a wall and drawn upwards by capillary action. Since a brick wall "breathes," moisture within the wall gravitates to the exposed surface, resulting in a moist, clammy feeling near the base of a wall.

Open Joints – Open masonry joints are among the most common problems observed in historic buildings, particularly older buildings with soft mortar that are not being well maintained. Open joints are particularly dangerous because they allow water to enter the wall and then freeze in cold weather. When water freezes, it expands causing cracking of the masonry and providing more ways for water to enter.

Cracks – Cracks are worrisome for two reasons: (1) they indicate that a building's walls are moving and (2) they provide opportunities for moisture penetration and further deterioration. Cracking may be caused by settlement, structural failure, freezing of moisture within the wall, or the rusting of metal within the wall.

Spalling – Spalling of the surface of a brick can be caused by absorption of water in the brick which then freezes and spalls off the face of the brick. Spalling causes the soft inner core of the brick to be exposed to the weather, continue to absorb water, and rapidly deteriorate within the wall.

Steel Lintels – In masonry buildings constructed during the twentieth century, it has been common practice to install steel lintels above door and window openings. Frequently, these lintels rust over time. The rusted steel expands, causing cracking and the jacking of the masonry above the opening.

Efflorescence – Efflorescence is a whitish stain that is prevalent in newly laid brick walls and sometimes occurs on older walls. It results from water-soluble salts that have crystallized and risen to the surface of bricks and mortar. Extensive appearance of this stain may signal a moisture problem in the wall.

Chimneys are the most frequently present brick features in wood buildings within the Cottage Street Historic District. Difficult to access, this brick chimney has open joints which will absorb water.

The surfaces of these bricks have spalled.

Jacking of a steel lintel at the window to the right has caused cracking of the brick masonry at left.

Brick Masonry Treatment and Repair

a. **Sandblasting**: Brick walls should never be sandblasted. Sandblasting removes the protective outer crust of the brick and exposes the softer inner core. This inner core was not meant to be exposed directly to the weather and will deteriorate rapidly. Sandblasting can also break mortar joints, which can lead to moisture penetration.

b. **Cleaning**: Cleaning should use only the gentlest means necessary, such as a low pressure water and natural bristle brushes. Soap may be used if necessary. Use water pressure at no more than 300 pounds per square inch (psi). High pressure water spray can have similar damaging effects to those of sandblasting.

c. **Chemicals:** If chemical treatments must be used for cleaning, obtain the advice of a building materials conservator or historic preservation professional on appropriate products, means, and methods. Consult with the manufacturer's representative for any products under consideration for use. Prepare a test panel before treating the whole wall.

d. **Crack Diagnosis:** Cracks in brick masonry should be properly diagnosed before undertaking any repair work. Cracks caused by structural stresses should be investigated by a structural engineer to determine their cause and appropriate remedial repairs. Any underlying structural problems must be addressed before performing repairs.

e. **Crack Repair:** Cracking through masonry joints should be repaired by repointing the affected joints. Cracking through brick units may require the replacement of the cracked units with new brick to match that existing. Use mortar and masonry techniques outlined below in the discussion of pointing and mortar.

f. **Spall Repair:** Remove spalled brick units and replace with new brick to match the existing in size, color, texture, and strength. Use mortar and masonry techniques outlined below in the discussion of pointing and mortar.

g. **Steel Lintel Repair:** The long-term solution to the jacking of masonry over a window or door by a seriously rusting lintel is to remove the rusting lintel in its entirety. A new lintel should be installed, properly flashed, and the removed brick should be used to reconstruct the masonry facing over the window or door to match its previous appearance.

h. **Extent of Replacement:** When replacement is necessary, replace only (1) individual bricks and small areas of brick masonry that are deteriorated through cracking or spalling or (2) areas that are structurally unsound as determined by a structural engineer. Do not replace wall areas that are not unsound.

i. **Painted Coatings**: In general, do not paint brick walls that have never been painted. However, a painted coating may be an appropriate treatment where excessive spalling of brick is occurring due to the poor quality of the brick. Use a breathable masonry paint that will not trap moisture within the wall.

j. **Efflorescence**: When efflorescence appears on an old wall, the source of the moisture should be identified and repaired. Remaining deposits can then be removed with a natural bristle brush or with a solution that neutralizes the salt.

k. **Sealant**: Waterproof building sealants should only be applied to joints in horizontal wash surfaces such as at sills, watertables, projecting cornices, and steps. These joints are particularly prone to water penetration. Do not use sealant in joints on vertical wall surfaces because it will trap moisture within the wall and lead to deterioration.

Pointing and Mortar

Mortar mix is extremely important to the functional needs and aesthetics of a brick or stone wall. Pointing mortar for an historic building should match the historic mortar in strength, color, texture, and finish.

In historic masonry walls, the mortar joints were soft, absorbing the seasonal thermal expansion and contraction of the wall and allowing moisture within the wall to escape through the joints.

Today's commercial mortars are too hard – harder than historic brick. When used in historic brick walls, today's hard mortars (1) force the softer historic brick to absorb the thermal movement causing cracking of the brick wall and (2) force moisture to escape from the wall through the brick causing cracking and spalling of brick units.

a. **Repointing:** Repoint open or unsound mortar joints. Match historic mortar joints in color, texture, strength, joint size, and tooling. Work to achieve visual continuity between surviving historic material and new patches. Do not repoint sound historic mortar joints.

b. **Unsound Mortar:** Remove unsound mortar to a depth of 2 1/2 times the width of the joint or to sound mortar, whichever is greater. Remove unsound mortar joints with hand tools that are narrower than the mortar joint. Do not use power tools, because they can scar adjacent masonry.

c. **Saw Cut:** Under special circumstances and careful supervision, a thin saw cut may be run down the center of a horizontal joint with the remainder being removed by hand. However, masonry saws should never be used on vertical joints.

d. **Mortar Strength:** Match repointing mortar to the strength of the existing mortar of the historic building.

The repointing below the window in this historic wall does not match the color, texture, or tooling of the historic mortar to the right and left.

Detail of repointed joints showing modern grey mortar to the right that does not match the rich brown color and texture of the historic sand mortar to the left.

Repair of a structural crack caused by building settlement between the head of the window below and the sill of the window above.

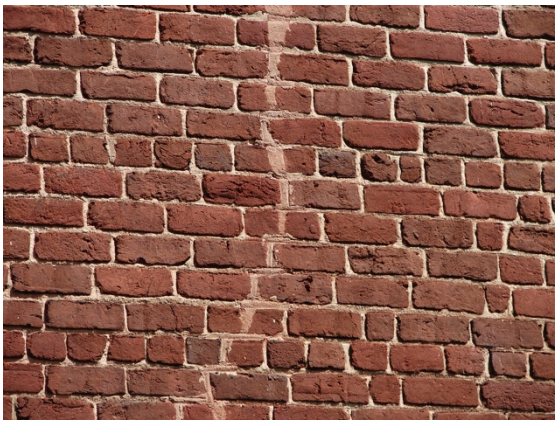
e. **Mortar Analysis:** If possible, have a mortar analysis undertaken of a sample of the historic mortar to determine its composition and strength. Such an analysis can be performed by a building conservator for a modest cost. Use the mortar analysis to prepare a custom specification for the new mortar matching the materials and mix proportions of the historic mortar.

f. **Commercial Option:** If matching the historic mortar mix is not feasible, a commercially available "Class N" cement mortar may be used. Type N mortar mix is an industry standard general purpose mortar mix preferred for soft brick or stone masonry. A type N mix is composed of 1-part Portland cement, 1-part lime, and 6-parts sand and has a medium compressive strength.

g. **Color and Texture:** Pointing mortar for a historic building should match the historic mortar in color and texture. Sand should be used as the coloring agent wherever possible, as opposed to commercially available tints. Do not use standard grey colored mortars.

h. **Test Panels:** Matching the color, texture, and appearance of the historic mortar should be achieved through trial and error using test panels. Multiple test panels are usually needed to achieve the right color and texture match.

i. **Mask Grouting:** Mask grouting is the practice of applying a skim topcoat of mortar over existing joints and is essentially a cosmetic fix. Not only does it hide any underlying existing mortar problems, it alters the appearance of the entire building. This practice is inappropriate and should be avoided.



The crack repairs in the two photos above use mortar of the wrong color and texture, not matching adjacent historic mortar. Additionally, cracked brick units were not removed and replaced but their cracks were repointed. Though not preferred, this treatment may be acceptable when matching bricks cannot be obtained, such as in the extremely old wall at top; but in general is inappropriate.

STONE MASONRY

Stone is one of the strongest and most enduring building materials. Despite its desirable qualities, the expense of quarrying, shipping, and building with stone has often limited its use in construction. Stone was not commonly used for exterior walls in eighteenth and nineteenth century vernacular buildings in Massachusetts, which were usually of wood frame construction. However, field stone was used for basement and foundation walls.

Stone was sometimes a featured material in landmark buildings that were prominent in public life or private industry, such as banks, libraries, government buildings, and mills. Stone was often used as a trim material for lintels, sills, watertables, and steps in conjunction with brick masonry walls.

By the late nineteenth century, stone became more widely available due to the ease of shipment by railroad. It became a desirable material in emerging architectural styles for both commercial and affluent residential construction. Common types of featured building stone included limestone, sandstone, marble, and granite.

Stone was not a common material for residences within Wellesley's Cottage Street Historic District. It appears more frequently in later, affluent early twentieth century historic neighborhoods in the Town. Along Cottage Street, stone is used for foundation walls and exterior steps. Some of these applications, however, appear to be later decorative changes, not original to the buildings. In several cases, stone was applied as a veneer treatment over underlying foundation walls that may be of earlier masonry or of later concrete.

Condition and Causes of Stone Masonry Deterioration

The issues and recommended treatments for stone are similar to those that are recommended above for brick masonry. Both stone and brick are resilient when properly maintained, but can quickly succumb to water damage when mortar joints deteriorate.

Joints, however, are not the only locations where water can enter a masonry wall. Although stone is often thought to be impermeable, many types of stone are actually porous and can absorb water through their face. Like brick, stone must be allowed to breathe or water vapor can become trapped inside the wall, causing weathering and deterioration of the body of the stone and causing cracking when it freezes.

Stone foundation of a wood framed vernacular building within the Cottage Street Historic District.

Open Joints – When mortar joints fail in a stone wall, they allow water to flow into the wall, creating a chain of events that can weaken the entire wall. Variations in pressure caused by water and ice can cause individual stones to move. Cracking along the mortar joints is one indication that the stones are in motion.

Cracks – Cracks in masonry should be properly diagnosed before undertaking any maintenance or repair work. Cracks caused by structural stresses should be investigated by a structural engineer to determine their cause and appropriate remedial repairs. Any underlying structural problems must be addressed before performing repairs.

Not all cracks in stone masonry require repair. Cracks may simply be a part of the natural weathering process for some stone masonry. Small, hairline cracks on vertical surfaces of stone masonry should not be repaired unless they are deep enough to allow water to infiltrate into the masonry wall. However, such cracking on horizontal wash surfaces should be patched with a knife-grade patching compound

Delamination – Surface deterioration and delamination through the body of stones are problems caused by water infiltration into masonry. Saturation of porous limestone or sandstone caused by water infiltration from above or from the ground can result in surface deterioration in which layers of stone flake away.

Sodium, calcium, and magnesium chloride based de-icing salts can damage foundation masonry as well. The salts are absorbed into the masonry with the water. As the masonry dries, the salt residue forms deep within or on the surface of the masonry causing internal stresses and damage.

Washes and Watertables – Stone is often used for wash surfaces in masonry walls, such as sills and watertables. A watertable is a sloping horizontal course of stone where a transition from thicker lower walls to thinner upper walls is made. Many watertables in brick masonry walls are design features and made of stone.

Masonry joints on the wash surfaces of sills and watertables are exposed to weathering, and the mortar often deteriorates leaving open joints. Water enters the wall though the open joints causing movement and cracking when it freezes.

Examples of stone foundation walls of historic buildings within the historic district.

Stone Masonry Treatment and Repair

In general, for treatment of stone masonry, follow the recommendations outlined above for brick treatment and repair.

a. **Resetting and Replacement:** Minimize the removal and replacement of historic stone masonry. Only remove or rebuild substantial portions of stone masonry walls when such rebuilding is crucial to maintaining a building's structural integrity. When resetting or replacing a stone wall, replicate the existing pattern of stone. Rubble stone is laid randomly, and ashlar (rectangular) stone is laid in neat rows.

b. **Repointing:** Cracks and deteriorated mortar in joints should be filled with new mortar that matches the color and texture of existing historic mortar joints. The width and profile of existing mortar joints should be replicated as closely as possible. Work to achieve visual continuity between surviving historic material and new mortar.

c. **Unsound Mortar:** Remove unsound mortar to a depth of 2 1/2 times the width of the joint or to sound mortar, whichever is greater. Use hand tools that are narrower than the mortar joint. Avoid the use of power tools, which can scar adjacent stones. Repoint only those joints that are no longer sound; do not remove sound mortar from existing joints.

d. **Patching:** Where appropriate, patch small pieces of lost masonry with cementitious patches. Commercially available patching compounds can be either Portland cement-based or natural hydraulic lime-based. It is important to choose a patching compound that is compatible with the compressive and flexural strengths and permeability characteristics of the masonry to be repaired. The use of overly hard material can result in further damage to the stone.

This chimney within the historic district appears to have a custom stone cap with a terra cotta flue cap.

A rubble stone foundation wall at a house within the district.

Granite stone exterior steps have been installed on several homes within the historic district. They also appear to be later additions, but they are appropriate to the character of the district.

e. **Dutchman:** Damaged areas of stone that are too large to patch may be repaired by installation of a dutchman. The deteriorated portion of the stone is cut away and a new piece of stone or dutchman is installed matching the existing stone. Dutchman repair is a much more durable repair than a cementitious patch repair and should last as long as the masonry itself. Dutchman repairs require skill to install correctly and should only be undertaken by experienced masons.

f. **Limited Repairs:** Fine masonry details exposed to the weather at some locations have experienced some chipping and spalling of their corners and edges. While visually detracting, such conditions may not threaten surrounding masonry. It may be advisable to leave such details as is. Repairs may not hold up to the severe conditions that caused the chipping in the first place.

g. **Consolidation:** Consolidation is a common remedy for surface disintegration in silicate-based masonry such as sandstone. Consolidation material is penetrated into the stone to strengthen cohesion between grains at a microscopic level. Consolidation should only be considered in situations where the masonry is friable (prone to crumbling) and exhibits surface disintegration and should only be undertaken by qualified professionals.

h. **Sealant:** Sealant should be installed in the horizontal wash surfaces of stone masonry such as sills, watertables, parapets, and steps. Sealant should never be installed on vertical wall surfaces, as it will trap water within the masonry wall, forcing the water back into the masonry units.

i. **Coatings:** Do not apply waterproof coatings, paint, or stucco as a substitute for repointing and general maintenance. Such coatings will trap moisture within the wall and cause deterioration.

Stone is used most prominently in foundation walls within the historic district. In general, the walls are in good condition and are well maintained. The walls are mostly roughly coursed field stone, and some may not be original to the buildings.

The bricks in this chimney show their age – some are chipped and slightly spalled. They need not be repaired or replaced, however, if they do not threaten the masonry as a whole.

STUCCO

Stucco is a form of mortar used to give walls a smooth, finished appearance and protect them from deterioration caused by exposure. Stucco was traditionally applied in two or three coats directly to the underlying substrate, usually masonry. Buildings that have historically been covered with stucco should remain so. The underlying masonry may have been of inferior quality and was never meant to be exposed to the elements. In the twentieth century, stucco began to be installed over metal lath nailed to the substrate for better adherence.

Stucco should not be installed on buildings that were never historically stuccoed and should never be used as a substitute for maintenance of the masonry substrate. Masking problems with a surface coating solves nothing. In some rare cases, however, stucco may be an appropriate protective surface treatment for masonry buildings where the building's underlying brick or stone material is of poor quality and is severely deteriorating.

Stucco is meant to be a sacrificial protective coating and, therefore, requires cyclical maintenance and reapplication. Stucco is composed of a binder of sand and often a reinforcing fiber. It is applied in two to three coats. The first coat is called the brown coat, the second is the scratch coat, and the final coat is the finish coat. Stucco was traditionally composed of lime-based binder materials. Modern stuccoes are usually composed of Portland-cement and hydrated lime.

Condition and Causes of Stucco Deterioration

Moisture and water infiltration is the main cause of stucco deterioration and failure. Problems with roof drainage systems can accelerate stucco deterioration. Excessive water runoff over a stucco surface will lead to disintegration of the stucco. Water splashing up from the foundation, or moisture penetration through rising damp, can cause the stucco to lose its bond to the substrate.

Wet stucco is vulnerable to freeze/thaw deterioration in cold weather. Water moving through the stucco leaches out carbonate material which builds up in areas where the water evaporates on the surface. Salts from the ground may accelerate stucco deterioration through salt crystallization.

This building at the south end of Cottage Street has the most prominent use of stucco within the historic district.

Cracking – Cracking in stucco can be caused by several mechanisms. Shrinkage cracks can form if the stucco has dried too quickly during installation. Building settlement can cause cracking in the stucco finish. Metal elements, such as metal lath or metal corner beads, expand at different rates than the stucco, causing cracking.

Stucco On Lath – Later stucco applications that have been applied over metal lath is particularly vulnerable over time. Often, the metal lath or lath nails have been inadequately sized and are not strong enough to hold the applied stucco.

The stucco on metal lath may have no expansion joints, which are required to absorb the movement of the lath during thermal expansion. Water infiltration into the stucco and metal lath system will cause the lath to corrode and fail.

Stucco Treatment and Repair

a. **Preservation:** Retain, repair, and maintain stucco surfaces that are historically significant to an existing building.

b. **Extent of Repair:** Where existing stucco is deteriorated, it should be repaired to match adjacent surfaces. Remove only the deteriorated stucco.

c. **Stucco Hardness:** It is important to repair existing stucco with similar materials. Dissimilar materials will have problems bonding to the existing material. Portland cement-based stucco mixes are too hard and dense for soft, permeable historical masonry.

d. **Compatible Stucco:** Natural hydraulic lime-based stucco mixes will require more care during installation, but provide a flexible breathable coating that is compatible with historical masonry.

e. **Test Panel:** Before applying the replacement material to a large wall area, use a test panel to determine if the color and finish are appropriate. Once a proper recipe has been determined, it should be recorded for any future repairs to the building.

f. **Match Existing:** When repairing stucco, make sure that areas of patched stucco match the strength, composition, color, and texture of the original to the greatest degree possible.

Details of stucco walls.

g. **Tinting:** Stucco patch recipes should be tinted to match the weathered appearance of the existing material.

h. **Stucco Repair:** In stucco repair, remove all of the loose or severely cracked stucco to expose the masonry substrate. The area to be patched should be cleaned of all debris. Masonry joints may need to be raked out 5/8-1 inch to ensure good bond between the substrate and the new stucco. Stucco should be applied directly to masonry whenever possible.

i. **Application:** In applying stucco, begin from the top of the wall. Application should be smooth. Surplus stucco should be washed off with a light stream of water. Allow the stucco to set for 30 to 60 minutes. Using a fine spray of water, etch the surface to match the texture of the earlier stucco.

j. **Thickness:** Carry out stucco repairs so that the surface thickness of the repaired stucco matches that of adjacent historic stucco.

k. **Crack Repair:** Cracks in stucco should be repaired with cementitious materials similar to those found in the original mix. Hairline cracks can be filled with a slurry made of the finish coat mix. Larger cracks must first be cut to provide a groove or "key" for receiving the new work. A groove can be cut by using a knife to open up an existing crack. The edges should then be undercut with a hammer and chisel. After applying stucco, it should be kept moist for three to four days to allow curing.

l. **Sealant:** Sealant should never be used to repair cracks in stucco.

Stucco has been used as a protective coating over vulnerable masonry foundation walls.

METALS

Metals were in limited use as original historic materials in Wellesley's historic neighborhoods and are found on the exterior of buildings today most frequently in hardware, flashing, roofing, railings, and decorative features. Where original historic doors, windows, and shutters are still present, their historic metal hardware is usually present as well. Metal was often used as a roofing material for shallow pitched roofs, such as for entrance porches, but most original metal roofing has been replaced over time due to weathering.

The metals most commonly used in architecture are alloys containing lead, tin, zinc, copper, nickel, aluminum, and iron. Iron and its alloys, including steel, are particularly prevalent in buildings because of the increase in quality and lowering of production costs brought about by technological breakthroughs in manufacturing in the late nineteenth century. Metal elements are inherently durable if properly maintained.

Condition and Causes of Metal Deterioration

Corrosion is the major cause of deterioration of architectural metalwork and is exacerbated by the presence of moisture. Corrosion can be caused by structural stress, electrochemical reaction with dissimilar metals, or corrosive environments, such as salt-laden water. It is accelerated wherever water collects against metal elements, such as at the base of metal posts.

Metals undergoing corrosion are slowly reverting to their natural ores, such as iron oxide. This process involves significant expansion of the corroding metal, which can cause extensive cracking when the metal is embedded in masonry or concrete. (See the discussion of steel lintels under Brick Masonry, above.)

Architectural metals can also deteriorate from mechanical failures, such as overloading or fatigue. For example, operable metal hardware installed with doors and windows can deteriorate over time due to metal fatigue. The constant use of metal handrails can result in sections working loose at their anchors, causing damage to the wood or masonry to which they are connected.

As also discussed in Chapter 7, remnant historic metal features such as this pintle form a late nineteenth century shutter hinge should be preserved whenever possible.

Metal Treatment and Repair

The architectural metalwork of historic buildings can be maintained through proper surface preparation and application of protective coatings where appropriate. Some metals must be painted for protection while others should be left unpainted

a. **Iron and Steel:** Cast iron, steel, and tin are the most common metals used in historic features in Wellesley's neighborhoods and should be painted to protect them from corrosion.

b. **Other Metals:** Copper, bronze, aluminum, and stainless steel should be left exposed. Historic copper and bronze are present to a limited extent. Aluminum and stainless steel are modern materials used for new, non-historic features. Modern aluminum often has a baked factory finish that should not be painted.

c. **Maintenance:** Ongoing maintenance can help prevent weathering and deterioration and the need for replacement of metal features.

d. **Paint Deterioration:** Deteriorated paint on painted metal surfaces should be removed using appropriate methods, including wire brushing for non-decorative elements exhibiting light rust, or chemical paint removal for heavier built-up paint.

e. **Removal for Repair:** Severe corrosion of historic metal features may require that entire sections or features of metalwork be removed and carefully repaired in a shop before reinstallation.

Copper is a common historic material used for roofing, gutters, and downspouts and should be retained whenever possible.

Lead was commonly used for the flashing of brick masonry chimneys and is still present within the historic district.

Most metal handrails within the historic district are of modern installation. The posts of metal handrails are susceptible to deterioration where they anchor into concrete or masonry.

f. **New Paint:** Newly cleaned metal should be immediately protected with a rust-inhibiting primer. Alkyl-based enamel paints are recommended for finishing iron alloys. Latex and other water-based paints are not recommended.

g. **Replacement:** Replacement of historical metal elements should only be undertaken as a last resort, when the element is deteriorated beyond repair. Most original metal elements in historic buildings are important character defining features, and replacement in kind could be expensive.

h. **New Metal Features:** Where new or replacement metal features are required, their design should be sympathetic to the historic character of the building. Most modern stock handrails, for instance, are not appropriate for historic buildings. Sympathetic modern profiles should be found. Usually, simplicity is preferred over new metal features that are highly decorative, especially for vernacular residential buildings.

Decorative metal features such as this light and house numbers are common within the district but are generally modern installations.