

*Family plot threshold  
Watertown*



## GENERAL RECOMMENDATIONS PERTAINING TO MUNICIPAL HISTORIC BURIAL GROUND AND CEMETERY COMPONENTS

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During the winter and spring of 1999, fall of 2000 and spring of 2001 on site investigations, analyses and evaluations of 32 historic burying grounds and cemeteries across the Commonwealth were completed. Examination revealed a distinct similarity of problems and the desirability of standard acceptable solutions to these difficulties, where appropriate.

The overall goal of the Historic Cemeteries Preservation Initiative is preservation and stabilization to prevent further damage and to enhance the appearance of historic burying grounds and cemeteries wherever possible. The importance of these sites to a community is emphasized by well kept lawns, other components kept in a good state of repair and an inviting informative sign system. A well maintained site tends to discourage vandalism and promote further community support. All outdoor elements need regular maintenance regardless of age or condition.

The following contains a summary of general guidelines for protection, stabilization, preservation, restoration and/or maintenance. Because of the rapid advances in knowledge and techniques today, this should serve only as a general guide. Specific changes in these recommendations, particularly in regard to materials and methods, are expected over time.

These guidelines are provided for general information and are presented on a variety of levels. Most of these techniques and materials should not be used without appropriate training and in most cases a professional should be consulted before attempting anything. Inappropriate use of these techniques and/or materials can cause irreparable damage. In the majority of cases, a professional conservator should prepare a program of work specifying appropriate methods and materials for use. Conservation work should be performed by professional conservators. In some instances a conservator might be able to train people to perform some of the types of work involved and should supervise any work done by volunteers.

## GENERAL

### *Issues*

The sites examined in this program included both active and inactive sites that are maintained by a variety of municipal departments. Newton is unique in that there is no other active cemetery in the city and their maintenance crews have not developed the special skills necessary to maintain a historic burial ground or cemetery. Most of the grounds examined are kept reasonably free of trash and leaves, and the grass is mown regularly. Not surprisingly, burial grounds and cemeteries that are still active or in use tend to be the best maintained. Communities with active and collaborating Cemetery and Historic Commissions tend to care quite well for their inactive historic sites. The few sites that are primarily maintained by volunteers have for the most part been abandoned by the respective municipalities in terms of providing maintenance. The quality of maintenance in these cases is determined by the interest, stamina and long term endurance of the volunteers as well as available equipment.

### *Recommendations*

Litter is a major problem in any public open space and one that must be controlled to create pride in a historic property. A neglected appearance seems to encourage vandalism or additional trash dumping. In this regard it is important to provide a moderate to high maintenance and management approach. A site should receive complete attention every 10 to 12 days during the summer. Leaves, paper, trash or debris should ideally be removed on a weekly basis and more often once it becomes a heavily visited site. Collection of trash from receptacles should be performed daily. Leaves should be removed during the fall and the grounds cleared of fallen branches.

Each landscape character has its own requirements and potential hazards that maintenance personnel and budgeting or funding entities must be aware of. There needs to be maintenance standards and an interest in upgrading training beyond a basic level. Maintaining a continuity of maintenance staff with a commitment to the preservation of a historic place is critical. It is also beneficial because this specialized knowledge is transferred to new staff members over time.

Most tree work is currently performed by private contractors because of their skills. Most need to be made aware of concern about historic artifacts on the ground below trees. Maintenance practices should be implemented in many communities to include the elimination of side collecting lawn mowers and introduction of the use of plastic whip weed whackers to reduce chipping and scratching damage on grave markers. Power mowers should be equipped with rubber bumpers as well as blade guards to prevent them from throwing stones and sticks.

## LANDSCAPE CHARACTER AND VEGETATION

### Landscape Character

#### Issues

The landscape character of historic burial grounds and cemeteries includes much more than grave markers and monuments. Natural topography and grass are essential character defining features of the older historic burial grounds. It is difficult not to appreciate a dramatic lawn covered hillock. Complimentary vegetation is an additional feature of later historic cemeteries. The landscape character must be nurtured and accentuated where appropriate to provide a more comprehensive experience for public appreciation, beyond the grave markers.

Selecting an appropriate landscape expression for each property is perhaps the most difficult choice to be made. Many sites combine more than one period of development and span more than one period or style in the evolution of graveyard design. Vegetation has been added to most sites, either purposefully or by natural forces.

*Limited vegetation in early burial grounds, Old Hill Cemetery, Newburyport*



The primary question related to the landscape character of historic burying grounds and cemeteries is whether the notion of plantings, which were not introduced to most graveyards until the mid 1800s, should remain. This often lavish treatment was frequently added to very old burial grounds that date back to the 1600s and 1700s. Trees were not planted in these early cemeteries and few ornamental plantings were included. Prior to the mid 1800s, most vegetation had been left in place as a burial ground developed, or perhaps it filled in at the perimeter of a site as volunteer growth. The lawns were often used for grazing cows.

Most plantings were added in the mid 1800s in response to the ground breaking work at Mount Auburn Cemetery and the rural cemetery movement. Historic photographs of many of these sites from that period and later indicate that they contained numerous shade trees. Extensive shrub, vine and ground cover plantings, urns with seasonal plantings and bedding out planting is a typical and appropriate Victorian treatment for many sites developed or expanded after Mount Auburn Cemetery.

*1833 engraving illustrating barren character, Kings Chapel Burying Ground, Boston*



Only two of the sites in this program could be considered part of the rural cemetery movement [Nahant and Everett], although a number of others have portions of properties that were developed during the Victorian period [Newton, Sunderland, Braintree, Brookline, Brimfield, Sterling, Spencer and Worthington]. Few of these sites retain many fragments of the Victorian era, other than at family plots, and restoration to the rich splendor of this period will be difficult.

Landscape choices are often dictated by the financial ability of a community to maintain a site. Graveyards from the 17th and 18th centuries were simple and easy to maintain with virtually no landscape embellishments. During the mid 19th century cemeteries had lush plantings and decorative elements which required labor intensive maintenance. More recent cemeteries have simplified maintenance requirements in comparison. Some of the Victorian cemeteries established in the mid 19th century find it difficult to live up to the promise of perpetual care without additional funds. The cost to maintain a Victorian cemetery may require more labor and expense than most communities can afford without extensive fund raising efforts.

*Victorian planting c. 1907, Kings Chapel Burying Ground, Boston*



Returning the landscape image of early burial grounds to a relatively plain expression is desirable but often complicated by changes in the surrounding context of many of these sites. Visual intrusions from adjacent properties can detract from a visitor's experience. For many of the older burying grounds, the period between 1830 and 1850 [that is, between the establishment of Mount Auburn Cemetery and the Victorian period], could be considered the period of significance in regard to landscape image. This was the beginning of a significant image shift. Trees and other vegetation were introduced during this time, as well as perimeter cast iron fencing. Significant decorative elements, Victorian embellishments, had not yet found their place in these sites.

In our contemporary setting, 1830 to 1850 is an important period. There is often a definitive need to retain the concept of the trees introduced at that time. When these grounds were initially established, there were often distant views and very few competing structures or other visual elements. There have been significant changes in the visual character at the edges of most of these sites since that time. Today many are shrouded by buildings, often tight up to their boundaries. These buildings are a visual distraction. The trees are an important element, if only to cloak the buildings and provide some visual separation or isolation of the burying grounds from their surroundings. Trees also provide a distinct inviting image for tourists and passersby.

### *Recommendations*

Looking at the context of each burying ground and cemetery today in relation to how each began is a determining factor in resolving an appropriate landscape character. In historic burial grounds there is often merit in maintaining the addition of plantings, particularly shade trees. In the most extreme examples shade trees provide some visual separation from the adjacent tall buildings in a dense urban context. Other historic burying grounds also benefit from the incorporation of trees for similar reasons, although perhaps to a lesser degree.

Because of adjacent undeveloped or open land and separation from contemporary architectural surroundings, some sites offer greater potential to present an appropriate 17th or 18th century image than others. This adjacent land could be acquired for open space purposes, or potential setbacks and view corridors could be imposed upon it. While most historic burying grounds should retain shade trees, some could and should have less and be presented with an image closer to their 17th or 18th century heritage. This would allow them to express the landscape character of that period. Where appropriate and possible, vines should also be introduced on adjacent structures to reduce the architectural visual intrusion and give the impression of green views or surroundings.

On sites that have multiple stages of development, it has been generally recommended that each stage of development be given the appropriate, applicable landscape treatment. This will accentuate visual differences in areas of different historic periods and help facilitate public understanding of the evolution of landscape treatment for sites of this type. Care must be exercised in the re-establishment of this landscape treatment to avoid creating a romantic view of what a 19th century cemetery looked like. Decisions should be based upon information available in historic planting plans, photographs of the period and/or the results of other definitive forms of investigation.

As a general rule shrubs, vines, ground cover and seasonal plants or flowers should not be replanted within historic burying grounds established before 1831 for historic, maintenance and security reasons. Shrubs and seasonal plants should be added to support the sites with a recommended Victorian image. This should be done thoughtfully and with consideration given to safety and security at each of these sites. The replanting of numerous shrubs, vines, ground cover and seasonal plants or flowers within a cemetery should be limited to the capabilities of maintenance staff and/or volunteers. The use of tall shrubs and small trees that obscure eye level views should generally be limited for security reasons.

Some authorities favor the use of ground cover over grass to decrease weekly maintenance requirements and offer greater protection to grave markers. This is generally not "historically correct" in terms of appearance, and other technical issues may also limit the apparent benefits of this approach.

## Planting

### Issues

Large deciduous shade trees are the predominant plant material in most sites and for the most part they should be maintained. They provide a distinct inviting image for visitors, passersby and adjacent residents. Shade trees also provide some visual separation from adjacent buildings. A few sites have mostly evergreen trees with the related problems of dense shade, difficulty establishing ground cover and moisture retention in grave markers. There are generally few shrubs on any of the sites. Soils in many of the sites are of poor quality, so surface roots are not uncommon.

Trees can be either an asset or a liability to a cemetery or burial ground depending upon decisions made and adopted in the planning stage. It is of utmost importance that the proper tree or shrub is planted in the right location, maintenance is provided, and a long term plan is adopted for care. A revegetation program should be initiated on many sites with appropriate species. It has been proven that a good healthy urban forest consists of trees of varying ages and a mixture of species of trees. There is no such thing as maintenance free trees or grass. However, choosing trees and turf with proven resistance to diseases, insects and environmental problems will reduce some of the maintenance.

### Recommendations

Replanting is important in sustaining an inviting atmosphere on many sites. Trees should be planted as older ones are removed and a general effort should be made to replace trees. Underplanting of existing trees is not advantageous. After several years of dense shade and crowding, underplanted trees are typically malformed, weak and thin. If root conflicts with gravestones are a problem, the trees should not be replanted in the same exact location. Each case should be evaluated individually with the preservation of gravesites being the prime consideration. An archaeologist should be consulted regarding specific tree locations and a permit should be obtained from MHC prior to the execution of new planting.

If trees die or need to be removed due to conflict with gravestones or tombs, the trees should be cut as close to the soil level as possible and the stump and root system left in place to decay. Because the use of chemicals to speed this process could cause problems for gravestones, they should be avoided. If chemicals are deemed necessary, a stone conservator should be consulted before use.

*Storm damaged tree, Village Cemetery, Tisbury*



*Storm damaged tree  
Watertown*



In cemeteries with little activity, smaller trees, 1" to 2" caliper in size, will establish relatively quickly with very little care. New research has shown that a tree takes 1 year to establish itself for each 1" of tree diameter of size when planted. For the first 30 years, trees grow about twice as fast as they do when they're older. Water newly planted trees for the first 3 to 5 years. Remove guying cables and tree wrap [if used] from newly planted trees after the first 2 years.

**Mulching:** Trees growing in an area with a restricted root zone, low nutrient levels, pH imbalance, low moisture conditions and soil compaction decline faster as they mature. Grass and weeds also compete for nutrients and moisture. Research is showing that trees, especially older mature trees, improve in health when turf or grass is removed under the branch spread and mulch or wood chips are applied at a depth of no more than 3 to 4". Surface roots are also protected when mulch is applied at that rate. When appropriate, trees should have grass removed from beneath their canopies as far as possible from the main stem. However, this is not always appropriate in historic burial grounds and cemeteries where prevention of erosion is of paramount concern.

**Shrubs:** Fertilize shrubs once a year during the spring. Spread fertilizer over the surface of the ground surrounding the shrubs. Soak the area thoroughly. Edge plant beds twice a month or as needed. Ornamental trimming or pruning should be consistent with the natural landscape and historic character. Plants should appear natural and healthy as opposed to geometric and fanciful. Prune to admit light and air to the center of the shrub. Prune only as plant growth requires. Prune spring flowering shrubs after they have bloomed. Prune summer flowering and other deciduous shrubs during the dormant season. Prune evergreen shrubs in late spring or early summer. Remove dead wood at any season.

**Ground Cover:** Keep weeded continually. Avoid disturbing runners. Prune regularly to maintain a low spreading appearance. Remove vertical shoots. Fertilize at the same time lawns are fertilized.



*Fallen tree, East Parish Burial Ground, Newton*

## Species Selection Considerations

### Issues

A specific planting plan should be developed prior to planting additional trees. The selection of tree species is an important consideration in terms of appropriateness, maintenance requirements and protection of historic artifacts. Botanic diversity is a particularly important consideration for sites that have roots in the rural cemetery movement. Large scale monocultures are generally not recommended because of experience with devastating diseases like Dutch Elm Disease, White Pine Blister Rust and Chestnut Blight. Acid rain has been monitored for many years, and it is suspected to be affecting Sugar Maples, causing Maple decline. Traditionally, Maples have been considered to be long lived trees where narrow tree pits, road salt and drought have not been a problem.

### Recommendations

Replacement trees should be limited to areas that do not interfere with grave markers, paths, drives, fences, walls and buildings. The preference is to use large native shade trees like Sugar Maple and Oak. Consideration should be given to the reintroduction of improved disease resistant species of Elm and the use of non-natives like Katsuratree.

Evergreen trees add winter interest and could be used provided they are limbed up to maintain sight lines and a sense of security for visitors. Evergreens also offer the symbolic connotation of immortality.

Trees that require increased maintenance or present potential hazards to historic resources, like Poplar and Willow, should be used sparingly. Trees that are subject to storm damage should not be planted in the historic burying grounds and cemeteries because of the potential damage to historic artifacts with falling limbs, etc. This includes Ailanthus, Ash, Black Cherry, Cucumber-tree Magnolia, Poplar, Red Maple, Silver Maple, Sophora, Tuliptree and Willow. White Pine, White Ash and Tuliptrees are also struck more often by lightning than most other trees.

Trees that grow fast like Willow, Poplar and White Pine break up easily and have one of the highest failure rates. Most White Pines have codominant branching from White Pine Weevil invasion when they were young. This type of growth is prone to large branch failure facilitating the entrance of decay within main stems.

Trees that are subject to wind throw have had their surface roots damaged from vehicles or lawn equipment. Root failure occurs more readily on trees that have root decay or other root problems. Up to 75% of all tree failures are due to root problems. Tall trees with large upper crowns are more subject to wind throw with root loss. Trees that have vertical cracks and decay throughout the lower and upper stems are prone to failure.

Trees with a dense surface feeding root system make it difficult to grow turf in the same area and should also be avoided. These include Beech, Honeylocust, Linden, Norway Maple, Poplar and Willow. Trees that have annual problems with insects such as aphids on Lindens should be avoided because of the staining and mess it causes on the grave markers.

Trees that create significant litter due to fruit and/or seed production should be used sparingly because of the additional cleanup work required by maintenance staff. This includes Ash, Black Cherry, Catalpa, Corktree, Ginkgo, Horsechestnut, Mulberry, Planetree and Sweetgum. Many fruits cause staining on grave markers, pavements, walls, etc. Flowering trees of choice should have small fruits and be disease resistant to leaf and stem disease like fire blight, leaf spot and apple scab. Crabapple and Red Cedar should not be on the same site unless disease resistant varieties are used. Diseases causing leaf and stem damage can be devastating when both hosts are present.

The dropping of aphid secretion or 'sap' on gravestones and tombs is also a particular problem when the preservation of gravestones is of prime importance. Linden and Norway Maple should be avoided because of this undesirable trait. Both also create a dense shade that inhibits the establishment of a stabilizing ground cover beneath them. Their tendency to develop basal sprouts is unattractive and blocks views. Structural problems and heavy pruning requirements for Zelkovas to allow sufficient light penetration for lawn development should limit the use of this tree.

## Vegetation Management

### Issues

The goal of tree maintenance is to maintain healthy trees free of dead wood which could fall on people or gravestones and tombs. The reasons for pruning trees may include reducing hazards, maintaining or improving tree health and structure, improving aesthetics, or satisfying specific needs such as: removing disease; removing dead, dying, interfering or obstructing branches; training young trees; eliminating screened areas to discourage loitering; and providing clearances for utility lines. The uncontrolled growth of trees and weeds hides vandals and can cause toppling of stones and widening of cracks in already damaged stones.

*Tree growth at iron fence,  
Glenwood Cemetery, Everett*



Trees require pruning on a regular basis to protect historic resources from damage by falling limbs. Too many trees or trees of the wrong type can create shade that is too dense to support and maintain a stabilizing ground cover which makes the surface subject to erosion. Too much shade can also be detrimental, particularly to slate and marble grave markers, in that moisture could be retained for long durations, increasing the probability of biological growth on important historic artifacts.

#### *Recommendations*

##### *Inspection*

Inspect trees to safeguard against threats to stones and tombs from root systems and falling or scraping branches. Inspections should be made on a yearly basis and after each storm where winds exceed 55 mph. Ideally trees should be pruned to remove potentially hazardous dead wood on a yearly basis, but safety pruning every 5 years by certified arborists is acceptable. A 5 year cycle of pruning will help maintain and preserve large old trees. Provide plywood shelters as necessary to protect stones and monuments until pruning operations are complete.

Root collars should be cleared of soil, mulch, stones, brush and other items that could hide or cause decay which could cause a tree to fail. Keeping root collars clean helps control girdling roots and decay that leads to tree decline and failure. Questionable trees with cavities, cracks or seams in main stems or branches, or fungi fruiting bodies on or around the root area should be assessed for potential tree failure.

Failure prediction with any sort of accuracy is difficult. However, systematic evaluations of each part of a tree, using the procedures adopted by the International Society of Arboriculture and outlined in the guide known as "A Photographic Guide to the Evaluation of Hazardous Trees in Urban Areas," will help to eliminate most of the suspected hazards. Remedial action such as pruning, installing support systems and removal will help reduce the failure percentages and the damage or injury to property or persons.

##### *Pruning*

Trees should be pruned in such a manner as to preserve the natural character of a plant and in accordance with ANSI 300 standards. All pruning cuts should be made outside the branch collar. Remove all dead wood, suckers and badly bruised or broken branches to reduce potential injury or damage to people, grave markers, vehicles and structures. Remove branches to provide 8 foot overhead clearance.

The pruning of trees should be performed or supervised only by a certified Arborist. It should be done by nonprofessional crews only during an emergency situation or when there is an immediate issue related to public safety. The removal of dead trees should be done by certified arborists, preferably concurrent with a pruning contract. In cases where gravestones are impinged upon by tree trunks or roots, the gravestones should be temporarily moved to a new location to prevent additional damage to them, but only if it is safe to move the gravestone. If growth is in conflict with gravestones or tombs extreme care should be exercised. Cut trunks as close to the soil as possible and leave the stump in place to decay. After a stump has decayed sufficiently, topsoil fill should be added to blend in with surrounding grades, and the area should be reseeded.

#### **Volunteer Growth**

##### *Issues*

It is essential to maintain a landscape with an appropriate historic character. The character of a landscape is dynamic compared to the relative stasis of other historic components like grave markers and structural elements. Natural forces like landscape succession will change an unmaintained lawn into a forest in a relatively short period of time. The undeniable results of these forces can be seen in Littleton, Mashpee, Newton, Peabody and Sturbridge. Many of the older burial grounds have large trees that might appear as old as the sites themselves. However, most of them were not there before the turn of the century. Many are volunteers, developed from seed blown in from outside areas.

##### *Recommendations*

Most, if not all, volunteer species should be removed. Vegetation control programs are actively pursued in many communities, removing undergrowth, many of the smaller volunteer species and selected trees. Volunteer growth should be removed on a yearly basis during the summer months when frequency of mowing is reduced and maintenance crews have time to remove it. Because lawn areas and edges attract volunteer growth, lawns must be mowed on a regular basis to keep this under control. The edges of a property and individual elements like markers and tombs must also be constantly monitored to keep volunteer growth in check.

## Lawns

### Issues

The primary ground cover on all sites is grass. It is often in poor condition with areas of erosion, sloughing, bare spots, weeds and depressions.

Soil stabilization is an important consideration in preserving landscape character and protecting the overall historic resource. Unstable or bare soils erode quickly, altering the appearance of topography and decreasing the viability of stabilizing vegetation.

Erosion and sloughing often occurs in cemeteries on steep embankments and mound tombs with slopes greater than 2:1, along paths and drives, or even at individual grave stones placed on steep slopes. It is typically caused by slopes created steeper than the angle of repose of a soil, concentrated storm water runoff, concentrated pedestrian circulation, sheet runoff, settlement of steep slopes, dense shade that inhibits growth of ground cover and/or dense shallow tree roots that compete with growth of ground cover. Paths and drives may contribute to the increased flow, velocity and concentration of storm water through a burial ground or cemetery, also contributing to erosion.

Where grave markers are positioned parallel to the steep slope of a hill, they often act as miniature retaining walls by collecting or retaining soil on the upslope side where surface runoff slows down and deposits sediment as it intersects a marker. Surface runoff increases velocity as it travels around a marker and scours the earth on the low side, leaving an eroded depression. This build up and displacement of earth creates an unbalance. Pressure created by the build up of earth forces above causes markers to ultimately lean or fall down hill, creating a long term hazard for the resource.

Bare spots are typically related to concentrated pedestrian circulation, root competition from trees, dense shade and/or dryness. Weed intrusion is primarily related to dryness and low fertility levels. Heavy shade conditions also impact lawn quality. Most depressions are related to earth settlement or tree removals.

Moss is present in the lawn areas on many of these sites. In lawns, the presence of moss is an indication of wet soil, poor soil in need of fertilizing, very acid soil or a combination of these factors. In the areas where it is present on most of these properties, wet soil does not appear to be the issue. Most New England soils are acidic, but not to the degree that moss is present. More often than not, moss on these sites is an indication that a soil has low light and fertility levels, particularly a nitrogen deficiency.

Most lawn areas need renovation, including proper pH level and fertilization. Maintaining a healthy lawn cover with adequate light, moisture and nutrients, and good maintenance procedures would reduce bare spots, weeds, moss and erosion on all sites.

### Recommendations

The primary appropriate method of decreasing erosion potential is the establishment and maintenance of dense lawn. In addition to tree removal for public safety reasons and/or for the preservation of historic resources, thinning of especially dense tree groups and removal of trees whose roots compete with ground cover should be considered. With reduction of the quantity of trees, reduced root zone competition and less overhead canopy vegetation, more light is allowed to reach the surface. Light enables the growth of a dense vegetated soil cover which will in turn reduce erosion.



*Erosion and sedimentation at grave markers on a steep slope, Old Hill Burying Ground, Concord*

*Erosion from concentrated overland flow and pedestrian circulation, Old Parish Burying Ground, Rockport*

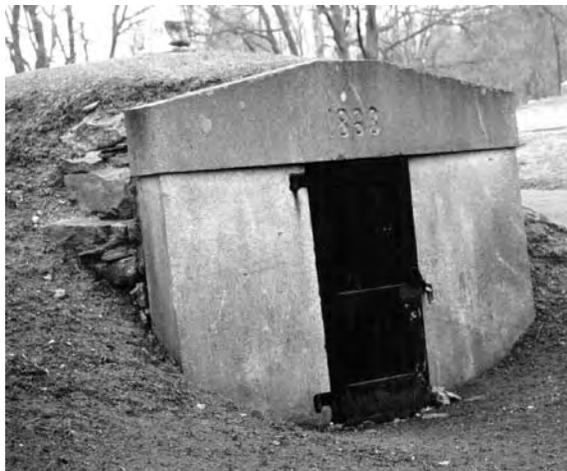


Where appropriate and possible, consider regrading paths to ameliorate erosive conditions. Replacing impervious paving materials with pervious materials, where appropriate, may also decrease erosion by reducing storm water run off.

At mound tombs regrade earth surfaces to reduce the concentration of storm water and velocity of flow where necessary, particularly adjacent to tomb facade structures.

Where markers are sited on steep slopes, earth sediment should be removed on the uphill side of markers and placed in the depression on the downhill side. These markers should be monitored annually with erosion repaired as needed.

*Erosion at mound tomb,  
Old Cemetery, Spencer*



*32 - General Recommendations*

Rehabilitating existing lawn areas: The rehabilitation of lawn areas in historic burial grounds and cemeteries needs to be done with more care than any other lawn because of the grave markers and potential bone fragments or other historic artifacts at or just below the surface of the ground. Weeds and other undesirable species should be removed. The soil should be loosened by power rake or vigorous hand raking. Rototilling is not recommended because of potential damage. Fertilizer and lime should be added as recommended by soil analysis. The fertilizer choice should be checked with a stone conservator as recommended herein under the discussion of soils.

Depressions that inhibit proper drainage of an area should be filled with topsoil to blend smoothly into surrounding grades. Care should be exercised with mounded or raised areas and regrading should be avoided or limited to avoid potential damage to subsurface elements. Bare spots should be topdressed, seeded and rolled. Water must be provided to maintain a sufficient moisture level to establish grass. The best time to install a seeded lawn is between August 15 and October 1 to reduce weed infestation and maintenance requirements. If it is necessary to plant in the spring, plant as soon as the ground can be worked and when the soil is free of excess moisture.

Installation of new lawn areas: In general sod is recommended in areas that need immediate use and seed is recommended for all other areas. Most seed mixes should incorporate improved, low maintenance, slow growing, drought resistant and shade tolerant seed cultivar mixes of Kentucky Bluegrass and Fescue. On steep slopes, stake sod installations and protect seed applications with biodegradable erosion control fabrics.

Watering: Water lawns as necessary to maintain normal growth and color. Soak the entire root area. Avoid light, frequent sprinklings. Watering lawns during the dry months of summer, does not appear to be a realistic possibility at this time given the current budget, maintenance crew size and limited sources of water at most sites.

Mowing: Mow to an average height of 3". The most serious issue is the routine removal of grass in the immediate vicinity of gravestones and tombs. Power mowers can scar and break stones. The types of stone used in older gravestones tend to be softer and more easily damaged than granite. The best current solution is to mow with lawn mowers to within 12" of gravestones and tombs and then use weed whips [rotating nylon filament trimmers] to trim the remaining area. The use of weed whips is permissible at granite, possibly slate and brick, but not marble markers. Metal hand trimmers should not be used because they can abrade stone. At the marble gravestones, and perhaps slate, consideration should be given to removing grass from areas around the bases of the stones. With most maintenance crew staffing, hand trimming is not feasible nor is the removal of lawn by hand to maintain a vegetative free zone adjacent to gravestones.

**Frequency of Mowing:** An ideal schedule would include mowing every 5 days from the beginning of the season to mid June, every 10 days from mid June to mid August, and every 5 days from mid August to the end of the season. Mowing just once or twice a year has some appeal in grounds with a low visitor population. However, the removal of grass adjacent to gravestones would be more difficult with longer and thicker grass blades, which in turn could potentially cause more damage to gravestones.

**Weed, Disease and Pest Control:** The use of salt, chemical weed killers as well as insect and disease sprays should be discouraged to prevent potential damage to gravestones. Many of these materials contain salts and acids which can be damaging to marble and limestone markers. When chemical controls are recommended, the formula should be checked with a stone conservator before use. Provide the appropriate pesticide application in late spring and early fall, if necessary. Do not treat a new lawn until its second year of growth. Do not burn grass in a historic burial ground or cemetery.

*Weed whip,  
Western Cemetery, Portland*



**Rolling:** Roll lawn areas in the spring as necessary to repair frost heaving irregularities caused during the winter. Use a light roller and roll the lawn when the soil is fairly dry, and freezing weather has passed.

**Aeration:** In sites with heavy visitation, aerate compacted lawn areas twice a year during the spring and late summer or early fall. Tines should not penetrate more than a 3" depth to protect buried resources. Do not aerate when the soil is extremely wet or dry.

## **Soils**

### *Issues*

**Soil Tests:** Soil analysis and testing helps determine the proper quantity and ratio of nutrients and other additives to improve a soil. Tests for pH and fertility levels should be made every 3 to 5 years to determine fertility changes made with basic treatments and to give a bench mark for further soil improvements. It typically also takes 3 to 5 years for the soil and the basic treatments to reach an equilibrium. Testing can be performed at places like the soils laboratory at the University of Massachusetts.

*Lawn mowed infrequently,  
East Parish Burial Ground, Newton*



**Liming:** Lime serves several important functions. It is of particular value in correcting the acidity of the soil. It also changes the structure of the soil, hastens bacterial action in the soil, aids in the liberation of plant foods which otherwise remain in the soil in unavailable form, hastens the decomposition of organic matter and supplies a small amount of calcium, which is one of the essential plant foods. By reducing the acidic nature of the soil, lime also helps protect in ground marble and limestone markers which are susceptible to acid damage.

#### *Recommendations*

Ground limestone should be applied every 3 to 5 years as determined by soil test results to bring lawn areas to the preferred 6.0 to 6.5 pH level. If a lime application is necessary, apply it 2 to 3 weeks prior to fertilizing. The soil pH must be at the proper level to make the benefits of a fertilizer available to plants. Lime should not be used in combination with animal manures or with nitrogenous fertilizers, as it causes the rapid release of ammonia. A fall application of lime provides time for it to break down in the soil before spring growth.

When applying lime for new lawn construction, it should be spread over the surface of the ground and thoroughly mixed with the upper few inches of soil. The rate of application depends upon the form in which the lime is applied and the texture of the soil. The rate of application of ground limestone should be determined by soil testing and should not exceed 75 pounds per 1,000 square feet at any one time. For new lawns lime should be applied either in early spring or late fall, with early spring [April] preferred. On established lawns or under trees, lime should only be surface applied so as not to disturb below ground elements or roots.

**Fertilizing:** Supplemental fertilizer improves vegetative health and vigor in a short period of time. Lawns and trees are both heavy consumers of nitrogen and they compete for it. Because nitrogen leaches from the soil, it should be applied annually. Application methods are different for trees and grass. If fertilizer is applied on the surface, the grass absorbs most of it.

Soil tests are required to determine fertilization needs. Lawn areas should be fertilized a minimum of twice a year to maintain a healthy lawn. Light, frequent applications of readily available Nitrogen fertilizers are preferred over heavy, infrequent applications. Lawns in this area generally require 0.5 pounds of Nitrogen per 1,000 square feet per growing month. Fertilizer should be applied with a mechanical spreader when turf is dry. This work could be either contracted out or performed by maintenance crews.

All trees should receive an annual application of fertilizer to sustain a reasonable level of health. Fertilizing with a slow release fertilizer with a ratio of 3-1-1 will not only improve the health but will also prolong the life of a tree. Trees should be subsurface fertilized to a depth of 12" at least every other year during the growing season, with Spring or Fall preferred. This could be contracted at the same time as pruning.

The chemical formulation of all fertilizers proposed for use should be checked by a stone conservator prior to use to prevent potential damage to gravestones and other artifacts. Many fertilizers are acidic which is detrimental to marble and limestone. Ideally a nonacidic, slow release, organic fertilizer should be used to reduce the potential conflict between stone conservation and the desire to obtain healthy vegetation.

## ACCESS AND SECURITY

### **Pedestrian and Universal Access**

#### *Issues*

All sites have pedestrian access, but few offer universal accessibility because of slope considerations, absence of paths, and/or the condition and narrowness of paths. The widths of paved paths vary, but tend to be in the 30" to 36" wide range. These and historic impediments make it virtually impossible for many sites to be completely universally accessible.

*Deteriorated path, Old Cemetery, Spencer*



### *Recommendations*

Universally accessible improvements should be made where feasible and where visitor demand merits such improvements. Gates need to have at least a 34" clear opening to be considered universally accessible and paths should be at least 48" wide to meet accessibility requirements.

Many sites have accessible slopes and could be made more universally accessible if paths were improved or provided. However, path systems are not necessarily recommended for each site. Some paths are too steep to make accessibility possible and would require a significant amount of excavation to reduce slopes to an acceptable gradient. Proposed excavations in historic sites should generally be avoided. If a new path is absolutely necessary, plans and excavation requirements should be evaluated by an archaeologist.

### **Vehicular Access**

#### *Issues*

Vehicular access has been and needs to be provided to most sites for service vehicles. Many sites also have vehicular routes for visitors.

#### *Recommendations*

To accommodate service vehicles, gate openings should be 12' wide. The minimum acceptable opening for small service vehicles is at least 8'. Gate openings between 6.5' and 8' could be considered accessible only to very small vehicles.

### **Security**

#### *Issues*

Few properties presently have lockable gates but most are contained within fences and walls. Some of these enclosures provide unintentional or unauthorized access through breaches made by vandals or deferred maintenance. Some have walls or fences that are easily scaled and others have open access off a street with no fence or gate.

#### *Recommendations*

Ideally, all of the historic burying grounds and cemeteries should be open to public access during the day. Security should be maintained at other hours to protect the resources of these properties. Lockable gates should be maintained at some of the sites. Vandalized fences and walls should be repaired to deny unauthorized and inappropriate access. These issues are discussed under the topic of administrative management.

### **VANDALISM**

#### *Issues*

Vandalism tends to be more of a problem in older inactive sites without adequate security measures and where visibility is difficult. The impacts of vandalism include toppled grave markers, vandalized tombs with doors removed, painted graffiti and broken glass. The latter is usually found at the rear of a site, away from public streets. Some sites also have problems with indigent inhabitants and illicit activities. Trash and piles of various types of debris were found at some sites and at adjacent properties. Dogs or rats have not been a problem reported on any of the sites.



*Vandalized monument,  
Mount Hope Cemetery, Boston*

### *Recommendations*

Efforts should continue to reduce the misuse of these sacred grounds and remove evidence of vandalism. Where necessary, sites should be kept fenced and locked when not open to visitors. Security lighting should be maintained to improve visibility where deemed necessary. Vandalism and other problems should be reported promptly to the community governing body. The local Police Department should be notified immediately if an act of vandalism or other delinquency is in progress.

A stone conservator should be consulted to determine the gentlest effective means to remove various types of graffiti from specific grave markers and other elements.

*Chip sealed bituminous concrete,  
Charlestown Heights, Charlestown*



## CIRCULATION SYSTEMS AND MATERIALS

### **Circulation Systems**

#### *Issues*

The development of pedestrian and vehicular circulation systems varies a great deal in the sites examined. Some sites have excellent circulation systems. Others have improved, but incomplete, circulation systems, or only remnants of paths remaining. Some may have had circulation systems, but none remains today, while others have never had path systems.

As a site becomes more heavily used and as more interpretive materials are provided directing visitors to significant sites, circulation systems will need to be improved to respond to those demands. The impact of the provision of interpretive materials with an uncoordinated or incomplete circulation system can be very evident with deeply worn paths through lawns.

#### *Recommendations*

The development or expansion of workable and logical circulation systems should be a high priority for sites with heavy visitation. Improvements should be made to path systems when public use increases because lawn can not withstand heavy and constant foot traffic. If visitation increases significantly in any of the sites, the introduction or expansion of path systems should be reconsidered.

Clean paths and drives weekly. Remove snow, keeping walks passable at all times and as safe as possible. Start removal when accumulation reaches 1". Spread sand on icy spots and steps. The use of excessive amounts of salt or some chemical deicers is not recommended for deicing because they can be toxic in excessive quantities to trees and other vegetation. Salt also accelerates the decomposition of mortar and concrete and is potentially detrimental to gravestones. Repair paved areas as needed. Patch depressions of 1" or more annually. Repair cracks every 5 years.

Where unit pavers like bricks have settled or have been removed, the base must be corrected to the proper level with the addition of new base material to match existing. The new base should be firmly compacted. When the paving units are reset or replaced over a previously settled area they should meet the line, grade and pattern of surrounding pavers.

## **Pavement Materials**

### *Issues*

The earliest burying grounds had no paths or pavement materials because space was at a premium. It has been noted that cows often grazed on the grass. As time passed many different paving materials were used in these historic burying grounds and cemeteries. The initial paths on most sites were most likely constructed of gravel, cinders or stone dust and were changed over time into harder materials like slate, brick, concrete and macadam. Concrete was first used in 1878 in Boston as an experiment in Copp's Hill Burying Ground. It was deemed satisfactory. The use of macadam at Boston's Mount Hope Cemetery began in 1909 and chip sealed surfaces in 1927. Most of the paths found in this investigation are now lawn.

In recommending paving materials, consideration must be given to historic and visual appropriateness as well as initial and long term cost and maintenance implications. One goal should be to make pathways visually recede into the landscape so they do not visually compete with gravestones and other historic artifacts. In regard to appropriateness, lawn would be the preferred choice for many of the burying grounds, particularly those without notation of a paved historic path system. However, as public use of a burying ground increases, lawn can not withstand the adverse effects of heavy foot traffic. Softer paving materials, like gravel, cinders, crushed stone or stone dust, can not be maintained on a slope of any significance without a great deal of maintenance and expense. Some sites are level enough for one of these materials, but the regular maintenance requirements may be too much for a maintenance staff to contend with. It is also difficult to maintain them in a safe condition for public use.

In terms of visual appearance, bluestone or slate would certainly harmonize with the gravestones in many of the burying grounds. But it could be confusing to see the materials used both vertically and horizontally. Questions could arise as to whether the pavers were actually former grave markers. In addition, the cost of this material may be prohibitively high in relation to other materials.

Cast in place concrete is typically too bright in value and distracts visitor's attention from gravestones and tombs, the primary display. There are similar issues with precast concrete unit pavers unless the color value is toned down enough to recede in context with the gravestones. Brick pavers also tend to call too much attention to themselves. Brick or precast concrete unit pavers set on a stone dust bed over bituminous concrete or concrete pavement offers flexibility in terms of future repair and replacement. It has a higher initial cost, but longer life expectancy than some other choices. Without a bituminous concrete or concrete pavement base, grass growing between unit pavers is a major problem that can be difficult and costly to maintain.

Bituminous concrete is dark enough to recede into the landscape but generally does not have the textural qualities of unit pavers to give it an appealing scale. The addition of a crushed stone application, or chip seal, on bituminous concrete can provide those textural qualities and give the visual impression of the more historic softer materials. Bituminous concrete is a relatively durable material, easy to maintain and relatively inexpensive to construct.

### *Recommendations*

Consideration must be given to historic and visual appropriateness as well as initial and long term cost and maintenance implications. Chip sealed bituminous concrete is the recommended paving material for most of the historic burying grounds and cemeteries that require a paved surface and are not heavily snow plowed. Some sites, like Greenlawn Cemetery in Nahant, should continue to maintain crushed stone surfaced circulation routes because a significant investment has already been made and it is an appropriate material. Most sites should continue to maintain lawn circulation routes as previously discussed. The timing of improvements is discussed under Circulation Systems.

## **Edging**

### *Issues*

Few of the paths or drives in these historic sites are edged with curbs and/or gutters to control storm water runoff and reduce erosion potential. However, paved gutters were added to some of Boston's historic burying grounds and cemeteries in the 1860s.

### *Recommendations*

Edging should not be introduced into these historic sites, unless it is deemed both necessary and historically appropriate.

## **Steps**

### *Issues*

Most steps on these sites are associated with family burial plots.

### *Recommendations*

Refer to recommendations for edging of family plots.

## GRAVE MARKERS

### Materials and Considerations

#### Issues

The deterioration of gravestones is becoming increasingly evident. Stone is subject to deterioration by natural weathering, and that process has been accelerated by atmospheric pollution. Porous stones like marble, sandstone, brownstone and limestone are more subject to the effects of weathering than nonporous stones like granite.

Slate and Sandstone: These silicate stones were the predominant material used for grave markers through the 17th, 18th and early 19th centuries. Sandstone, including brownstone, was used much less frequently than slate although some mid 1800 cemeteries have sandstone obelisks.

*Zinc markers, Center Cemetery, Douglas*



38 - General Recommendations

The vast majority of grave markers are made of slate or sandstone. Shaped like a doorway, they suggest passage from this world to the next. Smaller footstones were often used in addition to further demarcate the limits of a grave site. Headstones and footstones in combination suggest a bed, or final resting place.

Some of these stones have survived in fairly good condition. Slate's relatively smooth surface does not absorb much water and both stone types are less affected by acid rain deposition than marble. The incised lettering and low relief carving on slate is often still quite clear. Both slate and sandstone were geologically formed in horizontal layers. When the stones are set vertically with the horizontal layers facing upward, exposing the bedding planes, they often begin to delaminate or separate over time. When moisture seeps into the openings between the bedding planes, freeze-thaw cycles in this climate force the planes apart. Many of these stones, particularly the less dense slates, show some degree of delamination.

Sandstone also has the problem of being a granular stone. The binder between the grains weathers more rapidly than the silica [sand] grains, causing erosion of surface detail.

Marble and Limestone: These calcium carbonate stones came into use during the 1810s and remained very popular through the 1870s. The rural cemetery movement became a showcase for carved marble and most sites of this era contain a very high percentage of marble markers. Marble has not endured as well as the earlier silicate [slate and sandstone] markers, particularly in the northeastern states, because it is very susceptible to acid deposition and other pollution damage. Most of the marble markers have lost surface detail due to acid rain and general weathering.

Many of the marble markers that were set into bases of brownstone, marble or granite with slots cut into them to hold the markers are now broken with some or all of the slots left filled with broken pieces of marble.

Granite: During the 1870s and 1880s the use of granite increased because of improved equipment related to quarrying and stone carving. Now the standard for grave markers, granite is relatively impervious [more than slate] and endures quite well in outdoor environments. It is the hardest and most stable grave marker material in general use.

Zinc: Zinc markers are an example of a controversial late 19th century material called "white bronze". Although durable and inexpensive, these markers were prohibited in many cemeteries because they were perceived of as "cheap and faddish". Manufacturers promised better durability than marble. Some considered zinc as good as marble aesthetically. Zinc could be cast to take very fine artistic detail and lettering. The excellent condition of the zinc monuments at many of these sites more than a century later supports these claims.

#### Recommendations

Seasonal site visits should be conducted to check for fallen stones and any other cases of accelerated deterioration due to weather and/or vandalism. Repair/restoration efforts should be monitored at least once each year. Gravestone rubbings should be prohibited because the process can leave wax or ink and cause surface losses.

## GRAVE MARKER CONSERVATION AND REPAIR

### General

#### Issues

Stone conservation emphasizes the preservation of the original object as found rather than its restoration. Conservators have numerous and varied opinions on the issues of grave marker repair, restoration and protection. The suggestions and recommendations presented here are a relative, but not complete, consensus of opinion. Professionals should always be consulted on these matters and a permit must be filed with the Massachusetts Historical Commission prior to undertaking any of these efforts.

There is a philosophical conflict in the major approaches to preserving historic cemeteries. One approach is to preserve the integrity of a cemetery as a collection of memorials made for that location. The other approach is to preserve the integrity of individual gravestones. The latter is compounded by a major question regarding gravestones, that is whether to move some of the best early stones indoors for safekeeping. This was suggested as early as 1938 to prevent theft and protect against the detrimental effects of weathering. In the past, important fragments were encased in granite, concrete or copper, or a copy [identified as a replica] was erected while the original was placed indoors.

#### Recommendations

Many grave markers require repairs and/or cleaning because of general deterioration, vandalism, inappropriate previous repair techniques, etc. Specifications and trained supervision must accompany all conservation treatments. The repair of broken, vandalized, otherwise damaged or deteriorating gravestones should be assigned to professional conservators, particularly when the gravestones have historic value. These general recommendations include mention of many conservation materials which may be used to conserve historic stone and masonry in burying grounds and cemeteries. In no case, however, should anyone attempt to purchase and use these materials and techniques without the supervision of a qualified conservator. The recommendations often do not include information about dilution, methods of application and techniques of removal, dwell time, symptoms of dangerous situations or unforeseen hazards to applicators and stones. The infinitely various conditions of old grave markers require that the use of conservation materials must be done only by experienced persons in controlled conditions.

*Slate marker encased in concrete,  
Old Burial Place, Watertown*



Prior to making repairs, all markers should be inventoried and then prioritized for conservation/restoration in terms of significance. Most survey and some evaluation can be performed by trained volunteers and/or municipal staff. Work should be completed according to priority as funds are available. All repairs, resetting and cleaning should be done by professional stone conservators, particularly for sensitive work on historic pieces. It should not be undertaken by general contractors or amateurs, unless the work is done under the supervision of a conservator. Trained local staff can assist with resetting, mortaring into bases and keeping grave markers free of botanic growth and graffiti. Repair of stone masonry other than grave markers in these historic sites may be done by professional masons.

*Iron strap repair,  
Spring Hill Cemetery, Marlborough*



Stone conservation programs need to consider the urgency of a condition along with the integrity of a gravestone, visual priorities and cost effectiveness of treatments. Concurrent with archival research, an existing conditions survey should be conducted on site. Periodic surveys measure and evaluate deterioration that occurs gradually. An understanding of the decay processes is considered essential to developing appropriate and effective conservation treatments.

Conservators should document their work thoroughly. Conservation efforts should include documentation of methods and materials used and a close evaluation of the performance of those materials and methods. All repair treatments should be documented before and after treatment in writing and with photographs. All repairs that are documented should be monitored on an annual basis for performance. Reexamine each site at 5 year intervals to evaluate long term condition trends and effectiveness of treatments.

Proper treatments must be based on analysis of the stones and their conditions for any given location at any specific point in time. Miracle cures proposed for all stones and conditions often cause greater damage in the long term. Understanding what does not work might serve future expenditures well, so that investment in repairs which only endure for a short term is done with the knowledge that the repairs will have to be repeated within a year or two. When possible, conservation efforts should also include documentation of past methods and materials used and a close evaluation of the performance of those materials and methods.

Several guidelines should be followed when repairs are required on historic stone.

- Survey the stone and its history to determine its age, source, geologic type and the extent of degradation as accurately and as specifically as possible. This could be considered a modified form of a conservator's standard statement of existing conditions.
- The goal should be a repair that returns the stone to a sound functioning condition with the least alteration of its historic appearance. The repair should not remove all traces of the history of the stone or the passage of time.
- Specify the use of materials suitable for use in outdoor conditions. Many materials are only suitable for indoor conditions and can not stand up to the harsh extremes of the New England climate.
- Specify the use of known stable noncorroding materials to protect stone such as stainless steel dowels [type 304 or better], titanium dowels for monuments, nylon or Teflon dowels for gravestones and monuments prone to vandalism, and lead flashings. Iron dowels should be avoided as they rust, expand and crack stones. Dowels should preferably be set with molten lead. Do not use face pinning, polyester resin adhesives or gray cement grouts.
- Include fabrication and setting tolerances in the specifications as well as joint sizes.
- Include criteria for acceptance in the specifications including viewing distances, and finishes to match weathered appearance of adjacent historic stone.
- Stone dutchman repairs [cutting in a stone patch] are rare, but may be required on large monuments. They are even more rare on small individual grave markers. Where these repairs are required, cut deteriorated stone to a depth of at least 2" until sound stone is reached. Require a sample of the stone to be used for patching. A sample patch should be required that can be incorporated into the final work if acceptable.
- Where epoxy adhesives or grouts are used, the epoxy glue line should be kept back from visible surfaces by 1/4 to 1/2" so that the visible surfaces can be filled with a cementitious material having a historic appearance and composition. Epoxy adhesives should be concealed because the color of epoxies tends to darken over time. Hard or rigid epoxy adhesives should not be used on materials with significant coefficients of expansion like slate and sandstone.
- Prebid and preconstruction meetings should be required to fully acquaint Bidders and Contractors with site conditions, requirements and special conditions.
- Require submittals and mockups [to remain in place until completion of work] for approval for all materials used [mortar and grout formula and samples, dowels, adhesives, parging].
- If field measurements are made by an installer, they should be submitted for review prior to commencement of work.

## Resetting Grave Markers

### Issues

Upright grave markers are one of the most important visual impressions conveyed to visitors. This gives the appearance that a property is being watched over and cared for. Righting the stones is also one of the least expensive maintenance activities for the value received. Fallen or tilting grave markers should be reset in an upright position. Left in place, a leaning grave marker is more liable to be damaged by lawn mowers. Deterioration may be accelerated because some stones may absorb moisture from the ground or collect rainwater.

The vast majority of grave markers are individual grave markers. By far, the most widespread problem observed was the large number of substantially tilted, fallen, sunken, frost or root heaved gravestones. Stones tilted 15 degrees or more can break off at ground level due to their own weight. Grave markers will suffer less deterioration if they are upright. All grave markers that are lying on the ground are in danger of damage from mowers, pedestrians and weather. Sunken stones subject their inscriptions to lawnmower scarring. Those that are being overgrown by grass may soon disappear from sight. Displaced stones can rub against other stones and fall over on the ground.

### Recommendations

All stones that are tilted or toppled should be reset in a secure upright position. They should not however be reset to straighten minor tilts, "correct" orientation, or moved to line them up in straight rows. Markers should not be moved or turned capriciously. Once a stone is moved it no longer serves as a grave marker because it no longer marks a burial site. A marker should not be reset if the stone appears in fragile condition.

Some excavation needs to occur to reset a grave-stone because the use of force to straighten one may cause the stone to snap. Some conservators recommend straightening one piece slate and marble grave markers by digging out the soil from the backside of a stone, if possible. This keeps the soil on one side firm for a strong compacted face against which to reset the stone.

After the stone is set on a firm foundation with a cushion of sand, the excavation should be filled with alternating layers of soil with layers of a mixture of sand and crushed stone [1/2-3/4" sharp edged gravel], periodically wetting the earth as it is applied. Topsoil and lawn should be replaced at the surface. The surface grade should slope away from the exposed portion of the marker so that moisture in and on the marker can evaporate as soon as possible.

Other conservators recommend excavating on all sides of a marker and then surrounding it with compacted sand and peastone. This is particularly beneficial when working in soils that tend to retain moisture.



*Toppled marker about to be buried,  
Elm Street Cemetery, Braintree*

*Toppled marker about to be buried,  
High Street Cemetery, Danvers*

*Slate marker precariously leaning against a wall,  
High Street Cemetery, Danvers*



Generally, 40% of a single slab marker is below ground. Stones with insufficient bases or shaft length should not be reset. They should remain on site temporarily or be removed for storage until a suitable mounting technique is developed. They can temporarily be leaned against the back of another stone, or against an adjacent building or fence until repair is done. This should not be considered a long term solution, because leaning stones are subject to breakage.

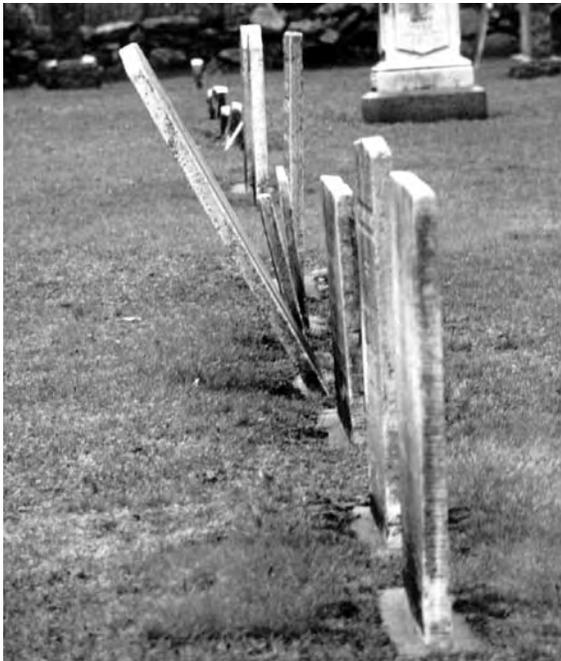
Gravestones should not be set directly in concrete, even incomplete broken markers. This setting method is too rigid, and soluble salts in the cement may migrate into a porous stone forming efflorescence and accelerating deterioration. However, markers broken at or below ground level may be reset with a buried concrete foundation provided a soft, high lime content mortar joint separates the marker from the concrete. This method can also be used for marble markers. Dowels should not be used on slate markers because drilling can cause delamination and destroy a stone.

## **Slate Markers**

### *Issues*

Various treatments used to stabilize conditions such as splitting, cracking and delamination of slate markers lead to losses. A variety of repair and conservation efforts for slate markers are apparent in historic burying grounds and cemeteries including encasement in concrete, encasement in bronze, encasement in sheet copper, encasement in slate, bronze bolts, bronze and iron straps, material applications and various coatings. Some of these efforts were made almost 100 years ago and most are either unsuccessful, unattractive or both. A number of different methods have had disastrous effects.

*Leaning markers with concrete foundations,  
Old Cemetery, Spencer*



*Delaminated slate marker,  
Wellfleet*



*Fractured slate marker,  
Chocksett Cemetery, Sterling*



Some early repairs and many contemporary materials that were considered miracle cures when first used 10 or 20 years ago have failed, leaving the stones in fragments today. Epoxy repair techniques, and later polyester resins, were often specified for the adhesive repair of gravestones in the 1970s and 1980s. Many of these repairs failed within 5 to 7 years because of the adhesive's sensitivity to ultraviolet light, thermal conditions and external stresses. The encasement of slate in various materials must be given thoughtful consideration because of the high coefficient of expansion of slate compared to other materials.

#### *Recommendations*

Stones that have vertical splits or are about to delaminate present difficult conservation issues and should be treated by a stone conservator. Ideally, moisture should be prevented from entering the voids, with a substance that remains flexible and does not expand to push the slate layers further apart. Previously used fillers have proved unsatisfactory. Mortar and adhesives should not be used to reattach peeling stone, as that material inserted between layers will eventually act as a wedge, applying pressure that continues the splitting process. Before filling any of the delaminations on slate tablets, a careful re-evaluation of all existing methods of treating that condition should be completed.

Until a long term solution is discovered, consideration could be given to installing a noncorroding metal cap [perhaps lead or anodized aluminum] that covers the skyward edge, limiting intrusion of rain and snow into the stone and movement of the stone layers. This is not a particularly attractive solution. Earlier attempts using such caps in bronze, copper and iron have proved mechanically stable, but the resultant corrosion stains on markers can be permanent and unsightly.

*Slate marker with copper cap,  
Old Hill Cemetery, Newburyport*



#### **Marble Grave Markers**

##### *Issues*

Most of these relatively porous stones have lost surface detail due to acid rain, other pollution damage and general weathering. Many others have suffered the negative impacts of vandalism. Conservation needs are significant in this part of the country.

##### *Recommendations*

The recutting of markers should never be done. This irreversible alteration of a historic artifact violates all codes of conservatorial ethics. Where surface detail has been diminished or lost, the honing of sugared marble surfaces is also **not** recommended because it results in loss of the information cut into the stone.



*Acid rain damage,  
Garden Cemetery, Chelsea*

Two part markers that have come apart or been poorly reassembled should be reconstructed in their original configuration. Priority in dowel replacement should be given first to marble markers that are visibly cracked or spalled, and second to marbles with visible metal stains at the junction between marker and base. Recommending an appropriate method to join two part markers is based on determining what may cause the least damage when the stones are subjected to vandalism and what will resist corrosion when the joint filler fails. Iron rods are clearly not recommended.

*Two part marble marker with deteriorating dowel, Village Cemetery, Tisbury*



Multipart stones that have come apart should be repinned with noncorroding dowels. Ideally these should be set in lead, preferably molten although lead wool and/or lead wedge strips tapped in place may be acceptable. Lead work should be done by an experienced and skilled tradesman. An epoxy fill is often used by conservators because less time and training is required.

*Poor adhesive repair, Riverside Cemetery, Sunderland*

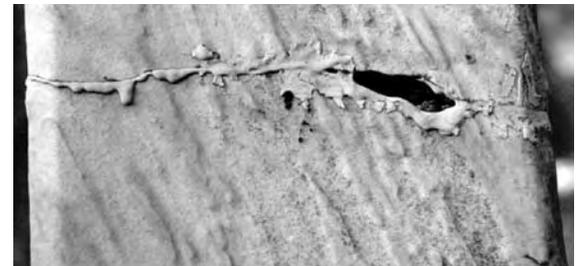


The joint between the vertical stone and base stone should be filled with a material matching the original installation such as lead or a high lime mortar. The latter may not be as stable in the long run as lead which has the added benefit of killing mildew and fungus as water or ambient moisture bring some of its ions into solution and washes them down over the stone. No polymeric caulk or sealant should be used.

Repair of broken stones may be done using Akemi or other appropriate adhesives if the break is clean and not worn at the edges. This is particularly appropriate for marble. The adhesive should match the color of the stone, if it will be visible. The use of cement or lime mortar is not recommended for these repairs. Teflon dowels may be used in cases where reinforcement is required.

Mounting truncated stones and fragments requires the development of clips to attach them to "blanks", new stones cut to support fragments. This method is proposed for use if ready made clips can be found or custom clips can be fabricated according to a conservator's specifications.

*Poor adhesive repair, Elm Street Cemetery, Braintree*



## Cleaning Soiled Stones

### *Issues*

It is difficult to remove even some of the soiling from historic stones safely. Stones with heavy soiling have limited legibility. Airborne particles that settle into the pores and crevices of porous stones are even more difficult to remove.

### *Recommendations*

General cleaning of all stones is not necessary and less cleaning is generally considered better than over cleaning. Soiled markers should be examined for legibility of inscriptions. If the inscription is fully eroded and the surface has no legible lettering or designs, the stone should be given a lower priority for treatment. No stone should be cleaned if its stability is in question.

Much more care needs to be exercised when cleaning marble compared to granite. Marble markers should be cleaned only if the surfaces are stable and not sugaring. If a grave marker is cleaned, the entire surface should be treated. Otherwise, the stone will look mottled and future soiling or growth will occur differentially and may appear more intense in some areas than others.

Some cleaning may be done using only a very soft natural bristle brush with distilled water and a properly diluted very mild non-ionic detergent in solution, safely removing some soiling from grave markers. Sound marble should not be cleaned with any more than regular hose pressure. These simple things can prove dramatically effective against environmental soil.

Never use any acidic compound or household bleach for cleaning. Acid cleaning marble should be avoided, not only because of the damage it can cause but also because it tends to leave marble with an orange cast. Ordinary household bleaches should never be used on marble because of discoloration and the long term detrimental effects of destructive salts.

Baking soda blasts for granite should be avoided because it can cause salt build up and general site clean up is difficult.

The removal of stains should be left to professional stone conservators. After the nature of a stain is determined, an appropriate solvent and poultice is typically applied and then covered with plastic for 24 hours. At that point the poultice is removed, the stone is thoroughly rinsed with clean water and checked for a neutral pH balance. Oxalic acid may be used on granite. Clorox, Naval Jelly or Lime Away should not be used on any stone.

*Marble marker with orange cast [acid cleaned],  
Pere Lachaise Cemetery, Paris*

*Soiled marker,  
Garden Cemetery, Chelsea*



## GENERAL GUIDELINES FOR CLEANING STONE GRAVE MARKERS

### Evaluate the Surface to be Cleaned

Determine the type of stone.

Check the entire stone for condition. Some areas of a stone may be more weathered than others and need to be treated more gently.

Determine the type of soiling.

Do **Not** Clean:

If the stone has cracks, loose or broken parts, is tilted or unstable.

If grains of the surface come off on your hands at the touch.

If there are underlying hollow areas [gently tap the surface with your finger].

If joints are open. Point first with soft lime mortar or lead as appropriate prior to cleaning. Do **not** use silicone caulk.

If the temperature is below 40° F, frost is anticipated, or temperature exceeds 85° F.

Do **not** attempt to clean stones without first receiving proper direction.

Do not clean stones often. Even the most carefully cleaned stone loses some stone particles with each cleaning.

### Test the Water

Test the water for excessive amounts of salts, iron and other potentially deleterious materials.

Use filters at faucets or in cleaning equipment if needed.

### Select the Appropriate Equipment

Garden Hose: Use on fragile stones and for gentle cleanings.

Steam Cleaner [with variable pressure and measurement gauges]: Use on all stones, varying psi accordingly.

Pressure Washer [with variable pressure and measurement gauges]: Use **only** on stable granite and **only** with a fan tip nozzle.

Washer Nozzle: Always use a fan tipped nozzle with no less than a 15° spread.

Brushes: Use soft nylon brushes or soft natural bristle masonry brushes. Soft toothbrushes and sometimes smooth wooden sticks like ice cream sticks or tongue depressors are acceptable for intricate areas as are Q-tips. **Never** use wire brushes, brillo pads, steel wool, scotchbrite or other abrasive pads. Do **not** use metal tools to clean stones.

Miscellaneous: Make sure water is available. Provide plastic buckets for non-ionic detergents and biocides. Do not mix solutions. Provide spray bottles or small pumps with sprayers for the application of non-ionic detergents and biocides. Provide clean soft rags, natural sponges, goggles and rubber gloves.

### Determine the Appropriate Water Pressure

Garden hose pressure is best. Use the lowest effective pressure because water can act as a damaging abrasive, particularly on old weathered stones. Pressure washing can reduce the longevity of a stone and reduce legibility. Note that water is used by some stone fabricators to cut granite.

For Marble, Sandstone, rough cut Limestone, damaged Slate and other stones: Use low water pressure 35-60 psi maximum on sound stone. Use a garden hose or hand held steam cleaner. **Never** use high water pressure.

For Slate, Rose Quartz and other silicate stones: Treat the same as for Marble.

For Limestone: Treat the same as for Marble.

For Granite: Use 100 to 600 psi maximum on sound stone. Other stones will abrade at this pressure.

### Select Appropriate Cleaning Solutions

Clean only if necessary. Always use the weakest cleaning agent that cleans stone effectively. Do not increase the recommended strength of a given solution. Use only those solutions recommended for the type of stone being cleaned.

Soapstone: Use water only.

Slate and Sandstone: If water is ineffective, use a sodium free, non-ionic detergent like PhotoFlo, Triton-X or Igepal at a rate of one ounce to five gallons of water.

Marble and Limestone: If water is ineffective, use a sodium free, non-ionic detergent like PhotoFlo, Triton-X or Igepal at a rate of one ounce to five gallons of water. For more stubborn cleaning requirements use Vulpex at a rate of one part Vulpex to 2 to 4 parts water. **Never** use household soaps, bathroom and sink cleansers, abrasive cleaners or solutions containing sodium like Ivory Soap, Clorox [sodium hypochlorite], Borax, Spic and Span, Comet, TSP [tri-sodium phosphate], Calgon, Fantastik, Formula 409 or other formulations with caustic lye [sodium hydroxide, NaOH].

Biological Growth Remover for Marble and Limestone: If an acceptable test is achieved, use calcium hypochlorite [CaOCl sold as HTH or SST in pool supply stores], Architectural Biocide D-2 or hydrogen peroxide. A 1 to 2% solution [125 to 250 cc in 5 gallons of clean warm water] with a small amount of non-ionic detergent [0.2% Triton-X-100, 20 to 25 ml in 5 gallons of water] is recommended. Use 2 ounces by volume of dry HTH to 5 quarts of water and note that it must be dissolved in warm water. Vulpex is an effective, although expensive, detergent for black and green growths on granite. Do **not** use Clorox.

**Never** use household bleaches for cleaning.

**Never** use a cleaning solution more acidic than pH 4.5.

**Never** use wire brushes.

**Never** use high pressure spraying or sand-blasting.

### Clean with the Least Aggressive Method

Remove dry loose particles with a soft bristled brush.

Gentle cleaning with clean water is best.

Test selected cleaning method[s] in a small unobtrusive area, preferably on the back of a stone, before general application.

Prewet the stone thoroughly. Do **not** press the nozzle up against the stone. The softer the stone, the farther back from the surface the nozzle should be.

Flush thoroughly with a low pressure hose to remove most surface dirt.

Then, if determined necessary:

Prewet the area with water before using a cleaning solution.

Prepare a dilute alkaline solution, 1 ounce in 5 gallons of water.

Apply the solution from bottom to top with a spray bottle.

Allow solution to soak into the surface for 3 to 5 minutes.

Scrub gently with a soft nylon brush or soft natural bristle masonry brush, cleaning from bottom to top to avoid streaking.

Rinse thoroughly with clean water from top to bottom. Do **not** allow cleaning solutions to dry on a stone surface.

Rinse for at least 5 minutes and do **not** direct the rinsing spray at one area for longer than 5 to 7 seconds.

Check pH for neutral balance.

Check the stone once it is dry and later in the season.

## Removing Biological Growths

### *Issues*

Some lichens and biological growths are acidic in nature or produce acids that can etch the surface or eat into stone, particularly porous stones like marble and limestone, in addition to discoloring them. Some lichen penetrate stone causing microfractures. Others develop parallel with the stone surface and may be mechanically removed. It is possible that some protect the surface of stone reducing degradation from weathering.

*Slate marker with biological growth,  
Old Burial Ground, East Bridgewater*



In general, the larger the population of certain types of growth above the stone surface, the more decay is caused below the surface, and thus the greater the need for removal. On the other hand, more damage is often incurred by removing these growths than the decay caused by them. Removal may be desirable but can result in considerable harm. Careless intervention can make the process of degradation more rapid. At the Botanic Garden of Ajuda in Lisbon, it was recently decided to leave botanic growths in place on a very important limestone balustrade rather than risk causing irreparable damage.

### *Recommendations*

A stone conservator should determine the type and nature of biological growths and the condition of a stone prior to taking any action. If it is determined that it is a growth that can be removed without causing damage, a conservator may proceed with caution. Biological growths on the surface of markers should be removed **only** if the stone is stable to the touch. Only those older stones which have substantial moss or dark botanical growth should be cleaned.

One approach to removing some surface biological growths is dry brushing with a soft brush during dormant seasons. With great care, soft wood or flexible plastic scrapers may be tested, but care should be taken not to remove any surface grains of a stone, particularly if it is marble or sandstone. Another good conservative approach entails the use of copious wetting and neutral poultices.

It is possible to retard the harmful biological growth on historic markers. Seek the advice of a professional conservator for how that may best be done for any given stone and growth. Always be sure to have supervised testing of any material recommended before working on a whole stone.

After brushing and/or scraping, a biocide solution may be brush applied to retard recolonization and to remove exceedingly stubborn growths. Markers with stable surfaces may be brushed with a biocide solution and then washed gently.

Once every 5 years is a typical cycle of retreatment, but local conditions of exposure to vegetation, water and shade may suggest more or less frequent application.

## Marble Protection

### *Issues*

Marble components have generally deteriorated much more than the older slate components. Most of the white marble stones have lost surface detail due to acid rain and general weathering. A survey should be undertaken to identify and locate the most endangered marble markers at each site, designating those that still have legible inscriptions for immediate conservation. Many however are now illegible.

### *Recommendations*

A long term plan should include selective conservation. Enough carved detail and lettering must remain legible to make a stone worth conserving. Where there is no legible lettering, conservation or consolidation is not advisable.

Do **not** treat stones with protective coatings that are impermeable to water vapor. These coatings can be very harmful to stones over time and others are ineffective.

Some conservators recommend that significant marble components have a clear protective coating applied to prevent further deterioration. The coating should have a proven track record like "BMC" or "Conservare". These materials have a low risk and can be applied by less experienced personnel. This will last 8 to 10 years before wearing off. Reapplication will be necessary at that time.

While there are conflicting opinions on the matter, some conservators recommend the use of stone consolidants like "Conservare OH Consolidation Treatment". These require more attention and experience during application and need a water resistant top coat for effectiveness. A two coat system is generally recommended with a first coat of "Conservare OH Consolidation Treatment" and a second coat of "Stand-Off Stone, Tile and Masonry Protector", both manufactured by ProSoCo, Inc., Kansas City, Kansas or approved equal. Materials should be applied in strict accordance with the manufacturer's recommendations, after the marble is clean and repointing is complete. This system should be reapplied in 8 to 10 years.

### **Zinc Markers**

#### *Issues*

These late 19th century markers have generally endured well and most require little attention at this time.

#### *Recommendations*

Annual inspection of zinc markers and monuments is recommended to look for splits or evidence of slumping, a form of metal fatigue. Special care should be taken to maintain the foundations of these markers and monuments so as not to introduce stresses that would result in metal damage. All repairs should be performed by a metals conservator.

### **Previously Repaired Markers**

#### *Issues*

Where broken stones have been repaired with iron or bronze straps and bolts, they are extremely liable to cracking around the bolt hole. Iron straps not only stain markers, but they also rust and expand, causing the stones to fracture. Bronze straps also cause staining.

#### *Recommendations*

When considering whether to remove prior repairs of this type, the main issue is the friability of the marker. Can it tolerate being taken apart? Repairing strapped markers is rarely attempted because of the high probability of causing more damage than leaving the straps in place. Straps are not often used for grave marker repair today because of the potential long term damage.

### **Damaged or Broken Markers, Fragments and Markers without Records**

#### *Issues*

The disposition of stone fragments is a significant issue. Uncollected fragments tend to disappear. Power mowers can easily cause these fragments to disintegrate. It is also very tempting for visitors to pick them up and take them home as souvenirs, particularly those with inscriptions or carvings. Another issue is determining what to do with found gravestones that have no records.

Ground disturbance is a concern of state agencies like the Massachusetts Historical Commission. Random digging or unauthorized excavation should not be done in a historic burial ground or cemetery without appropriate supervision. It is often not known how deeply people are buried. Bone fragments have been found just below the surface at depths as shallow as 6 to 8".

#### *Recommendations*

Record, collect and properly store out of the ground stones, whole and fragments. Carefully documented salvage of all fragments of fallen stones is recommended. Fragments should be picked up, recorded and stored in a secure location. The ultimate goal should be to eventually return out of the ground stones to the field in their original locations and to reconstruct fragmented stones. This is particularly important for fragments larger than 2" by 2", or smaller if they contain inscriptions or carvings.

*Iron strap repair,  
Old Burial Ground, East Bridgewater*



As an alternative, it has been recommended that stone fragments be left where they are found, buried with the location marked. Storage of fragments below ground is considered good preservation by some. As a general rule, granite and slate fragments can be buried. Marble and sandstone should not. While it is desirable not to remove fragments from sites, marble and sandstone fragments should be moved indoors because of their more porous nature and the potential of further deterioration.

*Settlement at base of monument,  
Village Cemetery, Tisbury*



50 - General Recommendations

Conservation efforts should include documentation of all stones or monuments removed from sites. Damaged gravestones that have lost their nomenclature [inscription] and/or artistic merit should not be repaired, but left in place or buried on site with their location documented.

Secure structures on many of the sites, like unused receiving tombs, could be designated as storage areas. If a sufficient amount of storage space is not available, slate and granite fragments can be buried, but not marble or sandstone because the acidic nature of our soils is detrimental to them. When burying fragments, document the fragments first, then bury them 10-15" deep behind the standing major fragment to which each belongs. Set them flat and face up on a 2" deep bed of clean graded sand, then cover them with sand and 6" of topsoil. The burial of grave markers, including fragments, should be conducted under the supervision of a qualified archaeologist and under permit from the Massachusetts Historical Commission.

#### **Approximate Grave Marker Repair Costs**

Repair Type	Cost/Each
Reset, Toppled or Leaning	\$150-175
Repair Loose	175-250
Repair Broken	250-300

The above costs are average costs and do not include documentation. Markers with complex repair issues can cost substantially more.

#### **Repairing Erosion and Settlement at the Bases of Markers and Monuments**

##### *Issues*

Many of the larger markers exhibit settlement and/or erosion at ground level exposing foundations of dry laid or mortared broken stone. Left alone this process will continue, undermining the structural stability of the marker.

##### *Recommendations*

Repair of settlement includes providing a porous fill and/or topsoil to return the ground elevation to the proper level. Surface drainage conditions should be inspected and corrected to prevent concentrated flows of water at the bases of large structures.

## STRUCTURAL ELEMENTS

### *Issues*

The repair and restoration requirements for elements like walls, tombs, vaults, larger monuments, plot edging, etc., are different than for grave markers. Most of these are constructed of a number of smaller components.

The principle underlying all conservation work is the retardation of the natural process of decay in a manner that does not cause any other sort of harm. Water penetration, combined with freeze/thaw movement, is the major cause of damage encountered today. Horizontal and vertical structures exposed to the weather are susceptible to a gradual infiltration of moisture and frost with subsequent damage in the form of movement and deterioration of porous elements like mortar, brick and concrete. It has been observed that structures made up of large stones withstand the punishment from weather much better than structures built of smaller elements.

Stone and concrete cap details are often inadequate to prevent water intrusion and/or they were built without sufficient allowance for differential movement. The introduction of roofing and flashing materials on historic masonry is often inappropriate, impractical and in many cases impossible.

### *Recommendations*

No repair that has been made should be regarded as permanent because the original construction was often inappropriate for the intended purpose or dimensionally less ample than would be used today. Ongoing maintenance will be necessary because unsheltered burial ground and cemetery structures will deteriorate rapidly without some form of protection from water penetration. Repairs on these sites should be considered an ongoing process, rather than "permanent" solutions, because the work involves historic components. The rate of natural deterioration can be slowed, but can not be completely stopped, as long as masonry and metals remain in their historic outdoor locations.

The overuse and over application of excessively hard mortars has been observed at most if not all of the sites. Virtually all of the original work involved the use of lime/sand mortar which predominated until about 1880. Although susceptible to washout, it was soft enough to allow bricks or stones some movement relative to each other. In a structure that lacks flexibility, stones and bricks break, mortar joints open and serious damage results. Cement mortars used after about 1880 were hard, creating strong and unyielding joints. They are appropriate to contemporary bricks and concrete blocks. Hard and soft building materials can not be used together effectively. Hard cement mortar will cause soft bricks and stones to spall and deteriorate.

Because these sites are located in a northern temperate climate, structural elements are subjected to a wide range of temperatures. This thermal stress requires regular examination and subsequent maintenance of structural elements. Inspect for cracked mortar, loose bricks, broken stones and other movement annually. Repair at least every 5 years.

## **Masonry Repair and Repointing**

### *Issues*

Repointing is probably the most common operation practiced in preserving and restoring old masonry structures. Improper repointing with soft mortars has been done on occasion in the past. But repointing that has been done since the introduction of hard cement mortar is more harmful. Repointing when badly done is difficult and expensive to correct. In extreme cases it causes irreparable damage to the physical structure as well as its appearance.

The clean, white appearance of lime tinted slightly by sand was a highly favored architectural effect. As a general rule, the color of the mortar used in historic structures in the United States depended on the color of the sand used in the mixture. White marble dust was sometimes added to mortar, replacing part or all of the sand, when pointing the joints between bricks and stones. Colored mortar, obtained by mixing in mineral or earth pigment like lampblack or Venetian red, was used sparingly. They are sometimes subject to fading. During the second half of the 19th century, dark mortar was popular. When colored to approximate brick, the narrow joints then fashionable contributed to create a continuity of wall surface effect.

### *Recommendations*

Masonry repairs should be performed by experienced conservation professionals. When choosing the type of mortar to be used in repointing, full consideration must be given to matching the old mortar in color, texture, aggregate, strength and hardness [density and porosity]. The new mortar used in repointing should have the same physical characteristics as the old, only if the old mortar was reasonably appropriate in the first place. It is best to repoint with mortar having the same density and absorbency as the stones or bricks in a structure.

Masonry repairs should be performed with a mortar formulation that contains at least equal parts of cement and Type S hydrated lime for repointing. Lime mortars are both more compatible with brick masonry, and more flexible in conditions of thermal and moisture cycling. It is important that mortar used for routine pointing is compatible with the softness or hardness of a brick or stone. With long stretches of unrelieved wall, the mortar should be as soft as possible [for thermal expansion and contraction resiliency] with some hardness for durability. A type N mortar formulated just above the proportions used for type O would provide both of these characteristics. Use a color, aggregate and joint profile to harmonize visually with the adjacent work.

Perimeter walls and retaining walls need routine, periodic maintenance at least once every five years. All joints that have loose mortar should be repointed. All surfaces to be repointed should be properly prepared and cleaned, removing all loose and deteriorated mortar. Joints should be raked out by hand. The depth of chipping and raking should be at least twice the width of the joint to a maximum depth of 1-1/2". Care must be taken to avoid enlarging the width of joints. Mortar should be applied in lifts no greater than 1/2" at a time.

Masonry repairs should include repointing of all field stone walls. Where mortar that is deep inside the joints of a wall is soft, remedial work should include consideration of weep holes or other drainage devices. In addition, cavities should be packed with a material such as foam backer rods or the equivalent. Walls should be anchored to the work of adjacent materials where possible. Many walls remain standing despite incredible abuse and neglect simply because they possess some form of tie back.

*Dry laid stone wall,  
Old Burying Grounds, Littleton*



Masonry repairs should be supervised by experienced professionals. Specific but broad comments relating to this topic are as follows:

- Never use premixed bagged mortar or grout. These materials are too hard. They will not accommodate movement of the masonry and in rare cases they may overstress the stone edge.
- Never point a bulged or leaning wall with hard mortar. This type of quick fix solution accelerates outward movement. Bowing is generally caused by earth pressure and/or mortar washout. Where possible and appropriate, use gravel backfill behind the wall and install weep holes.
- Masonry that has undergone excessive local movements should be rebuilt, not repointed. Do not exceed a joint width of 3/8" when rebuilding.
- Whenever possible, carry repointing below grade.
- Do not smear mortar on adjacent surfaces or on the joint being repaired.
- Where possible, tie thin elements together using stainless pins.
- Allow for large relative movements between concrete and brick. According to the Brick Institute of America, the thermal movement of concrete is more than double that of brick construction. Where possible and practical, install or cut drip edges in concrete caps to prevent moisture from entering mortar beds.

Where brick walls require rebuilding, horizontal wire joint reinforcement and vertical reinforcing bars should be included in their reconstruction. Surface brick work should be performed so as to match surrounding brick work in every respect. Bricks should match in dimension, color, surface texture and gloss, hardness and absorption rate.

On masonry and stone fence or gate posts, the insertion points of horizontal metal fence rails should be repaired with appropriate pockets to take the metal inside the masonry or stone surfaces.

A concrete cap with expansion joints at ten feet on center with sealed contact edges is an acceptable alternative, but not as durable as lead coated copper flashing. In some locations consideration could be given to lead coping joint fillers like those made by Weathercap, Inc. of Slidell LA. While these joints have a slight crown that may be visually inappropriate, they offer long term durability.

### **Repointing weathered materials**

#### *Issues*

Weathered bricks and stones in an old wall frequently acquire worn edges and rounded profiles. When repointing them it is advisable to recess the face of the new mortar slightly to keep the joint from becoming too wide and avoid spreading mortar over the edges of the bricks and stones. When repointing bricks and rubble, feather edges should be avoided. They break off easily, carrying particles of stone with them and leaving cavities through which moisture may enter.

#### *Recommendations*

The surface of an area that has been repointed or patched should be brushed so that some aggregate is raised before the mortar becomes hard. Alternatively, stippling the joint [marking it by touching it with the end of a stiff brush] before the mortar completely sets helps to give it a worn appearance. This surface texture retains a historic appearance and does not call as much attention to itself as a smooth mortar surface.



*Mortared stone wall,  
Old Burial Ground, East Bridgewater*

### **Sealants**

#### *Issues*

A sealant is a contemporary material that has been used in historic applications to prevent the intrusion of moisture.

#### *Recommendations*

The use of sealants should be limited because they are not visually compatible with the historic appearance of stone and masonry construction. Sealants also invade adjacent materials, making them extremely difficult to remove without removing some of the adjacent material. In addition, there is some degree of difficulty in controlling joint preparation and installation. Where sealants have been used, they are typically failing. It is preferable to use sealants only at expansion joints. In other locations, such as at a moving crack, they should only be used as a last resort. Caulking and sealing materials should not be used for repointing. Silicone sealants should not be used because of their tendency to absorb soil from soot and atmospheric pollutants. A fine aggregate can be applied to the surface of a sealant during the curing period to make it more closely match adjacent surfaces. Over time however, this aggregate has a tendency to erode away.

Sealant backings must be provided of preformed, compressible, resilient, nonwaxing, nonextruding strips of plastic foam or flexible, open cell polyurethane foam or nongassing, closed cell polyethylene, of a size, shape and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

## Concrete Repair

### *Issues*

Concrete has been used in a variety of applications on these sites. In many instances repair is a preferable option to replacement.

### *Recommendations*

Remove damaged concrete [cracked, chipped, spalled, gouged, etc.] to a 2" minimum depth and 2" minimum beyond the damage in all directions. Roughen and prepare finish surfaces to accept new concrete material. In locations where reinforcing can be repaired, clean it to bright metal and prime with a zinc rich primer. Remove reinforcing where it is exposed, corroded and can not be repaired. Replace it with vinyl ester resin bars reinforced with fiberglass equal to "Rebar" as manufactured by IMCO Reinforced Plastics, Inc., Moorestown NJ. Seal all field cut ends in accordance with the manufacturer's recommendations. Keep reinforcing back 1-1/2" from exposed faces.

In areas where concrete is to be repaired, install threaded dowels, vinyl ester resin reinforced with fiberglass equal to "Fibrebolt" as manufactured by IMCO Reinforced Plastics, Inc., Moorestown NJ, at 6" on center and 1-1/2" clear from exposed faces. Apply a bonding agent [equal to "Nitobond Epoxy Gel 400C" by Fosroc, Inc., Georgetown KY or "Sonneborn Sonoprep" by Chemrex, Inc., Shakopee MN] prior to placing concrete. Concrete should be air entrained and of the same strength as the concrete being repaired. The concrete should match the profile, finish and color of adjacent concrete.

## Mound Tomb and Vault Structures

### *Issues*

Mound tombs or vaults built into hillsides are located in a number of the sites. They typically have vertical granite walls with iron or marble doors on the entrance side and lawn above. Most of these structures are sound, but a few require dismantling and reassembling the stone facade and entrance structures. Some of the doors appear to be original, but many are missing or have deteriorated to such an extent that some form of sealing alternative has been undertaken. The existing methods are extremely varied and arbitrary. No standard exists.

### *Recommendations*

The practice of sealing door openings with mortar and parging should cease. The use of cobblestone or concrete block infill at granite facades or brick infill at brick facades should also be discontinued. If a replica of the door is not available, a visually similar, unobtrusive, standard painted steel or cast iron plate, secured to the masonry with expansion bolts, should be used. A paint study should be performed on the existing remaining doors to determine the appropriate historic color [often green or black].

*Open mound tomb,  
Brewster Cemetery, Worthington*



As a general principle, mound tombs [those with vegetation on the top and/or top and sides] should be maintained in lawn to preserve the continuity of image of a burial ground or cemetery. The requirement to mow these lawn areas has raised concerns about structural issues related to the tombs below and access for mowers when there is a desire for maintenance friendly sites. Mound tombs with very steep side slopes are very difficult to mow. The introduction of ground covers like Periwinkle would reduce structural and access concerns once established. Ground covers do however have very high maintenance requirements until they become established and the introduction of ground covers would change the appearance or image of a historic burial ground or cemetery. The successful long term use of any type of vegetation on mound tombs is almost entirely dependent upon the availability of moisture because these raised earth forms tend to dry out much more rapidly than the surrounding earth.

*Brick infill at vault entrance,  
Common Burying Ground, Templeton*



## Table Tombs and Box Tombs

### Issues

Some families preferred the use of table tombs, presenting a visible indication of the social class of the deceased. Many of the historic brownstone and marble table tomb tops are or are very close to becoming illegible. The original slabs should be stabilized and conserved even if the inscriptions are illegible. Each table tomb should retain as much of its individual character as possible.

### Recommendations

If brownstone tables or slabs on top of table tombs must be patched to prevent water penetration and freeze/thaw damage, it should be done only if it is clear that such damage would be prevented, and with a cementitious material tinted to match surrounding aged brownstone as closely as possible. The application of concrete will not slow the natural exfoliation process of this sedimentary material. Concrete should only be used for infill, never as a coating layer. Cut back only to sound stone. Undercut edges of area to be patched for better securing of the patch. Consider the use of "Acryl-60" as an added adhesive component in the patch.

*Damaged box tomb,  
Old Hill Cemetery, Newburyport*



Parging has been applied to many table tomb walls with generally poor results. It appears that parging was initially employed as a "quick fix" solution to deteriorating brick joints or as a method to strengthen fragile construction. Almost all parged structures observed exhibit evidence of cracking, bulging, leaning or instability. When repairing parged surfaces:

- Remove all loose parging and repair the masonry backup before any reapplication. Allow repair work to cure thoroughly prior to reapplication.
- Do not perform patchwork parging. Complete an entire surface.
- Carry the parging at least 6" below grade to avoid the unsightly flare that is often present when parging stops at the ground surface.

Check for signs of efflorescence on an annual basis and photograph with a scale in place so that changes can be seen and documented.

*Brownstone table tomb,  
East Parish Burial Ground, Newton*



## Edging of Family Plots

### Issues

During the Victorian era, affluent families enclosed their plots with a formal, enduring perimeter of granite or marble. The continuous stone edging typically raised the level of the plot above the surrounding surface and steps were frequently part of the plan. The less wealthy often used metal fence or chain enclosures. Most of the latter are missing today with remnants of low, square granite posts at the corners and/or granite fence post bases.

*Family plot edging,  
Mount Hope Cemetery, Boston*



Some of the stone plot edging is in good condition, but much has suffered from settlement and/or overturning and has heaved or rotated out of position. Stone corners are sometimes nominally pinned together with iron cramps.

#### *Recommendations*

Displaced edge stones should be reset and the ground raised adjacent to them to cover the foundations and bottoms of the edging. Existing corner pins are generally ineffective and should be replaced with concealed stainless steel angles and adhesive anchors. Alternatively, the concealed stone foundations could be replaced with a continuous concrete pad and the edge stones could be set on top of the concrete on mortar beds, with vertical stainless steel pins connecting the two materials.

*Settlement and overturning at family plot edging, Old Burying Grounds, Littleton*



## **BUILDINGS**

### *Issues*

Some of the sites once had buildings located within them that served a variety of functions, from morgues to hearse houses to maintenance structures. Some remain and others have been re-located or removed. They are or were constructed of an assortment of materials.

### *Recommendations*

Prior to determining an approach to the restoration of an existing building, a determination should be made during the planning phase whether it is historically significant. In regard to former buildings, many should not be replaced [replicated or returned to a site] unless there is an overwhelming desire for this to occur and a commitment to maintain such a structure. They could potentially become targets for vandalism, particularly in sites with little visitation.

*Buildings, Mount Hope Cemetery, Boston*



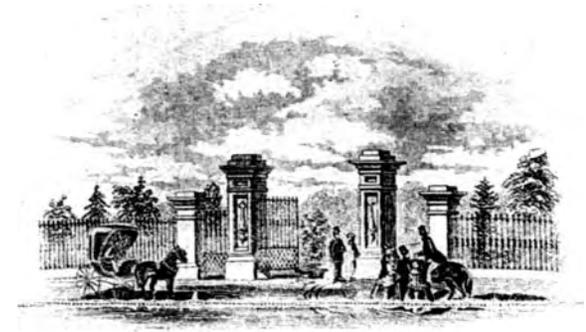
## **FENCES AND GATES**

### **Perimeter Fences and Gates**

#### *Issues*

The primary function of a fence is to keep unauthorized people and animals from entering a premises. Little is specifically known about the edge treatment of these sites prior to the use of cast iron fence. Most graveyards were open with an occasional site enclosed with a stone wall. Once walled, a graveyard was generally not otherwise maintained. As the 19th century approached with increased urbanization, the number of fenced or walled graveyards increased.

*1867 entrance gateway, Mount Hope Cemetery, Boston*



*Pedestrian and vehicular entrance gateway, Chocksett Cemetery, Sterling*



In the earliest burial grounds, iron was used only in conjunction with wood for gates and fences. During the 18th century iron became the chief material for “boundary fencing around houses, public buildings and grounds,” because of its strength and durability. It is possible that cast iron fencing was used in the burying grounds because of the popularity of decorative cast iron, which was both sturdy and relatively transparent. The latter qualities may also have seemed important as a deterrent to the grave robbing incidents of the 1820s. The fencing of Boston’s burial grounds with cast iron proceeded from 1839 through the 1850s which is the approximate time frame when the early rural cemeteries were established.

Rural cemeteries of any substance created imposing main entrance gateways emphasizing passage from the hustle and bustle of every day life to a special, quiet, sacred encounter with the place inside. Gateways were initially made of wood and later stone when finances allowed.

#### *Recommendations*

Perimeter fences and gates should be maintained where appropriate.

### **Iron Fences and Gates**

#### *Issues*

Three ferrous products [wrought iron, cast iron and steel] were popular in North America at various times. Wrought iron was used for most purposes until about 1790. For the majority of the 19th century cast iron became the principal material for gates and railings because it could be mass produced and was relatively inexpensive. The ornamental cast iron industry began to flourish in the 1840s. Cast iron was also used in building construction in the late 1800s and early 1900s.

Wrought iron became fashionable again about 1880. By the turn of century and with the Art Nouveau style both wrought and cast iron were used, and in some cases combined. After 1866 Americans also began to make large amounts of mild steel, a low carbon alloy used unhardened as a substitute for wrought iron, even though wrought iron resists rusting better than mild steel.

Wrought iron is a strong and malleable low carbon form of iron alloy with good tensile strength. It is almost pure metal with slag particles and can be shaped into complex and intricate forms because of its high elasticity. Formed by hammering heated metal, it becomes stronger the more it is worked. However, it ordinarily contains so little carbon that if heated and quenched like steel, it would not harden. Machine parts made of wrought iron would wear rapidly in use because of this softness. Working wrought iron is a laborious and costly process.

Cast iron contains a comparatively large amount of carbon [2-4%] as well as silicon. Melting at a lower temperature than wrought iron, it can be cast into intricate shapes, although not as crisp and graceful as wrought iron because of the molding process. Cast iron is very hard with excellent compressive strength, but poor elasticity. It is brittle and shatters if heated and suddenly cooled with water.

Some sites appear to have original decorative cast or wrought iron fencing and/or gates. The remaining iron or steel fencing tends to be more contemporary with angles, channels, H beams and/or tubular components. The condition of the fences and gates is generally good with most of the work required being in the nature of minor repair, related to straightening bent components, replacing missing parts and painting. Most of the paint finishes are in poor condition, needing repainting within 5 years.

#### *Recommendations*

In areas of high visitation, efforts should be made to restore historic ironwork, that is, to replace inappropriate current fences and gates with more historically appropriate fences and gates.

*Iron fence on stone masonry wall,  
Glenwood Cemetery, Everett*



## Interior Fences and Gates

### Issues

A number of properties have cast or wrought iron fences and remnants of other elements often associated with family plots. These enclosures had many advantages. They were adaptable to a variety of topographic conditions and it was possible to express imagery [religious and symbolic iconography] in the molded iron to an extent that was not previously possible. Even though cast iron was relatively inexpensive, it gave an impression of great luxury.

*Cast iron fence with rustic motif,  
Walnut Street Cemetery, Brookline*



58 - General Recommendations

Although popular early in the rural cemetery movement, these elements fell into disfavor by 1867 and were being removed from sites. Extensive plot fencing came to be viewed as detracting from the overall beauty of the landscape. The boundaries of numerous adjacent plots were marked with competing fences, with complete disregard for the visual impact on the cemetery as a whole.

Cast iron was not supposed to deteriorate if it was regularly painted. However, this routine maintenance did not always occur. Rust and overgrown vegetation hastened the deterioration of a lot of iron fencing. Many of the remaining iron fences were removed for scrap iron to support 20th century war efforts, leaving few examples of this most typically Victorian of embellishments.

### Recommendations

As a general rule the remaining fences should be restored as they provide excellent examples of this form of cemetery art. Granite posts around a number of family plots indicate that there was some iron fencing at one time. These should only be restored based upon historic photographs or other reliable information or illustrations.

## Metals Restoration

### Issues

In welding older metals, the welding technique must be matched correctly to the type of metal. This may involve preheating the metal, using hotter or cooler than normal welding heat, faster or slower rates of welding speed, or lower than normal strength electrode rods. Although wrought iron can be easily welded, cast iron can not be welded with modern techniques due to its propensity to melt at relatively low temperatures. However, cast iron can be joined with brazing like methods.

In the 1987 APT [Association for Preservation Technology] Bulletin No. 3, J. Scott Howell states in his article *Architectural Cast Iron, Design and Restoration* that although cast iron is extremely difficult to weld, a strong bond can be obtained using a high quality nickel rod in accordance with the procedures recommended by the American Welding Society.

The process becomes even more difficult when effecting repairs on original material. In many cases, welding can worsen the situation. Attempts to repair original iron with weldments should only be attempted by experienced craftsmen and should never be considered for structural cracks. Using the correct welding process is so important that a testing agency should be called upon for every case of planned welding to determine the nature of the metal and to recommend the correct procedure.

### *Recommendations*

Cast iron components should be recast when there is evidence of structural cracking or severe deterioration around attachment points. Missing components should also be recast. Castings should be made of Class 30 Gray Cast Iron conforming to ASTM A48. Master patterns for new castings should be made of White Pine or Mahogany, and working patterns made of aluminum or urethane. The original Victorian castings were assembled with low carbon wrought fasteners which were subject to premature deterioration. Noncorrosive stainless steel fasteners should be used today for cast and cast/wrought assemblies.

Where long fences are tied together with continuously welded connections, enormous forces can be generated as the metal expands and contracts from temperature changes. When a fence gets cold, it contracts and stresses welded connections. This results in a broken weld, bent support post and/or broken cap or foundation at the base of the support post. When a fence gets warm, it expands with similar results and/or buckled rails.

In the design, fabrication and installation of fencing and gates, allowances should be made for the thermal movement that results from changes in ambient temperature to prevent buckling, opening up of joints, overstressing of components or connections and other detrimental effects. Slip joints should be provided between embedded elements and connecting rails for lateral movement. Slip joints should consist of slotted holes and Teflon washers.

*Rust jacking at former fence post support, East Parish Burial Ground, Newton [left] Chocksett Cemetery, Sterling [right]*

Where metal fence posts are inserted into masonry or concrete, there should be no pockets to collect moisture. The preferred joint material in these locations is molten lead or a lime-sand mortar. Sealant will shrink and embrittle over time. The use of joint sealants within metal fabrications is appropriate to prevent moisture from collecting in metal to metal joints. Sealants for this use should be a premium grade polyurethane based elastomeric sealant conforming to ASTM C920, Type S, Grade NS, Class 25 equal to Sikaflex-1a as manufactured by the Sika Corporation, Lyndhurst NJ of a color to match the paint finish.

Galvanic action and other forms of corrosion should be prevented by insulating metals and other materials from direct contact with incompatible materials. Although the corrosion or oxidation of aluminum is far less destructive to stone than iron's "rust jacking," it is nevertheless unsightly. Aluminum replacement parts should not be used in cast iron or steel fences.



### *Rust*

*Iron reacts with oxygen in the air to revert to iron oxide. While the reaction is slow in the absence of water, it is more rapid when water vapor is present and a layer of hydrated iron oxide [rust] forms on the surface. Rust is permeable to air and water. Once rusting starts, it continues unless measures are taken to remove the corrosion present on the iron and a coating of paint is provided to prevent corrosion. Once a surface has developed rust, it becomes sensitized to further corrosion.*



### *Bronze Plaque Restoration*

*There are a number of bronze informational plaques in these sites. The verdigris patina that develops on bronze should be removed to prevent further corrosion. Restoration should include cleaning and protective coating. Loose dirt, debris and other water soluble corrosion should be removed with a low pressure water spray [1,000 psi or less] and/or soft nylon or natural hair brush with water.*

*On some surfaces and finishes, other corrosion may be removed by an abrasive method using "Scotch-Brite" pads and water. This is not recommended for polished finishes.*

*Protective coating should include a two part system with a first coat of "Incralac" and a second coat of micro-crystalline wax like Renaissance Wax or approved equal. Butcher's Wax and Bowling Alley Wax are acceptable alternatives. The first coat should be brush applied in strict accordance with the manufacturer's recommendations, covering all bronze, particularly into and around all raised components. After the first coat has cured, apply three coats of wax with a soft rag and buff each coat.*

All metals that are rusting or have failing paint finishes should be cleaned down to bright metal and properly primed and coated to prevent further corrosion. Older paint finishes should be laboratory tested for lead content prior to removal. The preferred method of cleaning and paint removal from historic cast iron is using low pressure dry grit blasting on site. It is the most effective, being fast, thorough and economical. The pressure should be less than 100 pounds per square inch using a fine aggregate of iron slag or sand, but not copper slag. The aggregate should not be very sharp or very hard. It is preferable not to use wet sandblasting or flame cleaning. Hand scraping, chipping and wire brushing is not as effective as other methods. Chemical rust and paint removal methods should generally be employed in the shop as opposed to in the field. When employing pressure blasting, comply with local building codes and environmental authorities, and take every precaution to protect adjacent materials, including plant materials.

Bare surfaces should be painted within 48 hours of proper cleaning. The preferred paint system for cast iron includes a two part epoxy primer and an aliphatic or acrylic polyurethane finish coat. An acceptable, but less durable, less expensive alternate for non corrosive environments includes an application of a passivating material, such as a high zinc dust content [90% zinc content minimum] primer, then a red oxide alkyd metal primer and alkyd enamel finish. Concealed surfaces should be thoroughly prime coated prior to concealment. While a semigloss black finish is often recommended for ease of maintenance, a paint seriation analysis should be performed on existing remaining metal components to determine historic paint colors and other characteristics. Shades of green, brown or black may be appropriate historic colors.

If spray operations are used, extreme caution should be exercised to prevent overspray from coming into contact with persons, motor vehicles, trees, surrounding buildings and other objects [particularly historic artifacts like gravestones] not intended for treatment.

Paint as often as required to maintain good condition and appearance, but not less than once each ten years. When coatings fail, fences corrode. Paint coatings should be monitored annually for peeling and failure.

### **Post and Chain Fencing**

#### *Issues*

This type of low control fencing is primarily used to discourage people from walking on grass in intensely used areas. It is currently used at Granary Burying Ground in Boston. Post and chain fencing should be used only where necessary. There are some safety concerns and it can be a visual distraction.

#### *Recommendations*

As a general recommendation, post and chain fencing should be removed from a site once an appropriate path system is in place. As long as posts and chains remain on some sites, reset posts in an upright position as required. Straighten or replace bent or crooked posts. Repair chain and related appurtenances as required. Locations should be carefully considered to prevent chains from rubbing against gravestones. Remove chains that rub stones.

## Chain Link Fences

### Issues

Typically used in less visible areas, wire and chain link fencing was an inexpensive alternative to the more substantial iron fences. Funds were used for wire fencing in 1880 at Boston's Mount Hope Cemetery. In general, most of the chain link fences examined were in good condition, but needed varying degrees of maintenance.

*Chain link fence,  
Western Cemetery, Portland*



### Recommendations

Missing and bent components should be replaced and/or repaired. Rusted sections should be prepared and painted. Structurally deficient rusted support posts should be replaced. Rust stains on masonry and concrete copings are primarily an aesthetic problem, as iron oxide deposits do not support botanic growth or harm masonry. However, rusting metal expands, and rusted support posts will crack masonry and concrete copings. This allows moisture penetration inside the coping and eventually the wall below where freeze/thaw cycles can cause significant damage.

Support posts should be inspected at least once a year for stability to insure structural support. Replace those that are weak or structurally unsound. Repair damaged fabric as soon as possible. For the long term, consideration should be given to replacing the chain link fence at some sites with a more historically appropriate fence. This is particularly important in areas of high visibility and/or visitation.

## Wood Fencing

### Issues

Wood, as well as stone, was used for enclosing the perimeters of a number of the early burial grounds. It is assumed that the earliest were a post and rail type, primarily to control livestock. Picket type fences with a more decorative character probably followed.

### Recommendations

Where wood fencing is determined to have existed and where it has not been replaced with another more durable material, consideration should be given to replacing or replicating it based upon historic information. Such is the case in Tisbury and Worthington. Where wood has been replaced with a more durable material, serious consideration needs to be given to whether it is appropriate to return to wood.

*Wood fence, Village Cemetery, Tisbury*



## SITE AMENITIES

### Signs

#### Issues

There are four categories of signs appropriate to historic burial grounds and cemeteries: identification, regulation, orientation and interpretation. Many sites need identification signs as a first priority. Few sites have signs for regulation, orientation, interpretation or information. Regulatory signs that exist tend to focus on preventing parking at entrances. Rules for use are rarely posted. Informational signs tend to be bronze commemorative plaques.

*Identification sign,  
Evergreen Cemetery, Boston*



Most of these sites need signs at the entrance that identify the property and list rules and regulations. At a minimum, these signs should provide some basic information, dates and historic designation. Placement of an orientation and informational or interpretive sign at or near the entrance of each site is also recommended. The placement of signs inside the grounds should be coordinated with path systems so that visitors naturally remain on path surfaces and are not attracted to walk on lawn surfaces. Interpretation is extremely important and a supporting sign system is critical.

*Victorian path sign,  
Boston*



#### Recommendations

Signs should be legible and visually compatible with the character of the grounds and an overall system to present a sense of uniformity and wholeness. The system should be designed to reflect the museum quality of the grounds. The issue of donor and/or organization markers or plaques is discussed under the topic of administrative management.

Special consideration should be given to restoring Victorian street or path sign systems where appropriate. Decisions related to sign materials should be made with consideration to the overall setting. Many materials, colors and styles can be visually distracting in terms of viewing a historic property. Signs set in granite bases might give the appearance of gravestone markers, potentially confusing visitors. Concrete bases are often an inappropriate material.

*Sign mounted on a tree,  
Glenwood Cemetery, Everett*



## Trash Receptacles

### *Issues*

Few of these sites have trash receptacles. Those that do, which tend to be the active sites, typically use painted 55 gallon metal drums.

### *Recommendations*

In general, sites that are typically not open should not have trash receptacles located within them. As a site becomes more open to the public, trash receptacles could be added, but they should be emptied on a regular basis. Trash receptacles should always be located outside, as opposed to inside, the cemetery if at all possible, particularly for small sites. The visual character of trash receptacles should be compatible with adjacent fencing where it exists. Steel slat type receptacles are generally the most compatible with metal picket fencing.

Inspect at least 3 times a year including all connections. Repairs should be made immediately upon discovery of need or notification. Paint metal components once a year.

*Stone bench marker,  
Greenlawn Cemetery, Nahant*



## Seating

### *Issues*

Few of the sites offer seating. Benches were not typically provided in burial grounds prior to the rural cemetery movement that began in 1831.

### *Recommendations*

Some authorities prefer providing conveniences for visitors like seating and trash receptacles as an alternative to littering and sitting on stones. As a general rule, however, benches should not be added except as appropriate in areas established after 1831.

*Cast iron Victorian planter,  
Mount Feake Cemetery, Waltham*



## Planters

### *Issues*

Most free standing planters tend to be associated with family plots. There are a few outside entrance gates or near administrative offices or visitor facilities. Seasonal flowers can brighten and enhance an entrance, provided they are maintained.

### *Recommendations*

The owners of built in or substantial planters at family plots should be encouraged to maintain them. Planters in other locations should be removed seasonally when there are no flowers in them, and permanently if maintenance ceases. Planters should not be added to historic burial grounds and cemeteries.

*Victorian planter,  
Oakwood Cemetery, Syracuse*



## Flagpoles

### Issues

Several of the sites have flagpoles. While some are simply flagpoles, a few serve as individual memorials and others have military associations.

### Recommendations

As a general rule, flagpoles should not be added except where there is a strong military association and presence because of the maintenance and management issues associated with them. Flagpoles should remain only as long as the responsible constituency continues to maintain the flag, raise it and take it down. Flagpoles should not be illuminated.

*Cannon at a military plot,  
Mount Hope Cemetery, Boston*



## Cannons

### Issues

At least 2 sites, Danvers and Everett, have field pieces or cannons placed in them because of the military associations of specific areas in each site.

### Recommendations

Cannons require maintenance which should be provided by the groups associated with each piece.

*Marker bases used as drain edging,  
Cambridge Cemetery, Cambridge*



## UTILITIES

### General

#### Issues

Most older burial grounds had no need for utility services. As the rural cemetery movement became established, water supply was deemed desirable to help maintain the overall landscape and allow visitor maintenance of plantings at individual and family plots. Electricity was only needed to service building needs and was not used for general illumination of a site.

#### Recommendations

In urban areas it is generally preferred that utility services such as electricity for lighting and water supply for irrigation be provided from adjacent public, institutional and/or commercial buildings. This would create the least disruption of the burying grounds or cemeteries and the least potential visual intrusion. Other means of providing utility services is less desirable and perhaps less feasible in strictly residential settings. Sites that formerly had buildings like tool sheds sited on them should be investigated to determine if utility services were provided to those buildings and if they are potentially serviceable.

## Drainage

### Issues

Storm drainage systems were found in few of the sites. Storm water discharges into the sites from adjacent properties from rain leaders or other sources were found at a number of the properties causing erosion and sedimentation conditions.

### *Recommendations*

Existing storm drainage systems should be maintained. New systems should generally not be added to inactive sites unless deemed absolutely necessary. Storm water discharges into the sites from adjacent properties should be rectified as soon as possible to prevent further erosion and sedimentation damage.

Inspect storm structures 4 times a year and remove sediments from catch basins in early spring or more often as required. Clean storm piping at least every five years or more often as required. Remove all mud, leaves and other debris. Repair fractures in masonry drainage structures as often as required. Improve site drainage to alleviate surface and ground water problems.

### **Water Supply**

#### *Issues*

While water is generally available at the active sites, it appears to be scarce in many of the others and is a significant reason why lawns are in fair to poor condition during the dry summer months.

#### *Recommendations*

Although desirable, the installation of an irrigation system could be very damaging to grave sites and gravestones, and would be costly. Frost proof hose bibs should be added where feasible at adjacent public, institutional and/or commercial buildings. This is particularly important in sites where public visitation is significant.

Inspect all working parts and plumbing for leaks or faulty operation at least annually and repair at once. Drain each fall to prevent damage from frost and turn on each spring.

### **Lighting**

#### *Issues*

No existing lighting was found inside any of the sites other than security lights at buildings. Existing adjacent street lighting provides some ambient illumination for some sites.

#### *Recommendations*

In most cases there is no need to provide lighting in properties of this type. A high incidence of vandalism may cause consideration of providing illumination throughout a site, or in certain areas. The lighting of sites from adjacent streets should be maintained and/or upgraded where deemed necessary for security reasons. The addition of security lighting in other areas should be mounted on adjacent buildings wherever possible. If this is not possible or practical, security lighting should be pole mounted at the edges of properties where it would create the least visual intrusion. Decorative or "period" pedestrian or holiday lighting should not be added to any of the sites.

Repair damaged metal surfaces as damage occurs. Spot check and repair all surfaces every 5 years. Replace bulbs as needed, averaging every 2 years. Replace ballasts every 10 years.

### A CONCLUDING CAUTIONARY NOTE

#### *Issues*

Subtle archaeological features in burial grounds and cemeteries should be identified and recorded before important scientific data is lost or destroyed by natural or cultural processes. For example, soil erosion poses a serious threat to sites where the sloping ground surface exposes markers, monument foundations, funereal decorations or grave shafts. Erosion and associated surface runoff can also gradually degrade the ground surface around markers and above grave shafts located on natural knolls and hilltops. Landscape modification can threaten burials placed close to cemetery margins, even when those margins are known and enclosed behind retaining walls. Impacts from leveling the ground surface or rigorous landscape maintenance can impact shallow burials or displace artifacts placed on coffins. Intensive landscape improvements, like leveling, reseeding and planting, can disturb evidence of surface treatment of graves and scientific information "such as color, texture, friability, moisture, and organic enrichment" evident from the soil matrix.



*Water supply,  
Pere Lachaise Cemetery, Paris*

Well intentioned, but inappropriate, restoration also poses a threat to scientific information from graveyards. Incorrect measures include covering pathways and traffic patterns, correcting unsightly, but historical alterations, and subsurface excavation to search for buried markers and bases. The latter activity disturbs scientific data on former landscaping efforts and may remove near surface artifacts and evidence of coffin treatment. Grinding or removing tree stumps and excavating root systems can dislodge coffins or coffin hardware and may intrude upon shallow burials. Equipment and vehicles brought on site to remove trees or tree limbs can damage near surface features and objects. Impacts from chemicals used to kill shrubs and tree roots will alter the mineral composition of the soil, may interfere with chemical analysis of skeletal remains and can damage or destroy coffins, coffin hardware and memorials.

Inappropriate beautification procedures include remounting markers in neat, orderly rows, when the originals were slightly askew or placed in asymmetrical family groups. No graveyard should be "restored" to a condition that is incompatible with its own historic reality. Early colonial burial grounds, for example, were often ill kept and used for pastures. They never achieved the bucolic character of 19th century rural cemeteries.

Occasionally broken markers or marker fragments have been removed from their original location and thrown outside the cemetery bounds, placed at the base of cemetery walls or even used to repair the original stone walls. Finally, unmarked burials, including those located in pauper's lots and along a cemetery perimeter, may be threatened by development on what might be assumed to be open space.

#### *Recommendations*

*Appropriate Stabilization and Protection Measures:* The ground surface of a historic burial ground or cemetery should never be excavated but can be made smoother with the addition of loam and seed. Trees should be hand trimmed whenever possible. If heavy equipment is necessary, it should be operated in a location outside the cemetery where possible. Tree roots should not be removed and stumps should not be ground below the surface. Trees and shrubs should be cut flush with the ground surface. Materials brought on site for repair [cement, mortar, gravel or peastones] should not be stockpiled on the ground surface, but placed on tarps and carefully removed when preservation efforts have been completed. In this way repair materials will not obscure the archaeological record of landscape treatment or cause damage to the root systems of trees and shrubs. If possible, stone wall repairs should be made from outside the cemetery. Markers should be remounted in their original position rather than in neat, orderly rows, unless there is strong evidence to indicate that the original cemetery was set out in this way.

Watch out for uncarved fieldstone markers. Do not remove them during landscape treatment and ground clearance. Careful gentle probing can provide information about the potential presence of markers just beneath the surface.

Excavating the ground surface to search for toppled burial markers should be avoided. The impulse to remount original markers should be moderated by an awareness that digging into the ground surface can destroy information on decorative ground treatment [planting, stone surface treatments, borders] as well as objects placed outside the coffin [military insignia, photographs, statues, rosaries, crosses, etc.]. Excavation, including stabilization, repair and/or protection, within historic burial grounds and cemeteries should be conducted only by, or under the supervision of, professional archaeologists under permit from the State Archaeologist as required by state law.

*While the procedures outlined in these guidelines are accepted practices in the field of conservation, neither the Department of Environmental Management nor the authors nor reviewers assume any responsibility for the preservation, conservation or restoration work of readers of this publication.*



## ADMINISTRATIVE MANAGEMENT POLICY ISSUES AND RECOMMENDATIONS

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### ADMINISTRATIVE MANAGEMENT **Laws, Rules and Regulations**

Each community is the governing authority responsible for the care and maintenance of these municipally owned historic burial grounds and cemeteries. However, a series of Federal and State laws also protect burial grounds and cemeteries. Principal among them are the Native American Graves Protection and Repatriation Act [PL101-601] and the Massachusetts Unmarked Burial Law [Chapter 659 of the Acts of 1983 and Chapter 386 of the Acts of 1989].

In Massachusetts, other supporting laws protecting burial grounds and markers include:

- Cessation of Activities at Unmarked Burial Grounds, Reports to State Archaeologist [Ch 9, Section 27C]
- Discovery of Unmarked Human Skeletal Remains [Ch 38, Section 6B]
- Preservation of Ancient Burial Places [Ch 114, Section 17]
- Care of Neglected Burial Places [Ch 114, Section 18]
- Violation of Sepulchre [Ch 272, Section 71]
- Injuring or Removing Tombs, Graves, Memorials, etc. [Ch 272, Section 73]
- Removal of Gravestones for Repair [Ch 272, Section 73A]

Gravestone Repair and Reproduction [Ch 448, Section 950 CMR 41]

The latter requires that a permit be issued by the Massachusetts Historical Commission to restore and/or repair a gravestone. Copies of the relevant laws and regulations can be obtained from the Massachusetts Historical Commission, 220 Morrissey Boulevard, Boston, MA 02125.

Archaeological excavations on public lands or involving state or federal licenses, funds, or permits must be conducted under permit from the State Archaeologist at the Massachusetts Historical Commission. Archaeological excavations of burials can be conducted only under exceptional circumstances, and after a special permit has been obtained from the State Archaeologist.

If a site becomes listed on the National Register of Historic Places, preservation restrictions may be imposed by the Massachusetts Historical Commission if state or federal funds are used. Local rules and regulations pertaining to use of a historic burial ground or cemetery should be reviewed and reaffirmed.

In regard to tributes, cut flowers should be allowed at any time provided they are laid on the ground and not wired or tied to grave markers. Potted plants and artificial plants or flowers should not be allowed. The planting of perennials or shrubs should also not be allowed. Statues, lights, glass objects or other impediments should also not be permitted. Flags on individual graves should be permitted only for 24 hours before and after Memorial Day, Patriot's Day, Evacuation Day and Veteran's Day.

Controlling activities on sites like these is generally beneficial. Curtailing them can sometimes have negative results. Once rules pertaining to the use of a site are adopted, they should be clearly stated on a sign at the gate. They should include:

- No Gravestone Rubbing
- Do Not Sit or Lean on Tombs or Gravestones
- No Alcoholic Beverages
- No Dogs Allowed

Other considerations should include the prohibition of bicycles, roller skates, roller blades and skateboards as well as picnics [the consumption of food or beverages], jogging and athletic games. Visitors should be reminded to conduct themselves in a manner in keeping with the dignity and sacredness of a burial ground or cemetery. Loud or unseemly conduct or music should be prohibited. Visitors should not litter the grounds, or cut, break or injure trees, shrubs or other plants.



*Rules and Regulations Sign  
Evergreen Cemetery, Boston*

*Rules and Regulations Sign  
Cambridge*



### **Access and Control**

This can be a complex issue because while there are numerous advantages to encouraging the public to spend time at a historic burial ground or cemetery, there are also benefits to keeping people out of these sites. The reduction of potential theft and vandalism are the primary reasons for keeping these sites locked on a regular basis. Unintentional damage by indigents and animals, dogs primarily, is also a concern. These potential problems have not surfaced to a significant degree in the sites examined as part of this program. It is however an important consideration for many sites in the Commonwealth.

In any case, most sites should have some form of visible boundary definition, such as a wall, fence or hedge, to discourage unintentional damage by unknowing or well meaning abutters. The type and form of this definition should be determined by the historic nature of the property and the financial ability of the community in which it is located.

Most of the sites in this program allow free public access at all hours. If there are no significant problems, sites should not be changed in this regard. Should problems arise, serious consideration should be given to discussing the matter with the local law enforcement entity, providing perimeter fencing and incorporating policies adopted by other municipalities that generally have more of an urban setting. Those sites are typically locked and opened only on request. This policy is maintained until public demand for access to a site becomes significant. At that point a site is opened on a daily basis at specific times by specific persons and the hours are clearly posted. Under these conditions, the development of local partners would assist in making sites more accessible to the public.

### **FRIENDS GROUPS AND CITIZEN PARTICIPATION**

Partnerships formed between municipalities and local constituency groups such as neighborhood associations, historical societies and friends groups can be beneficial for historic burial grounds and cemeteries. These relationships are essential for site management and successful fund raising. Local constituency groups are effectively the eyes and ears for these resources, providing oversight and watchdog functions. Local constituency groups also provide support for grant writing activities. Incorporation as nonprofit entities enables them to receive funds from charitable foundations, corporations and individuals.

Constituency group and volunteer efforts could be directed toward developing strategies and efforts to preserve and improve these sites including inventories, stone fragment collection, cleanups, plantings, watering of newly planted trees, public education, interpretation, special events, the development of visitor brochures and guided walks to increase public awareness of these important sites.

Education can play an important role in building community support. Cemeteries and burial grounds can be used as an outdoor laboratory for local schools, giving classes in history, art, sociology, religion, geology, botany or metalurgy.

The preparation of preservation master plans or guidelines can help closed or abandoned historic burial grounds and cemeteries become community assets once again. They can provide guidance on how to present historic burial grounds and cemeteries as community assets and/or appropriate tourist destinations. Without such guidance even the most devoted cemetery advocates find it difficult to sustain support. With the assistance of local constituency groups this can be created by enlightening people as to the historic value or significance of such a property to a community. As a potential tourism component for the Commonwealth, historic burial grounds and cemeteries must be presented in a compelling and appropriate manner. Many sites could be more highly utilized if they were associated with publicized trails or neighborhood walks. Increased public exposure will lead to greater use of these valuable open space resources.

## FUNDING

Most municipally owned historic sites have no endowment funds, unlike many of the well maintained private cemeteries. Care and restoration of these sites is funded primarily by matching grants and the efforts of the local Departments of Public Works or Parks and Recreation. A descendant's research project could become a means to encourage community members to make contributions. Funding for tree planting also needs to be pursued in many cases. State programs like Mass Releaf or the Shade Tree program provide funds for tree inventory and planting.

### Recognition of Contributions

As funds are raised for improvements, donor recognition becomes an issue of concern. Plaques, if necessary, should be grouped in a location near the main entrance of a burial ground or cemetery so as not to detract from the primary experience of a site. If this is not acceptable, plaques for donated or memorial trees should be hung on trees as opposed to being ground mounted on concrete bases. A minimum gift level should be set to at least cover the cost of purchasing and installing the tree, memorial plaque and long term maintenance for the tree. It is preferred that donations be made to a Memorial Tree Fund that can be used as an endowment for tree planting, maintenance and eventual replacement.

## WORKING WITH VOLUNTEERS

Volunteer involvement is an integral part of the success of most burial site preservation projects. They provide the enthusiasm, energy and driving force behind most projects. Much responsibility falls to those faithful volunteers who see a project through from beginning to end.

Because of the nature of volunteer staff, a coordinator, preferably a paid position, is essential. The coordinator takes charge of all the varied talents and time schedules of volunteers, sets timetables for goal accomplishment, assigns tasks and follows up to insure that they are completed. This person keeps others informed and on track, and insures that each participant understands the project and his or her part in it.

With only limited training, volunteers can be the backbone of the work force for documenting and photographing many sites.

Following more in depth training, volunteers can undertake elementary conservation efforts such as washing or resetting certain types of markers. Each volunteer must receive the necessary training for the particular task assigned. Untrained or unskilled individuals should not attempt even the most elementary conservation work.

## RESOURCES

Potential sources of assistance with burial ground and cemetery related issues:

### Informational Resources

Association for Gravestone Studies [AGS]  
278 Main Street, Suite 207, Greenfield MA 01301  
[413] 772-0836  
[gravestonestudies.org]

American Institute for Conservation of Historic and Artistic Works [AIC]  
1717 K Street, NW, Suite 301, Washington DC 20006  
[202] 452-9545  
[aic-faic.org]

Association for Preservation Technology International [APT]  
P.O. Box 8178, Fredericksburg VA 22404  
[703] 373-1621  
[apti.org]

National Museum of Funeral History  
415 Barren Springs Drive, Houston TX 77090  
[281] 876-3063  
[nmfh.org]

National Park Service  
Monument Research and Preservation Program  
200 Chestnut Street, 3rd fl., Philadelphia PA 19106  
[215] 597-5824

National Park Service  
Preservation Assistance Division  
Technical Preservation Services Branch  
P.O. Box 37127, Washington DC 20013  
[202] 343-9578

National Trust for Historic Preservation  
1785 Massachusetts Avenue, NW, Washington  
DC 20036  
[202] 673-4296  
Northeast Office  
7 Fanueil Hall Marketplace, 5th fl., Boston MA  
02109  
[617] 523-0885  
[nthp.org]

Save Outdoor Sculpture  
Heritage Preservation  
1730 K Street, NW, Suite 566, Washington DC  
20006  
[888] 767-7285  
[heritagepreservation.org/PROGRAMS/SOS/  
aboutsos]

Partners for Sacred Places  
1700 Sansom Street, Philadelphia PA 19103  
[215] 567-3234

Alliance for Historic Landscape Preservation  
co Sherda Williams, Membership Coordinator  
2740 Redick Ave., Omaha NE 68102  
[ahlp.org]

American Society of Landscape Architects  
636 Eye Street, NW, Washington DC 20001  
[202] 898-2444  
[asla.org]

Massachusetts Department of Environmental  
Management  
251 Causeway Street, Suite 600-700, Boston MA  
02114-2104  
[617] 626-1250  
[state.ma.us/dem]

Massachusetts Historical Commission [State  
Historic Preservation Office]  
220 Morrissey Blvd., Boston MA 02125  
[617] 727-8470  
[state.ma.us/sec/mhc]

National Center for Preservation Technology and  
Training  
Northwestern State University of Louisiana  
645 College Ave., Natchitoches LA 71457  
[318] 357-6464  
[ncptt.nps.gov]

#### **General Information Websites**

alsirat.com/silence  
members.aol.com/TombView/links  
potifos.com/cemeteries

#### **State and Local Organizations**

African American Cemeteries Online [Texas]  
[prairiebluff.com/aacemetery/tx]  
Benton County Cemetery Preservation Group  
[Arkansas]  
Center for Historic Cemeteries Preservation  
[Florida]  
Coalition to Protect Maryland Burial Sites  
Connecticut Gravestone Network  
Florida State Task Force on Abandoned and Ne-  
glected Cemeteries  
Grave Concern, Inc. [Lancaster County PA]  
Maine Old Cemetery Association [Augusta]  
Oregon Historic Cemeteries Association, Inc.  
Save Our Cemeteries, Inc. [Louisiana] [soc@  
saveourcemeteries.org]  
Save Southern Cemeteries [angelfire.com]  
Save Texas Cemeteries, Inc. [rootsweb.com]  
State Association for the Preservation of Iowa  
Cemeteries  
Vermont Old Cemetery Association  
Washington State Cemetery Association [roots-  
web.com]

#### **Education Programs**

The GraveNet Project [EduTel Communications,  
Inc.] gives K-12 students an opportunity to  
investigate community history, geology, etc.,  
through cemeteries by providing lesson plans  
and other resources. [edutel.org/gravenet]

**Grant Assistance**

Foundation Center  
79 Fifth Avenue, New York NY 10003  
[212] 620-4230

Grantsmanship Center  
1125 W. Sixth Street, 5th Floor, Los Angeles CA  
90015  
[213] 482-9860

*Foundation Grants Index*, New York Foundation  
Center  
[see Foundation Center above]

**Potential Funding Sources**

Historic Landscape Preservation Grant Program,  
Heritage Tree Care Grant Program, and MASS  
Relief Grant Program

Massachusetts Department of Environmental  
Management  
251 Causeway Street, Suite 600-700, Boston MA  
02114-2104  
[617] 626-1250  
[state.ma.us/dem/grants]

Massachusetts Preservation Projects Fund  
Massachusetts Historical Commission  
220 Morrissey Blvd., Boston MA 02125  
[617] 727-8470  
[state.ma.us/sec/mhc/mhcmppf/mppfidx]

Grant Program  
Massachusetts Cultural Council  
120 Boylston Street, 2nd fl., Boston MA 02116  
[617] 727-0044  
[massculturalcouncil.org/grant/index]

Getty Grant Program  
401 Wilshire Blvd., Suite 1000, Santa Monica CA  
90401  
[310] 395-8624

Institute of Museum Services [IMS]  
1100 Pennsylvania Avenue, NW, Washington DC  
20506  
[202] 786-0536

National Endowment for the Arts [NEA]  
1100 Pennsylvania Avenue, NW, Washington DC  
20506  
[202] 682-5400

National Endowment for the Humanities  
[NEH]  
1100 Pennsylvania Avenue, NW, Washington DC  
20506  
[202] 786-0438

Save America's Treasures  
National Trust for Historic Preservation  
1785 Massachusetts Avenue, NW, Washington  
DC 20036  
[202] 588-6215  
[fiona\_lawless@nthp.org]

Additional published resources can be found in  
the bibliography.