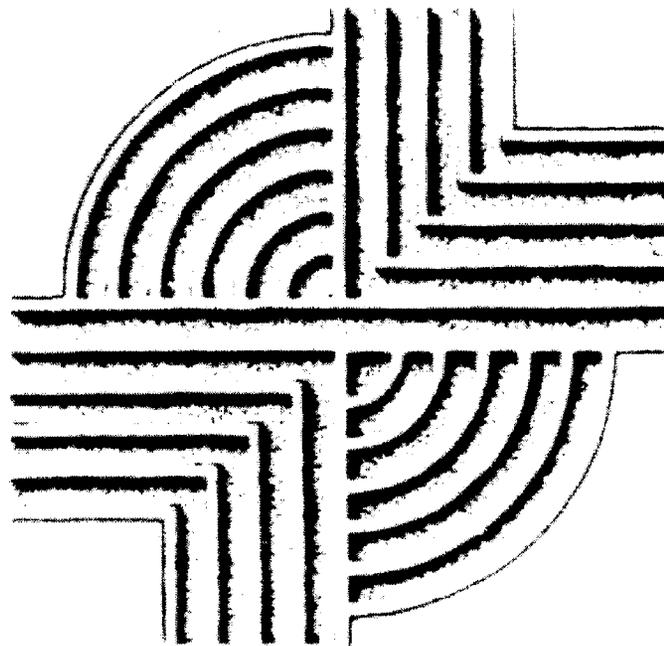


RECONNAISSANCE PRESERVATION
ASSESSMENT OF THE SUMMERVILLE
CEMETERY, AUGUSTA, GEORGIA



CHICORA RESEARCH CONTRIBUTION 305

RECONNAISSANCE PRESERVATION ASSESSMENT
OF THE SUMMERVILLE CEMETERY, AUGUSTA,
GEORGIA

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September 20, 2000

This report is printed on permanent paper ∞

ABSTRACT

Summerville Cemetery is generally well preserved. There is limited evidence of vandalism, relatively few broken stones, and much of the ironwork is in tolerably good condition. While other cemeteries show the results of various fads — such as the reduction of coping to make the excavation of graves easier or the increase in unimaginative lawn markers to ease the cost of maintenance — Summerville has remained true to its historic origins.

The cemetery is, however, in need of increased preservation efforts. As stones and monuments age, their needs tend to become more visible. This reconnaissance assessment has examined a broad range of preservation issues at Summerville. While no stone by stone, or fence section by fence section assessment was conducted, we were able to identify broad issues and concerns. We likewise attempted to lump similar problems together in order to provide the Board with an overview of the critical issues at the cemetery.

It is important that the Board strictly adhere to common preservation/conservation procedures in order to maintain and protect the cemetery's historic integrity and the well being of the monuments. This report briefly outlines and explains the most important issues, including the need to document the nature of all treatments and changes, the need to use the minimum amount of intervention that will ensure the protection of the stone or ironwork, and the need to respect the original fabric. In addition, we focus on two fundamental questions in attempting to develop treatment priorities. First, is the object a threat to others? Examples of this are loose monuments or tilted monuments which might fall and injure visitors. Second, is the object a threat to itself. In other words, is the object in immediate danger of further deterioration. Examples of these include box tombs and stones that are actively deteriorating and for which delay in treatment may result in unrecoverable loss. Once these two priorities are met, other treatments that involve long-term preservation (such as the painting of

fences) or which deal primarily with aesthetics may be considered.

In terms of **maintenance issues**, one of the most important is increasing the level of care in mowing. The assessment observed a number of stones with mower damage. There should be a meeting with the landscaping firm to review procedures and ensure that their personnel are properly supervised. We found that shrubbery was not being appropriately pruned, resulting with many plants that were either scraggly or that were too dense for the good of nearby monuments. We also found that the lack of consistent attention to landscaping detail had allowed a great amount of intrusive vegetation, such as poison ivy and weedy trees (some with several years of growth) to take over fence lines, trees, plot divisions, and other areas. A much more aggressive landscaping policy is needed to keep out these undesirable species. The Board should also develop a tree care plan and take steps to remove several trees that are threatening monuments. The paths were found to be showing some early signs of maintenance neglect, such as loose bricks at steps. In addition, the number of steps in the cemetery dramatically reduces its accessibility by the disabled. Plans should be developed to ramp sections of the cemetery as repaving is needed. In addition, the use of concrete and asphalt should be replaced by the use of brick or concrete pavers. Drains are clogged throughout the cemetery and should be reopened with catch basins cleaned and pipes inspected for needed repairs. Loose stones and fence parts should not be allowed to be scattered across the cemetery, but should be collected for safe keeping. The Board should also take steps to renovate the maintenance shed in the northwest corner of the cemetery and make it available for storage and other preservation uses.

In terms of **stone and monument issues having the highest priority**, this assessment identified at least 45 stones that are loose and that require immediate resetting for either the safety of the public or their own safety. Some of these stones are large and will

require the assistance of a commercial monument company, but all should be overseen by a stone conservator. There are an additional 25 stones that are tilted 15 or more degrees and that pose a threat to themselves or others. Many of these evidence submergence resulting from an inadequate (or absent) foundation and they will need to be disassembled, have an appropriate foundation created, and then reassembled. Again, this is work that should be done under the supervision of a stone conservator. There are at least 17 broken stones which require treatment. This work ranges from minor repairs to very major operations to ensure the long-term preservation of the monument.

In terms of **stone and monument issues with a secondary priority**, this assessment identified at least 26 cradle graves or graves with coping partially or largely submerged below grade. These items should be excavated, re-established on firm foundations, and where necessary receive repairs by a stone conservator. The assessment also identified eight locations where there were stucco problems. These can be addressed by a competent mason, working under the supervision of a conservator. There are also seven areas where brick repairs were needed.

The assessment also identified a variety of other issues, including stones which require whitewashing, stones that would benefit from composite treatment, repair of a concrete bench and so forth. Finally, there are also a handful of stones for which there is no appropriate treatment and these must be regarded as lost.

This assessment also examined **issues associated with the care and preservation of the fences and ironwork** at Summerville. A total of 17 fences were included. We found that in general the needs of the fences were limited. As a first step, many of the fences evidence buried bottom coping rails. These should be excavated and the ground level of the individual plots resculpted to ensure that the bottom rails are not reburied. A few minor repairs, such as reattaching fence segments to newel posts, tightening newel posts, or rehangng gates, are recommended. We strongly discourage efforts to replace missing parts. Not only is this fabrication of missing parts very expensive, but it is not a critical feature of preservation efforts. Far more important, once the bottom rails have been

exposed and the minor repairs made, is to ensure that all of the cast fences in Summerville are cleaned and painted. Specifications for these operations are outlined, but this work should take place under the direction of a conservator.

Finally, this assessment divides the various activities into a series of eight action stages for consideration by the Board, with the emphasis on those needs that are most critical.

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INTRODUCTION

Nature of the Project

While two primary concerns of the Summerville Board members rightly involve the condition of the various stone monuments and the iron fences enclosing family plots, this assessment also includes a brief discussion of various landscape maintenance issues which have impacts on the overall care and condition of the cemetery. This reconnaissance assessment is intended to help organize preservation efforts at the Summerville Cemetery and is divided into a series of easy-to-navigate sections which outline priority issues and appropriate responses.

Nevertheless, it is critical that the reader understand that all aspects of cemetery preservation are inter-connected and it is often difficult to realistically treat them as distinct tasks. For example, there are cases at Summerville where it is impossible to treat a monument without first removing vegetation — but is the removal of that vegetation an appropriate step? Is the vegetation as historic as the monument? Would it be better to document and relocate the monument? There are a number of difficult issues which the Board must carefully consider before an appropriate plan of action can be developed. This study will help illuminate some of these issues and concerns.

It is also important to understand that this is a reconnaissance level investigation. The survey, conducted on September 5 and 6, 2000, did not attempt to assess the condition of every stone or every fence section. Instead, a more rapid — and admittedly superficial — survey attempted to “lump-together” monuments and fences with similar problems and concerns.

To accomplish this a two-stage survey was conducted plot by plot. The first day an assessment of monuments was undertaken. Notes were taken on markers which exhibited obvious problems, with an emphasis on those monuments which posed a threat to

either themselves or to site visitors. Information was noted on the nature of the problem and a photograph was generally taken to illustrate the concern. The second day a similar survey was conducted on the ironwork in the cemetery. General problems were noted and evaluated on a plot-by-plot basis, although the assessment is preliminary in nature.

Treatment options are similarly discussed in terms of grouped materials, not on a item-by-item basis. While this was necessary for budgetary reasons, the resulting report still provides guidance, in general terms, on which treatments should receive priority, and why. It also offers some general budgetary recommendations to help the Board prioritize treatments.

The report outlines appropriate conservation/preservation strategies, materials, and techniques. Summerville Cemetery is a unique resource, beautifully preserved, and representing an extraordinary amount of Georgia history. It should be treated as the fragile resource that it is. This section of the report will help explain to users of the cemetery why some activities and some “repairs” are inappropriate.

Historic Summerville Cemetery

Summerville Cemetery was established by the deed of Thomas Cumming in 1824, which described the plot as measuring about 260 feet square (roughly 1.6 acre). The use and care of the graveyard was to be overseen by a Board of Trustees (as it still is today) and burial in the cemetery was limited to residents of the vaguely defined Summerville neighborhood.¹ It is clear

¹ While one author has suggested that slaves may have been buried in Summerville Cemetery, this is unlikely. Unmarked graves and those marked only by fieldstones are much more likely to represent whites in the Summerville community of more modest means and not African Americans.

RECONNAISSANCE PRESERVATION ASSESSMENT OF THE SUMMERVILLE CEMETERY

that the cemetery was in use prior to the first quarter of the nineteenth century, with a number of burials present² and a fence already constructed around at least a portion of the area at the time of Cumming's deed. It appears that the earliest portion of the cemetery certainly included the northeast corner, bordered to the north by what is today Mount Auburn Street and to the east by what is today Johns Road. Nevertheless, the cemetery gradually expanded (although it doesn't appear that any historical research has been conducted to document this expansion) and today the cemetery measures about 463 feet along Mount Auburn Street to the north, 416 feet along Johns Road to the east, 539 feet along Cumming Road to the south, and 413 feet along Harford Street to the west — encompassing a total of about 5 acres.

Only a very brief history of the cemetery has been prepared³ and it leaves unanswered many of the questions that concern us in terms of preservation. There has been no research on period photographs that might help address questions of ironwork care; there is no information concerning the various periods of expansion; there is no documentation on the small cemetery structure at the northwest corner of the cemetery; nor is there information on the various wall building or repair periods. Some of these questions may be addressed by a careful review of the records of the Trustees, others may be answered by a more complete title, map and plat search. **This information should be collected since it will ultimately be of critical concern to preservation efforts.**

Understanding Conservation/Preservation

There is a tendency for governing organizations to act in haste when it comes to cemetery preservation and to engage in activities and repairs which are not in the best long-term interests of the cemetery. At least one reason for these problems is that

² There are at least 11 graves predating 1824 in the northeast corner of the cemetery.

³ A few pages have been written by Russell R. Moore as a preface to the Augusta Genealogical Society's recordation of stones at Summerville.

governing bodies are often not aware of acceptable conservation procedures. Being unaware that some approaches are better than others, they are often swayed by commercial appeal, low cost, or advertising claims.

There are certain minimal ethical standards to which any activity in a historic cemetery should adhere:

1. The condition of the object (whether stone, iron, or some other material) must be carefully documented before any intervention.
2. All methods and materials used during treatments must be fully documented to help future generations understand what was done.
3. Any intervention must be the minimum necessary. Less is almost always considered more.
4. The intervention must be governed by unswerving respect for the aesthetic, historical, and physical integrity of the property. In other words, it is essential that the historic fabric be respected.

These rules apply whether I am discussing brickwork, ironwork, stonework, or even landscaping.

It is also useful to understand the essential difference between "restoration" and "conservation/preservation." One of the foremost architects of the nineteenth century, John Ruskin, commented that *restoration* "means the most total destruction which a building can suffer." The same can be said for cemetery stones and ironwork.

Restoration means returning an object to "like new" condition. This approach typically shows disregard for the original, historic fabric, replacing bits and pieces here and there in order to make the historic object new. This approach also often mixes incompatible materials — causing deterioration of the very object that we are attempting to preserve.

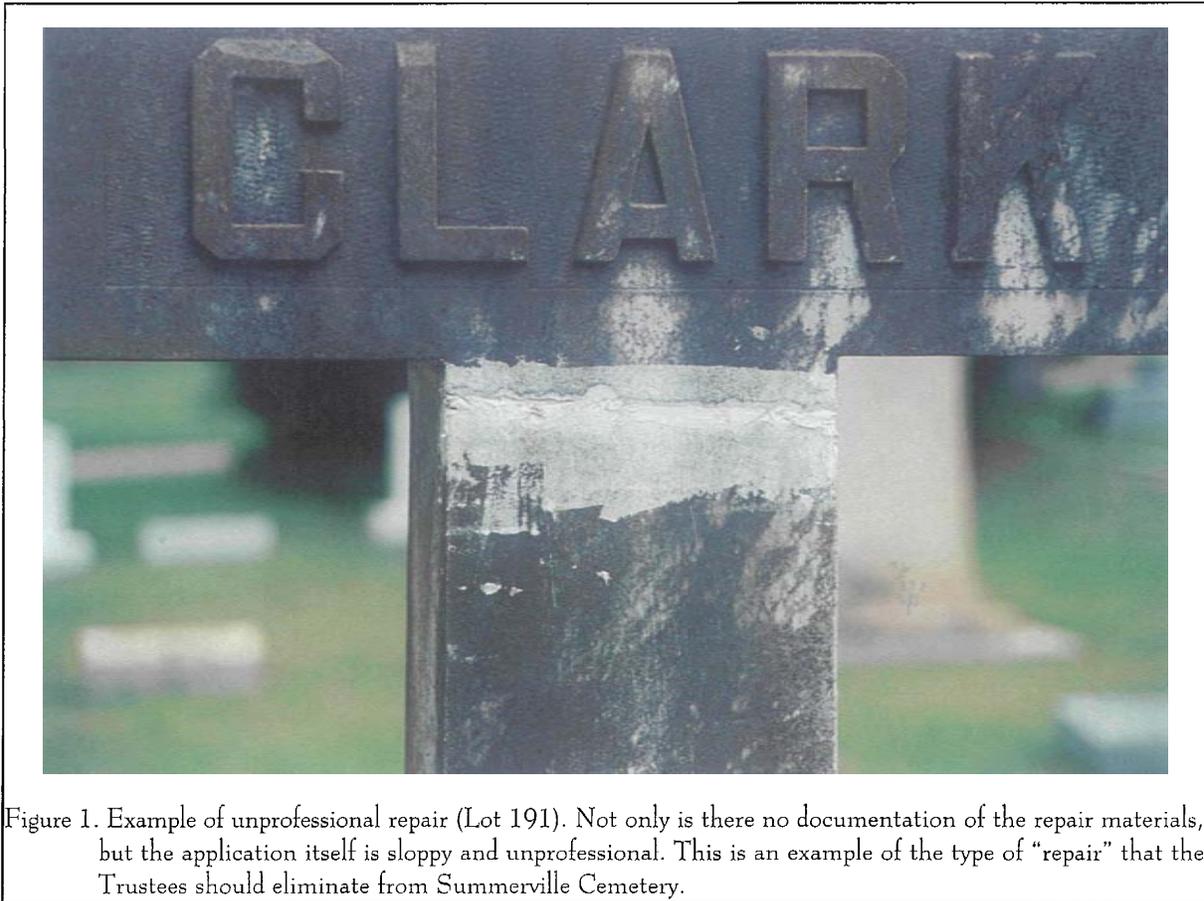


Figure 1. Example of unprofessional repair (Lot 191). Not only is there no documentation of the repair materials, but the application itself is sloppy and unprofessional. This is an example of the type of “repair” that the Trustees should eliminate from Summerville Cemetery.

In contrast, *conservation/preservation* seeks to minimize future deterioration, stabilizing an object’s condition and maintaining its integrity. Essential to our understanding of conservation and preservation is also an appreciation for appropriate maintenance. I have found that preventative maintenance will often dramatically reduce the need for far more costly, intrusive, conservation treatments. In other words, by appropriately painting fences we may slow deterioration and often prevent more drastic intervention, such as replacement of corroded or lost parts. By appropriately pruning trees we can forestall their loss through disease or by storms and the resulting damage to stones and monuments.

This report focuses on conservation and preservation and I encourage the Board of Trustees for Summerville Cemetery to likewise avoid efforts of “restoration” that are likely to cause more harm than

good.

Finally, the Board must understand that all conservation repairs or treatments are routine maintenance — they must not be considered permanent.

Acceptable Conservation/Preservation Procedures

I will briefly outline a few critical issues for different conservation or preservation approaches at Summerville. In some cases volunteers may be able, with training, to carry out simple activities. In many cases, most particularly conservation of ironwork and stone, volunteers are strongly advised not to undertake the work. In fact, even professionals in related fields may be inappropriate. Just as one would not ask a house painter to repair a portrait, it is important that



Figure 2. Rebuilt box tomb (Lot C). The use of modern brick and hard mortar, coupled with a lack of care in finishing the joints and cleaning the brick has resulted in an inappropriate “restoration” that detracts from the historic integrity of Summerville Cemetery. Such work should not be allowed.

handymen or stone/brick masons familiar primarily with modern materials and techniques not undertake the conservation treatments outlined in this assessment. The work should be completed by conservators thoroughly familiar with the exacting requirements of the treatment involved.

Stone Conservation

Fragment storage protects fallen or broken stones from loss and damage. At present there appears to be no procedure to ensure that damaged stones are identified and cared for.

Repairing damage is the surest way to protect them, but in many cases fragments can be provided temporary storage until funding is available for repair. Temporary storage should be in a dry, secured facility. Individual items should be marked with information

concerning where they were found.

At Summerville a perfect storage solution would be rehabilitation of the garden shed in the northwest corner of the cemetery.

Resetting is a common need at Summerville. The simplest resetting involves stones which are tilted or which have come out of the ground. These should never be reset using concrete, but rather should be set in pea gravel and sand.

In cases where portions of stones are loose, resetting involves the use of a wet, high lime mortar mix. Appropriate is a 1:4:8 mix (1 part of white Portland cement, 4 parts hydrated lime, and 8 parts clean graded sand). **Cement, mortar mixes, epoxy, or other adhesives should never be used for this purpose.**



Figure 3. Lost obelisk fragment (Lot 46). This broken fragment of a marble obelisk was found tossed aside in the leaves at the edge of a lot. These are the sorts of fragments which should be carefully gathered up and safely stored until their original location can be identified and repairs made. Additional monument fragments were found in Lots 9 and 10. Fence fragments were found scattered on walkways.

At times resetting may be made more complex by the presence of corroded iron or brass dowels. Often these will need to be removed before the stones can be reset. Such a repair requires that the old pins be drilled out using a core drill, new pins of stainless steel be inserted using an appropriate epoxy, and mortar then used to set the monument.

Cleaning stones simply for the sake of appearances is usually ill-advised. Such efforts endanger the stone and often promote even quicker soiling afterwards. Where cleaning is critical, it should be limited to the use of low pressure (i.e., less than 90 p.s.i.) water and soft bristle brushes. All other chemicals should be avoided without the specific advice and recommendation of a conservator.

Commercial stone cleaning methods are

Coatings are not recommended for any stone material at Summerville. Many coatings are actually detrimental to the stone, causing staining, efflorescence or spalling. Moreover, coatings are not reversible, so once applied they are impossible to remove should detrimental effects be noted. There are a very few that appear to be vapor permeable and are being tested for possible use on stone. Even these, however, should be used only under the direction of a stone conservator and sparingly.

generally not appropriate for use in historic burial grounds. In absolutely no case should sandblasting, stone refinishing or polishing, or high pressure chemical or water washing be used at Summerville Cemetery. Commercial cleaning agents should only be used under the direction of a stone conservator.

Mechanical repair most often means the rejoining of fragmented stones. Such work should be undertaken only by stone conservators trained in this area.

In most cases gravestones are fragile and their repair is delicate work. There are many commercial products on the market, used by many commercial stone companies, that are totally inappropriate for historic stone.

Appropriate conservation treatment will usually involve drilling and pinning, carefully aligning the two fragments. Threaded nylon rod and epoxy adhesives formulated for the specific stone are used in this type of repair. Diameters and lengths of pins vary with the individual application, depending on the nature of the break, the thickness of the stone, its condition, and its expected post-repair treatment.

Sometimes pins are not used to save time and money. Instead the pieces are simply joined using epoxy or some other adhesive. Experience indicates that for a long-lasting repair, even in non-structural applications, use of pins is advised. Moreover, most adhesives are far stronger than the stone itself, meaning that failure of the repair is likely to cause additional damage to the stone.

At times mechanical repairs also involve dismantling intact elements and ensuring that a sound foundation is present. Foundation work may involve filling in depressions, establishing a concrete footing, or taking other measures to ensure that subsidence is minimized. Then the entire structure is repaired as it is reassembled.

Composite stone repair consists of filling voids with a natural cementitious composite stone material resembling the original as closely as possible in texture, color, and strength. This type of repair may be used to fill gaps or losses in marble or granite and is often used to help slow spalling of bedded sandstone exposed to the elements.

Under no circumstances should latex materials be used in composite stone repair. A more suitable material is a product called Jahn. This closely resembles

the natural strength of the original stone, exhibits good adhesion, and can be color matched if necessary.

Brick Conservation

There has been some rebuilding of box tombs using modern bricks and mortar. Based on the condition of the original brickwork, this may at times be necessary.

Such repairs should always begin with photographing the structure as it exists in order to completely document the original fabric and construction details. Only the unsound brickwork should be removed, stopping as soon as sound material is encountered. Repair should, as far as possible, use similar brick, mortar, joints, and tooling. Brick should match in size, hardness, texture, and (if not being covered with stucco) color. Mortar should match the original in color (although minor post-treatment discrepancies can often be solved using tinting materials³), texture, and most importantly, strength. Historic bricks are often far softer than modern examples. The use of a modern hard cement mortar will cause extensive damage to this soft brick as one expands more rapidly than the other. Mortar should always be designed to deteriorate more quickly (meaning the use of high lime mortars) than the brick since it can be readily replaced through tuckpointing.

The single best guide to historic brick work is provided by the Association of Preservation Technology and their guide to brick work is reproduced here as Appendix 1.

⁴ One example of a chemical toner for mortar is Epochrome-S. It is available from Cathedral Stone, 800/684-0901.

⁵ While historically appropriate mortar can be mixed using a 1:2:6 to 1:3:10 ratio of white Portland Cement: hydrate lime: sand, recently a prepackaged mix, Restomix, has been marketed. This product is superior when only small jobs are undertaken, since it assures that the materials and mix is consistent. It is available from Cathedral Stone, 800/684-0901.

In some areas brick and concrete have merged. This is not a good idea since the thermal movement of concrete is more than double that of brick construction. Where the two meet it is critical that an expansion joint be allowed.

Where brick walls are bulged or leaning, the only satisfactory repair is rebuilding. Bowing is generally caused by earth pressure and/or mortar washout (primarily the first at Summerville). This means that the existing wall should be taken down to stable brick, the earth behind the wall should be replaced with gravel, and the wall should be rebuilt. Weep holes should be incorporated into the design, as should be horizontal wire joint reinforcement and vertical rebars. It does not appear that any capping material (other than brick) was used at Summerville.

Stucco Repair

There are several brick walls which were originally covered in stucco. Prior to the late nineteenth century stucco was a mixture of hydrated lime, sand, and water, resulting in a soft, flexible coating that breathed. With the introduction of Portland cement ca. 1871 stucco became hard, brittle, and relatively impermeable. This cement stucco traps rising damp and, because it is so inflexible, tends to come off in sheets.

Previous repairs have largely been undertaken in Portland cement and in many areas these repairs are in failure. Portland cement should never be used as stucco material on historic brick — it is far too hard and will either fail, falling off, or will damage the underlying bricks.

It is possible to use a more sensitive mixture to repair the stucco, using a base coat of 3 parts white Portland cement to 2 parts hydrated lime to 8 parts very coarse sand. Either goat hair or Fibran (polypropylene strands) should be added to this base coat for strength. A second coat should use 1¼ parts white Portland cement to 1½ parts hydrated lime to 2½ parts medium sand. A finish (flow) coat should consist of 1 part hydrated lime to 3 parts very fine sand. Another approach which many have found acceptable is to use

Jahn M60 Exterior Stucco⁶, a single component, cementitious plaster which can be color matched. This latter approach greatly reduces application time and helps eliminate irregularities in mixtures.

Ironwork Conservation

Every effort should be made to retain all existing ironwork, regardless of condition. Replacement with new materials is not only aesthetically inappropriate, but often causes galvanic reactions between dissimilar metals. When existing ironwork is incomplete, a reasonable preservation solution is to repair and maintain the remaining work rather than add historically inappropriate and incorrect substitutes. If replacement is desired, salvage of matching elements is preferred over recasting. Replication is typically not an appropriate choice since it is by far the most expensive course of action, and is often done so poorly.

The single best protection of ironwork is maintenance — and this revolves around painting. Painting maintenance should begin with a good surface cleaning, followed by removal of loose rust and flaking paint. Typically a stiff wire brush is adequate for this.⁷ A rust inhibitor (or even a rust converter) may be applied as an undercoat. There are also paints which include rust inhibitors which may be used. Alkyd should be used rather than latex, although there are also a new generation of epoxy paints which may be suitable. In no case should the paint be applied thickly — this obscures detail and does not appreciably lengthen the lifespan of the paint. In fact, thick paint can chip more easily than a thinner coat. An appropriate color, lacking any other historic evidence, is flat black. Gloss enamels should be

⁶ Available from Cathedral Stone, 800/684-0901.

⁷ Abrasive cleaning is appropriate for cast iron, which is sufficiently hard. Wrought iron, however, is softer and the surface can be easily roughened. Other methods of cleaning should be sought first. If abrasive cleaning is necessary, it is advisable to begin with a starting pressure of about 20 psi with a fine (50/100) slag grit. Final working pressure is not likely to exceed 60-70 psi with a working distance of at least 12 inches.



Figure 4. Example of stucco failure on a box tomb (Lot 23). This photograph shows at least two layers of a hard concrete stucco in failure with typical cracking and delamination.

avoided.

Repair may include reattachment of elements. Ideally repairs should be made in a manner consistent with original construction. For example, loose newel posts originally attached to the stone or masonry base using a threaded rod packed in lead. When this assembly

is loose, the ideal approach is to replace the threaded rod, repacking it using lead or an epoxy filler.

It may also be appropriate to use small stainless steel braces with stainless steel nuts and bolts to reattach coping rails to posts. While welding is often expedient (and may be better than inappropriate mending), this approach causes a radical change to the fence. Once welded pieces are no longer able to move with expansion/contraction cycles, this causes internal stresses that may lead to yet additional structural problems.

In addition, while wrought iron is easy to weld because of its low carbon content, cast iron contains up to 4% carbon and is difficult to weld. Welding on cast iron should be done only by firms specializing in this work and capable of preheating the elements.⁸ An alternative is to braze cast iron since this approach requires much less heat.

When used, welds should be continuous and ground smooth, in order to eliminate any gaps or crevices. When finished, it should be difficult to distinguish the weld — the original metal should blend or flow directly into the reattached part.

Understanding Priorities

With limited funds it is often critical that organizations establish priorities for cemetery conservation/preservation projects, ensuring that the

⁸ The reason that cast iron is so hard to weld without cracking is its rigidity. When one small area is heated, causing it to expand, the unheated area resists — and cracks.

INTRODUCTION

most critical issues are dealt with first. Sound priorities will be based on two factors:

First, is the object a threat to people? Examples of this include loose monuments which might topple, diseased trees which might shed limbs unexpectedly, and brick walkways which are tripping hazards.

Second, is the object a threat to itself? In other words, if left unattended, will the condition deteriorate and cause additional damage, and expense to repair. Examples of this include delaminating sandstones, corroding ironwork, and trees growing against other cemetery features.

It should be abundantly clear that first priority items require immediate — even emergency — treatment in order to ensure the safety of visitors and avoid claims of liability against the cemetery's Board.

Second priority items are nearly as important since failure to deal with these items will result in repairs costing far more as the condition deteriorates. Deferred maintenance is not only good stewardship, but it is fiscally irresponsible. Simple repairs, delayed, turn into very expensive treatments.

Beyond these two priorities, all other issues in the cemetery are cosmetic and fall into a third category. Examples might include cosmetic infill, replacing missing features or elements, and cleaning of stones. It is far more critical that the Board establish, as their third priority, a preventative maintenance program that will help to ensure that appropriate maintenance is carried out on an on-going basis, limiting the need for future emergency treatments. Only once all priority one (threatening to human life) and priority two (threatening to the safety of the monument or other feature) and a preventative maintenance program is established, should the Board turn their attention to cosmetic issues.

MAINTENANCE ISSUES

Mowing

Mowing too often becomes a goal in itself instead of being understood as but one part in an overall preservation plan. Maintenance crews, trained in turf management and instructed to work quickly, often disregard the concerns of the cemetery, which should include protecting the markers from mower damage, from herbicide, pesticide, and fertilizer damage, and protecting the site from unwarranted landscape change.

Mowing should be done with great care and additional time is needed to appropriately mow a cemetery setting such as Summerville. The layout of Summerville is such that **only hand mowers are appropriate**. The Board should ensure itself that the current contractor is not using riding mowers. **Mowers should never touch any stone** — meaning that the mowing should leave a 6-12 inch swath of unmowed grass around all stones. **Nylon filament weedwhips or trimmers may be used to complete the cutting, but only if a light gauge filament is used and even then only around stones which are in good condition**. Unstable stones — meaning those that are delaminating, spalling, flaking, or otherwise delicate — should have the grass around them hand clipped.

At the time of this assessment the grass has been recently mowed, but I have not observed the mowing actually in process. I have noted that a number



Figure 5. Example of mower damage (Lot 45). This marble head stone, which needs to be reset, also shows evidence of extensive mower damage (the nicks and lost material on the edges) as well as improper use of nylon string trimmer (the parallel “scratches” across the stone face). This is evidence of improper mowing techniques and a lack of care.



Figure 6. Example of unpruned plant taking over Lot 40. This azalea needs careful pruning for both its health and also to remove it from the box tomb. This dense vegetation will ultimately result in deterioration of the marble and the mortar joints.

of plaque or lawn-type markers have had aluminum angle stock fitted to the edges, presumably as protection from mowing operations. The angle metal exhibits considerable wear and at least one piece was completely dislodged, being twisted, cut, and bent, apparently from a lawn mower. This suggests that mowing is aggressive and stones with mower damage were observed.

Since mowing often accounts for much of a cemetery's maintenance budget, it may be worth considering the replacement of the current lawn with a grass that is slow growing, drought resistant, and easy to maintain. One example is Bermuda Tifgreen 328, although this variety is not shade tolerant. For those areas there are a variety of St. Augustine and Zoysia

varieties that might be suitable.¹ The Board may, once other critical issues are dealt with, consider overseeding the existing grass with one or more of these special varieties to help reduce lawn maintenance costs.

Shrubbery

At the time of this assessment the various plantings in the cemetery were in serious need of pruning. It does not appear that the current landscaping firm is providing adequate service in this area.

Every plant has a natural shape which should be observed, with pruning in a manner that will allow this form to develop as the plant grows. There are some

¹ One supplier of these grass varieties is Thomas Brothers Grass, 888/639-4727.

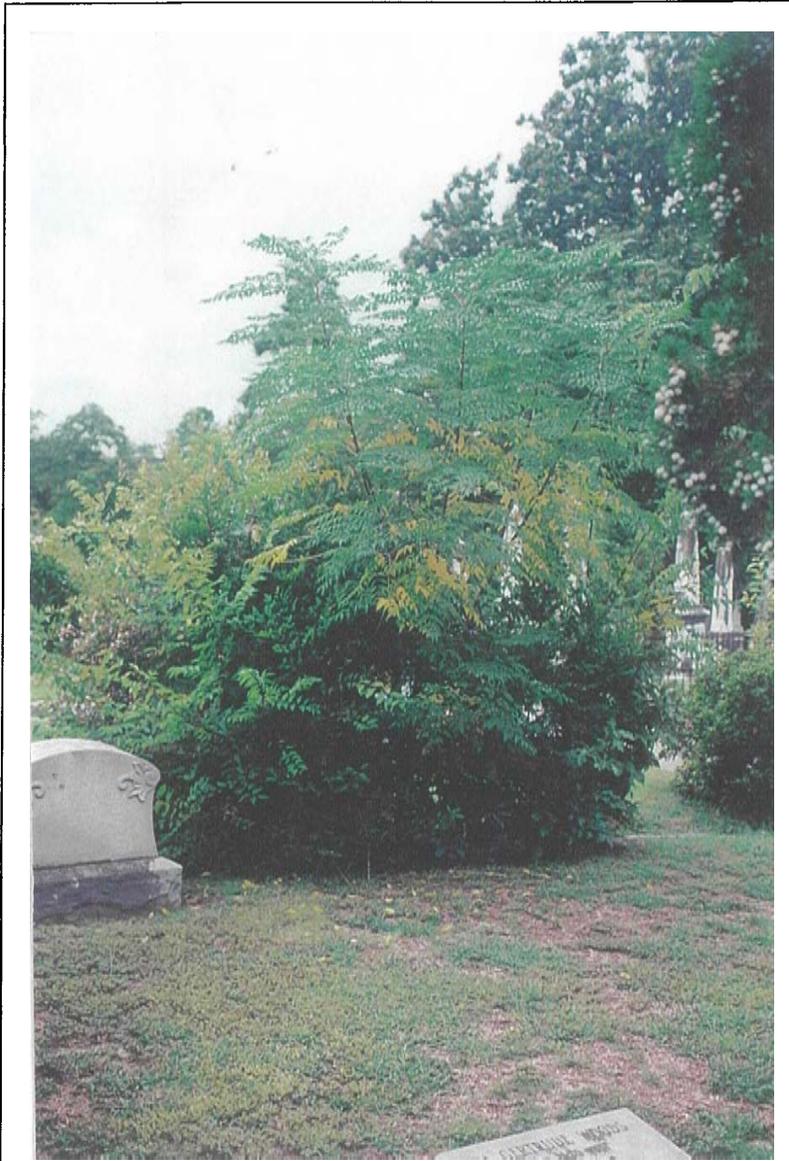


Figure 7. Example of intrusive vegetation growing up inside an ornamental (Lot 193). The size of these scrub trees, growing up within an ornamental reveals that no effort has been made to remove "weedy" plants for several years. This should be an immediate goal of landscaping.

plants in the cemetery which are likely pruned for flower production. In general, spring-flowering shrubs bloom from wood formed during the previous year and pruning should wait until flowering has finished. Growth that the shrubs make after flowering will provide blooms for

the next year. Most summer-flowering shrubs bloom on growth from the spring of the same year. They should be pruned during the winter dormant season. In other words, pruning specific to the plant should be conducted throughout the year.

It may be possible to reduce the size of overgrown shrubs through "renewal pruning." Using this technique the oldest stems are removed at their base, which promotes the growth of new shoots and allows light to penetrate the interior of the shrub for denser foliage. Severe pruning should be done in the winter when the shrub is dormant. While this approach works for most broad-leaf shrubs, narrow-leaf evergreens may respond poorly. A professional horticulturist should be consulted.

While this may seem to be an essentially aesthetic issue, it also affects the health and longevity of the plant. Many of the plantings at Summerville are historic and every reasonable effort should be made to ensure their care.

Intrusive Vegetation

I am particularly concerned by the abundant quantities of scrub or intrusive vegetation at Summerville. These materials, left unattended, can disrupt gravesites either by growing out of control or by spreading their root systems.

Recent scrub vegetation should be removed to avoid damage to stones or historic vegetation, but great care should be taken not to remove early varieties that may have been planted as living memorials. In general, the scrub vegetation I observed was not historic and represents "weedy" materials that should be aggressively attacked. These were found growing up between plots, in



Figure 8. Example of “weedy” tree species growing from suckers off earlier cut stumps (Lots 13/14). Unattended these trees have caused extensive damage in this brick wall. These trees should be immediately removed, the wall taken apart and rebuilt to preservation specifications.

fence lines, and in hedgerows. In almost every case they demonstrate a lack of proper care in shrubbery maintenance by the current landscaping firm.

This intrusive scrub vegetation should be removed by cutting it at ground level, scoring the stem, and painting it with an herbicide. Herbicides should never be sprayed in a cemetery since they contain salts that can damage stone.

Poison ivy is fairly common at Summerville Cemetery and is a health and safety hazard to the public. A special effort should be made to remove this plant. The safest approach is to institute a program of periodic cutting, which will eventually starve the plant. Alternatively, where the poison ivy is found in areas without stone, spray herbicides may be used with a very coarse spray pattern on windless days to prevent drift of the herbicide to stones or other vegetation.

Tree Care and Developing an Appropriate Plan

Summerville currently has a variety of trees, although the cedars tend to stand out to most visitors. There are a mix of “good” and “bad” trees. The “bad” trees have a variety of undesirable traits, including vigorous and unsightly sucker growth, droppings of sap, surface roots, and leaves which create dense shade. The “good” trees are those that lack suckers, have little or no sap droppings, have a deep (not shallow) root system, and that produce limited, small leaves and allow light to filter through to the grass.

This distinction does not mean that the “bad” trees should be removed. But, what it does mean is that as trees die or have to be removed for other reasons, they should be replaced with tree species appropriate to the cemetery which have “good” traits. New trees should

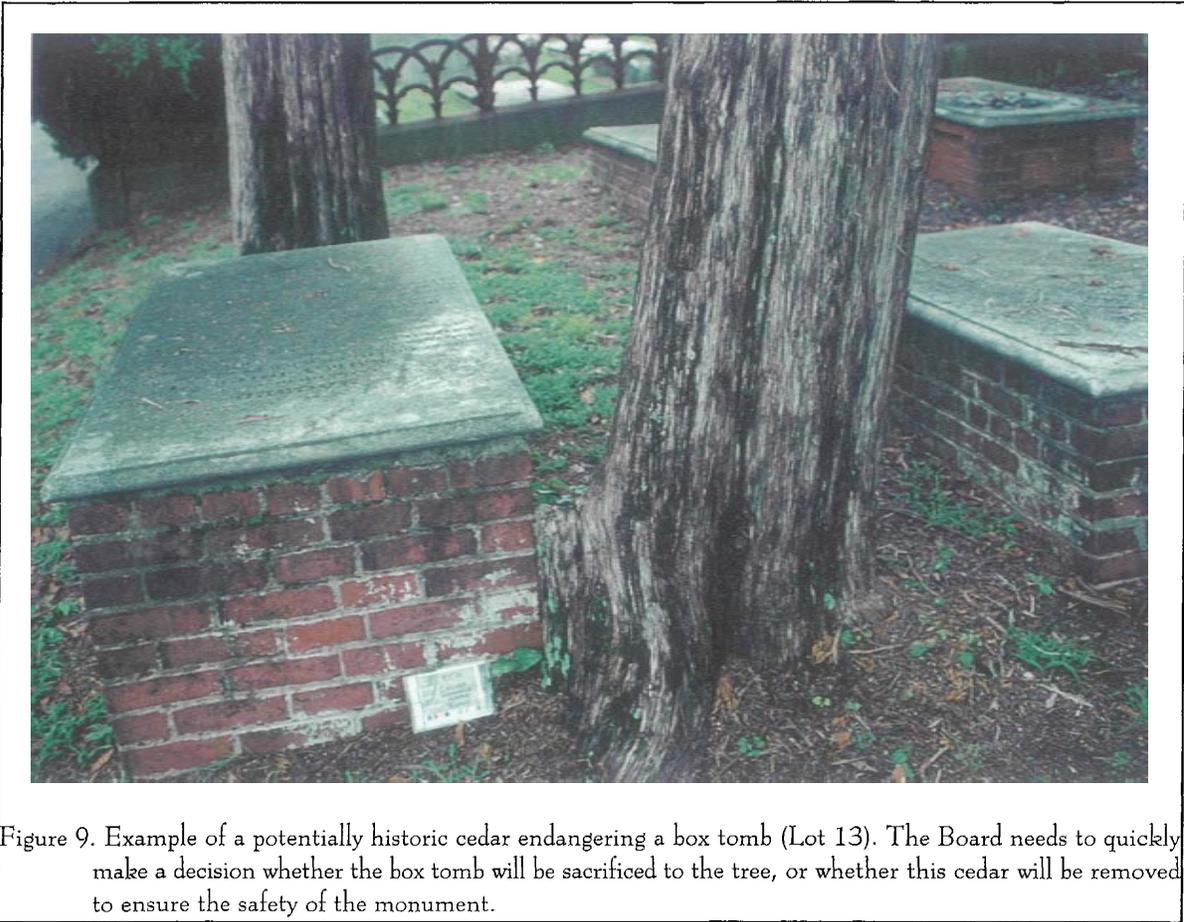


Figure 9. Example of a potentially historic cedar endangering a box tomb (Lot 13). The Board needs to quickly make a decision whether the box tomb will be sacrificed to the tree, or whether this cedar will be removed to ensure the safety of the monument.

be carefully located to keep them away from monuments and stones. In addition, the number of new trees should be limited to the replacement of existing trees — the number of trees should not be increased, especially in the old section of the cemetery.

The removal of a tree must also be done in a manner that ensures the safety of adjacent monuments. At times it will be necessary to build a temporary timber crib around a monument to ensure its safety while a tree is being removed. Trees which die or need to be removed should be cut as close to the soil level as possible and the root and stump left in place to decompose. Grinding stumps can endanger nearby fragile stones and efforts to dig out stumps can expose burials and disrupt the landscape. The presence of a stump, however, will create a maintenance issue and it will be necessary to periodically fill the stump hole with clean sand.

In terms of routine maintenance it is critical the mature trees are checked on a routine schedule to safeguard against threats to stones and monuments from invading root systems and falling or scraping branches. A professional firm should be retained to trim the trees annually.²

A common question concerns what to do if a tree is in conflict with a monument or fence. Should

² It is important, however, to prevent trees from being either “topped,” or “hat-racked.” Both approaches are inappropriate and will cause increased disease, branch loss, and potential for subsequent damage to the stones in the cemetery. Tree pruning should only be sufficient to keep the tree healthy and remove unhealthy branches and those that threaten stones.

the tree be removed or should the stone or fence be relocated? There is no one single answer.

The determine should be made by evaluating the historic significance of both vegetation and markers, the degree of intrusion of one upon the other, the degree of difficulty, and the degree of potential damage that may be done in altering either.

This issue, however, clearly illustrates why the planting of new vegetation should not only be limited to replacement of existing trees, but also should be done with the monuments in mind.

Paths and Open Areas

In several areas of Summerville trees are not only affecting monuments and fences, but are also affecting the pathways.

In general I recommend against altering pathway materials. To alter such features is to alter the entire cemetery. However, at Summerville the pathways have clearly gone through several episodes of unplanned maintenance and alteration, so that today there is a mixture of both concrete and bituminous material. There are a variety of levels represented, with elevation changes bridged by steps of varying heights and materials. This patchwork of elevations and materials is not historic and detracts from the historic character of the cemetery. Moreover, it makes the cemetery very difficult for those with disabilities to navigate and it creates the potential for liability in so far as it endangers public safety.

I recommend that as it becomes necessary to replace sections, consideration be given to the use of brick with a brick edge or concrete block pavers with a precast concrete edge, both on a stonedust bed. This approach is far more flexible and more easily maintained



Figure 10. Example of a clogged drain. Other drains are completely clogged and some even have vegetation growing in them. These need immediate cleaning and repair.

than any of the materials in use currently. Although the initial cost is higher, the paving unit will last longer and present a safer walking surface. Maintenance of this type of pavement requires that settled paving units be removed, additional base material added and compacted, and the paver replaced. Likewise, heaved pavers should be removed and the cause of the heaving investigated. Roots and other vegetation should be removed and the pavers restored.

In addition, I recommend that consideration be given to creating ramped walkways, eliminating as many of the steps as possible. Until this is done, it is essential that loose brick edging be fixed and that steps be clearly marked.

Site Drainage

There are a number of catch basins attached to drainage culverts throughout Summerville, typically at the intersections of north-south pathways with east-west roads. A great number of these (probably the majority) appear completely filled with sand and other debris. Several even have plants growing out of them. One or two appear to have been paved over by asphalt. This creates unacceptable drainage in the cemetery and should be corrected.

Grates over the catch basins should be removed and the basins cleaned out. It may be that use of high pressure water will be adequate to remove any blocking soil from the drainage pipes, although more drastic action using power augers may be required. It may also be necessary to repair masonry fractures in the drains.

Nevertheless, once cleared of debris, the catch basins should be cleaned at least once a year, or more often as required. All piping should be cleaned every five years. All mud, leaves, and other debris should be removed on a routine basis. This will help prevent the current situation (a perfect example of maintenance being deferred to the point where a major project has resulted) from reoccurring.

Security

Summerville Cemetery is exceedingly fortunate that it has had so little vandalism and theft. The current

level of security is inadequate and should be immediately upgraded.

The use of security lighting in cemeteries can be controversial. It may stem vandalism, although in neighborhood areas it may also raise complaints of light pollution at night. Where such lights are used they should be mounted on independent poles — such as has been done at Summerville Cemetery.

There are three pedestrian gates on Cumming Street. All are lockable, but all were open during the various times I visited the cemetery and there is no signage indicating that the cemetery is locked after a certain hour or that trespass after a certain hour is illegal. A policy of locking the cemetery (perhaps at dusk) and unlocking at a set hour should be instituted and closely followed. The hours should also be clearly posted, along with regulatory signage regarding conduct in the cemetery and the laws which protect the graveyard.

There are two motor vehicle gates on both Harford Street and Johns Road. These were locked with chains at the time of my visit. These gates, however, fit poorly and have sustained a variety of damages. An effort should be made to make these gates more functional. Notice of hours and trespass provisions should be clearly posted at these gates as well.

The Maintenance Building

The maintenance building in the northwest corner of the cemetery has been allowed to deteriorate. Currently it represents a hidden spot that creates a public safety hazard to those visiting the cemetery and the neighborhood in general. As such it represents a liability to the cemetery and its Board of Trustees.

If refurbished this building has the potential to be used for storage of equipment and materials necessary for the routine and on-going maintenance of the cemetery, as well as storage of displaced monument fragments until repair can be accomplished. It could likewise serve as a secure storage area for fence parts.

I strongly recommend that the vegetation around the structure be removed, that the roof be



Figure 11. Example of entirely inappropriate landscape maintenance action (Lot 54). The piled leaves will kill the grass that is struggling to grow in a too-shaded portion of the cemetery. Even worse are the limbs and sticks piled on top of a box tomb.

repaired, the building made weathertight, and a new high security³ door installed. The building should have

electricity restored and, if the Trustees feel appropriate, an alarm system installed.

³This would involve replacing the existing steel door and frame assembly (which has been attacked successfully on several occasions). A 12 gauge metal frame and solid steel or solid wood door should be used with 12-inch long treated wood blocking placed between the wall and frame to prevent frame buckling during attack (this may be identified to potential contractors as a frame assembly which meets or exceeds the current version of ASTM F476-76 or NILECJ-STD-0306.00). The frame should be tied directly to the brickwork using lag bolts. The door should have interior hinges, and there should be two high security deadbolt locks with at least 1-inch throws — one about 1/3 of the way from the top and a second about 1/3 of the way from the bottom.

ISSUES ASSOCIATED WITH STONES AND MONUMENTS

First Priority Repairs

Loose Stones That Require Reattachment

There are approximately 45 stones (Table 1) which are loose on their bases or which have loose parts

Table 1. Loose Stones Requiring Reattachment or Resetting			
Lot #	# of stones	Lot #	# of stones
D	2	53	1
F	1	55	2
H	1	61	3
I	1	69	1
K	2	74	2
15	2	78	1
17	4	81	1
28	1	86	1
31	2	128	2
32	3	150A	1
36	2	157	2
48	1	158	1
50	1	178	1
51	1		

(such as decorative urns or large crosses). These stones pose a threat to themselves since, if they fall, they are likely to break — and repair of broken elements is far more expensive than ensuring that these stones are appropriately attached to their bases. In addition, many of these stones pose threats to the public since they are large and could cause serious injury if they were to topple on someone.

Many of these are small to medium stones which may be successfully and safely reset using a high lime mortar mixture (1:4:8 mix of white Portland

cement, hydrated lime, and clean graded sand). There are, however, others for which this approach is not adequate. A number of large crosses, for example, were originally set in Summerville without any attachment other than a small amount of setting compound which has long since dried and entirely given way. These large monuments should be pinned, using stainless steel rods to prevent them from tipping off their bases, with the cross or other decorative item then attached with a high lime mortar. In combination these approaches offer a much safer alternative than mortar alone for these large and top heavy pieces.

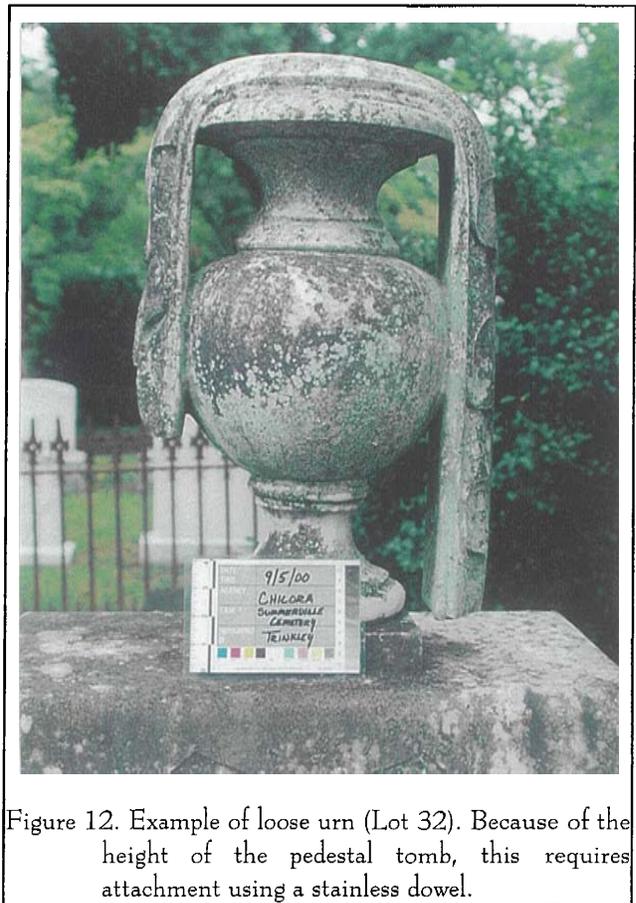


Figure 12. Example of loose urn (Lot 32). Because of the height of the pedestal tomb, this requires attachment using a stainless dowel.

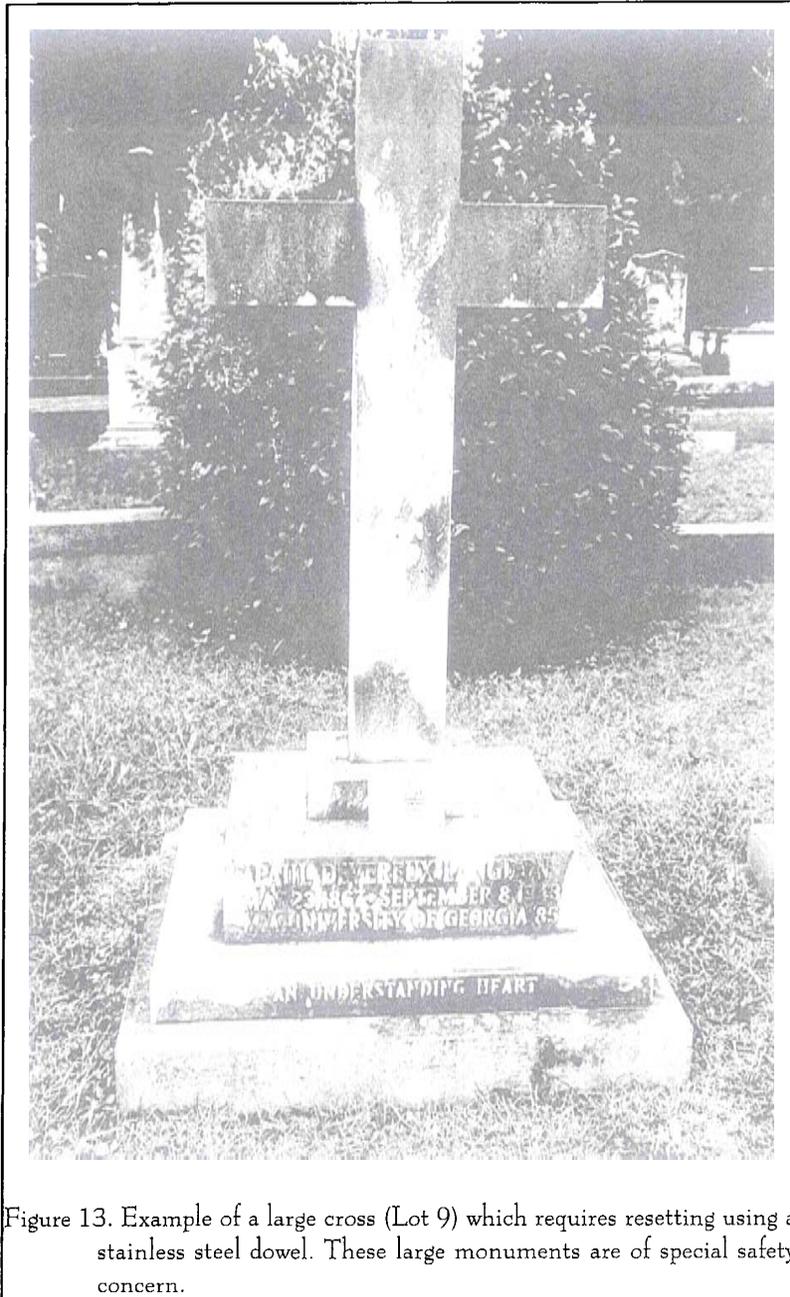


Figure 13. Example of a large cross (Lot 9) which requires resetting using a stainless steel dowel. These large monuments are of special safety concern.

many cases the resetting will require the assistance of a commercial monument company with the mobile equipment to safely lift and move the large stones off their existing bases. The creation of an adequate foundation may require the use of gravel fill, sometimes with the addition of concrete to create a firm, level base below grade. Typically this base should extend out beyond the monument and should be about 6-inches below grade, allowing grass to grow up to the monument at grade.

Many cradle graves exhibit head stones which are loose and/or tilted and the cradle rails themselves are almost covered by soil — either from soil accumulation or gradual sinking. There are, in other words, some monuments with multiple problems, each requiring a special approach or treatment.

Tilted Stones That Require Resetting

There are approximately 25 stones which evidence tilting sufficiently severe that they pose a threat to themselves (tilting to the point of falling and breaking) or visitors to the cemetery (Table 2). It seems that few of the monuments were set on adequate foundations. Often there is no evidence of any gravel or concrete footing and the monuments are set directly on the grave soil. As the grave as settled, or as tree roots have shifted soil, these monuments have begun to

lean. Once a monument leans more than about 15° it becomes a candidate for resetting.

There are also some cases where unattached monuments are associated with secondary problems.

A few of the monuments are also tilting, likely from the absence of a firm foundation and the settling of graves. For these it will be necessary to relevel the monument prior to reattachment of the loose pieces. In

In essence, these are a subcategory of those previously discussed and although they do not, at present, appear to be loose, it is likely that many will need to be disassembled in order to be reset on solid

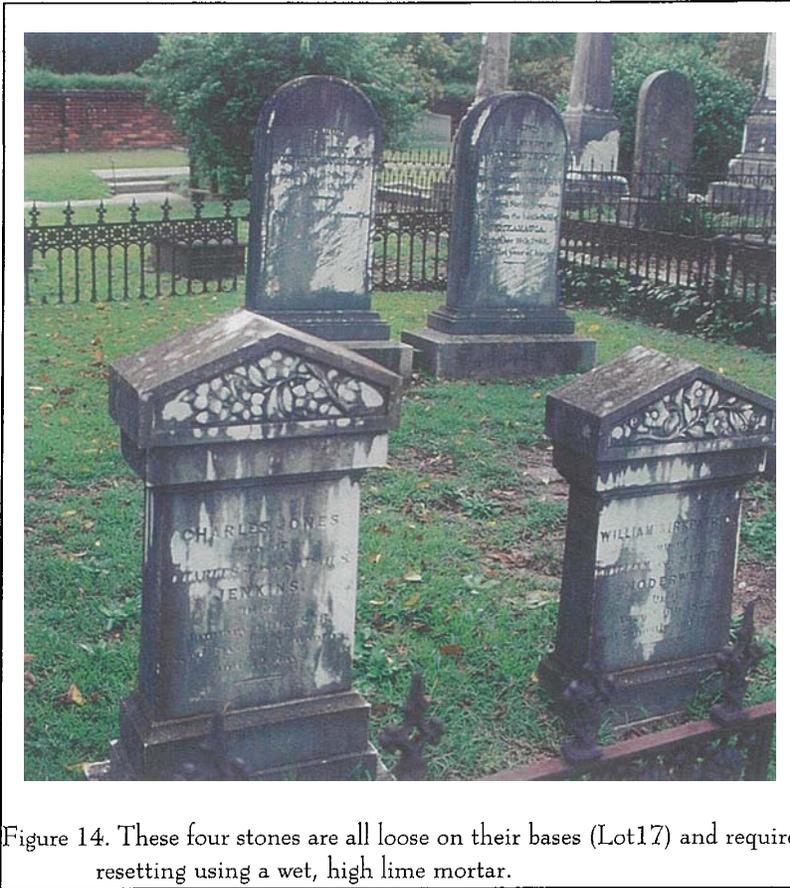


Figure 14. These four stones are all loose on their bases (Lot 17) and require resetting using a wet, high lime mortar.

foundations.

Some of the stones are simple headstones and

Table 2.
Titled Stones Requiring Resetting

Lot #	# of stones	Lot #	# of stones
5	3	56	1
12	1	58	1
15	1	64	1
21	1	79	1
24	4	90	2
36	1	133	1
42	1	141	1
43	1	142	1
48	1	188	1
52	1		

the process of resetting is very simple. They need only to be removed from the soil and reset on a pea gravel footer. Others are slightly larger and heavier, but again require fairly minimal intervention. They may need to be taken apart, but a firm foundation can usually be established using pea gravel and bricks. They then need to be reset and reattached using a wet, high lime mortar mix.

Some of the leaning monuments, however, are quite large and pose a significant threat. Examples include the obelisk in Lot 7 and the Davies pedestal tomb on Lot 36. Resetting these will require the assistance of a monument company with the equipment for safely moving the stones, allowing access to the basal area. In many cases it will be necessary to excavate out the existing soil and pour a concrete pad to support the weight of the monument.

Although this sounds like an elaborate undertaking, it is essential for the long-term preservation of these larger monuments. Eventually they will lean to the point of falling. It is likely that many will not only damage themselves, but will also significantly damage adjacent stones. The cost of repairing this subsequent damage will far exceed the cost of correcting these deficiencies now, before any significant loss occurs.

Broken Stones

Summerville Cemetery has relatively few broken stones, but many of those present are in critical need of repair before additional damage or loss of original fabric occurs. This reconnaissance assessment identified 17 stones worthy of Priority One treatment.

It is very difficult to offer generalized treatment strategies for these stones since such a great range of conditions is present. As a result, I will focus on several of the stones as examples of the type of



Figure 15. Example of leaning obelisk (Lot7). This stone will need to be disassembled, a foundation established, and the stone erected again.

treatment which is needed.

On Lot 20 there is a marble box tomb set on granite curbs that exhibits very severe damage. The granite curbing has shifted over time, probably from settling and the absence of an adequate foundation. In turn, the marble sides of the box tomb began to shift, cause a stress crack in the corner of one side. The

remaining corner, while intact, also evidences shifting. In addition, the ledger for the box tomb has broken, apparently in association with the shifting side wall.

This box tomb offers a good example of why routine maintenance and periodic inspections are so critical in a historic cemetery. Had these problems been identified early, it is likely that simple modifications to the foundation could have prevented the damage we see today.

Now, however, it will be necessary to completely disassemble the box tomb so that the granite curbs can be leveled and the foundation set. Then the box tomb will need to be re-erected, with the corner of the side wall repaired by drilling and pinning. Additional repairs may be necessary, depending on how successfully the tomb can be dismantled. It may be necessary to create an inner support for the box tomb and this can be determined only once the monument is disassembled. The final setting of the ledger will require that it be leveled on the side supports, drilled, and pinned for support. Infill may be necessary to replace lost fabric.

Another box tomb problem is identified on Lot 35 where a section of the side wall is missing. This has allowed the marble ledger to slump in along one side, causing a significant crack. Again, routine maintenance could have identified the loose section of the side wall and effected a simple repair, drastically reducing or eliminating the extensive repairs which are necessary today.

The ledger will need to be very carefully removed, with support provided under the cracked area. Given the extent of deterioration, it will be difficult to

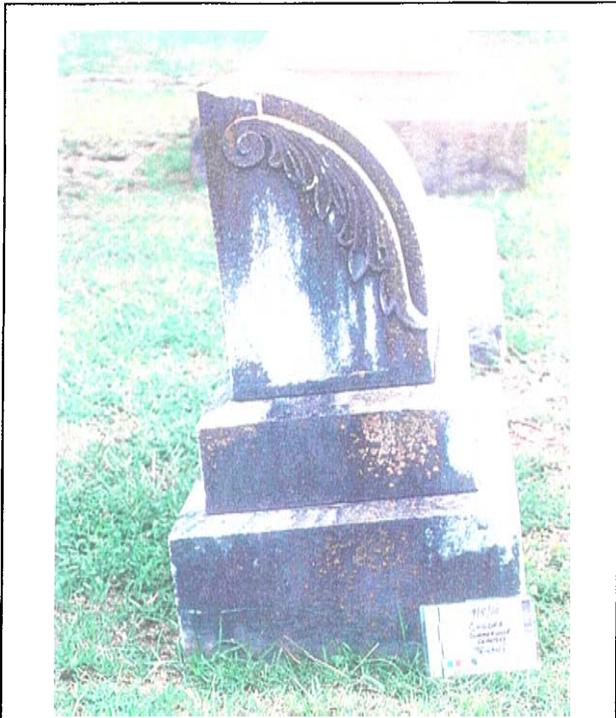


Figure 16. Example of small, leaning monument (Lot 188). These are relatively easy to reset, but early action will prevent additional damage and more costly repairs.

remove the ledger without further damage. Nevertheless, removal is necessary to determine if the missing side piece might be inside the box tomb. If it is, it should be possible to reinstall the piece. If it is not, then it will be necessary to fabricate an internal support for the ledger in the area of the crack. The corner pieces of the box tomb should also be checked for stability and, where necessary, re-assembled using a high lime mortar. Finally, the ledger will need to be replaced on the box tomb, using a high lime mortar to keep it from moving. It will then be necessary to use an appropriate infill to fill the existing crack. This will help it from widening through weathering.

The Carrie Family Cross on Lot 50 evidences previous, failed repairs. Both arms of the cross have broken off and two efforts have been made to reattach the broken pieces, once using a setting compound or mortar and again using an elastomeric compound. Both

repairs failed because of the weight of the cross arms and the failure of previous repair efforts to provide any long-term support. The adhesives used were stronger than the stone, so as the weight of the cross arms pulled downward, the repairs failed, taking with them a thin layer of sound stone. There are additional repairs to the top of the cross. These have not failed since they are held in place by gravity.

Repair of this stone will require the installation of internal stainless steel rods to support the weight of the repairs. This will consist of drilling and installing the rods in epoxy, then setting the arms back on. It will also likely be necessary to use some infill to replace fabric lost through the previous repair efforts.

Lot I contains a very beautiful three-dimension sculpture of an angel clinging to a cross, which is broken. This was originally sculpted with the cross being a separate part, held on using an iron wedge.

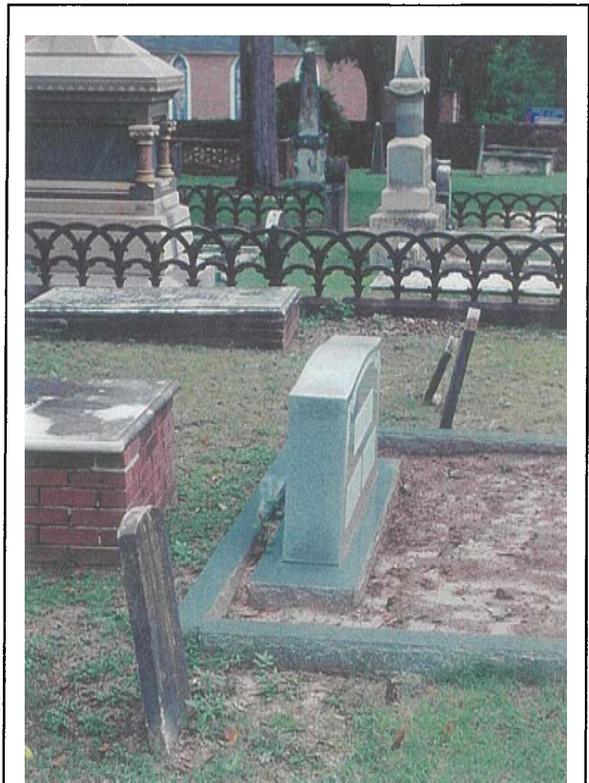


Figure 17. Leaning headstones (Lot 5). Resetting stones such as these is simple and inexpensive.



Figure 18. Box tomb with foundation problems causing damage to the side and top ledger (Lot 20). This is one of the more complex repairs.

At some point this joint failed and some unknown material was used as an adhesive. This, too, has failed. The repair of this piece is particularly difficult since the iron wedge is corroding and requires removal. This will likely require drilling or cutting it out. And of all the repairs necessary, this is the most problematic since there will be very little sound material left on which to reattach the top heavy cross.

Removal of the iron wedge is necessary since it will continue to corrode, spalling the marble and causing any repair to fail. The exposed portion can be cut off, but the remaining portion, set into the marble, must be drilled out. Afterwards it will be necessary to drill for the placement of a stainless steel dowel on which the cross can be set. The small portion of the cross which is currently broken off will be reset using a Jahn Stone Adhesive, since this part will bare no substantial weight with the completed repair. Finally, infill will be necessary to replace those missing portions.

The simple headstone in **Lot 56** illustrates a common, but simple break. A previous repair was attempted using a thin smear of epoxy. This repair failed since the stone is weaker than the adhesive and eventually something or someone placed pressure against the repair, causing it to fail.

In this case it will be necessary to remove the previous repair material, cleaning the stone for appropriate fit. Then it will be necessary to drill and pin the stone using nylon rods.

The break of the headstone of a cradle grave on **Lot 24** is especially instructive. As the stone fell, it broke — providing a perfect example of why it is so critical to reset those loose stones previously discussed before they fall and are damaged. Resetting is always far less expensive than repair. In this case it will be necessary to drill and pin the stone using nylon rods.



Figure 19. Collapsed headstone of a cradle grave (Lot 24). This illustrates why resetting intact loose monuments is so critical. Had this stone been reset before it fell, no costly repairs would have been necessary. Now, it will be necessary to drill and pin this stone, then reset it in the cradle tab — a more costly and time consuming operation.

Depending on the nature of the break once it is fully exposed and examined, infill may also be necessary.

Resetting will involve the use of wet, high lime mortar to adhere the tab back into the cradle socket. Prior to this it will be necessary to ensure that the cradle and socket are adequately supported and level.

Another cradle grave, on Lot 89, is also in need of immediate repair. In this case the top rail has been broken, possibly by a lawn mower. In addition the balusters are all loose. Repair of this monument will require that the side rail be disassembled and then put back together using nylon rods as necessary. It may also be necessary to pin the side rail to the head and foot stones — depending on how the cradle was originally constructed. Failure to make repairs will likely lead to the loss of this cradle. In fact, I am surprised that all

the pieces are still present and relatively intact.

Table 3.
Stones Requiring Repair

<u>Lot #</u>	<u># of stones</u>	<u>Lot #</u>	<u># of stones</u>
I	1	48	1
5	1	50	1
12	1	66	2
14	1	84	1
24	1	115	2
35	1	117	2
44	1	133	1



Figure 20. Example of simple headstone repair (Lot 56). This stone will require drilling and insertion of nylon pins for support.

There are also several headstones which have broken and are today laying flat on the ground. These should be repaired wherever possible and reset. Laid flat they receive more mower damage than they would upright and they are also subject to greater natural erosion as water collects in the lettering.

There are also examples of ledgers which are intended to be laid flat over the grave.



Figure 21. Broken cross (Lot I). Metal wedge will need to be removed before any repairs can be done.



Figure 22. Example of obelisk which requires closure at the tip.

Many of these, however, are no longer level, are partially submerged, and are therefore receiving mower damage. Those that are broken should be removed from the ground and a new, level foundation of gravel prepared. The stones should be replaced, resting slightly above grade. Repairs should be made using either Jahn Stone Adhesive or, in more severe cases, using drilling and nylon rods.

Closing Top of Obelisks to Water

There are three similarly constructed obelisks at Summerville, on Lots 4 (2) and 16 (1) which exhibit identical failures. At the top of the obelisk there is breakage and interior of the obelisk is open to the elements. This exposes the stone to considerable potential for freeze-thaw damage. The openings should be closed immediately to prevent further damage and so are included here for first priority treatment.

The treatment will consist of using a bronze or stainless steel wire screen as a plug and applying Jahn M-120 Marble Repair Mortar to finish the top and exclude water.

Tree Removals

There are two trees which the Board should consider for immediate removal. These include a cherry laurel (Lots 13/14; see Figure 8) which must be removed in order to restore the brick wall for these lots and a cedar tree (Lot 13; see Figure 9) which must be removed in order to preserve the integrity of an adjacent box tomb.

Of the two, the cedar on Lot 13 presents the greatest difficulty since it is already so close to the box tomb. This is a case where a professional tree removal firm should be retained that specializes in difficult removals and close quarters. As additional protection a timber cribbing should be constructed around the box tomb with timbers also used to cover the top. This will help ensure that the tomb is not damaged.

In addition to these two trees, the Board should also consider the wisdom of removing the small oak on Lot 182. At the present time this tree does not endanger the adjacent monument, but another decade

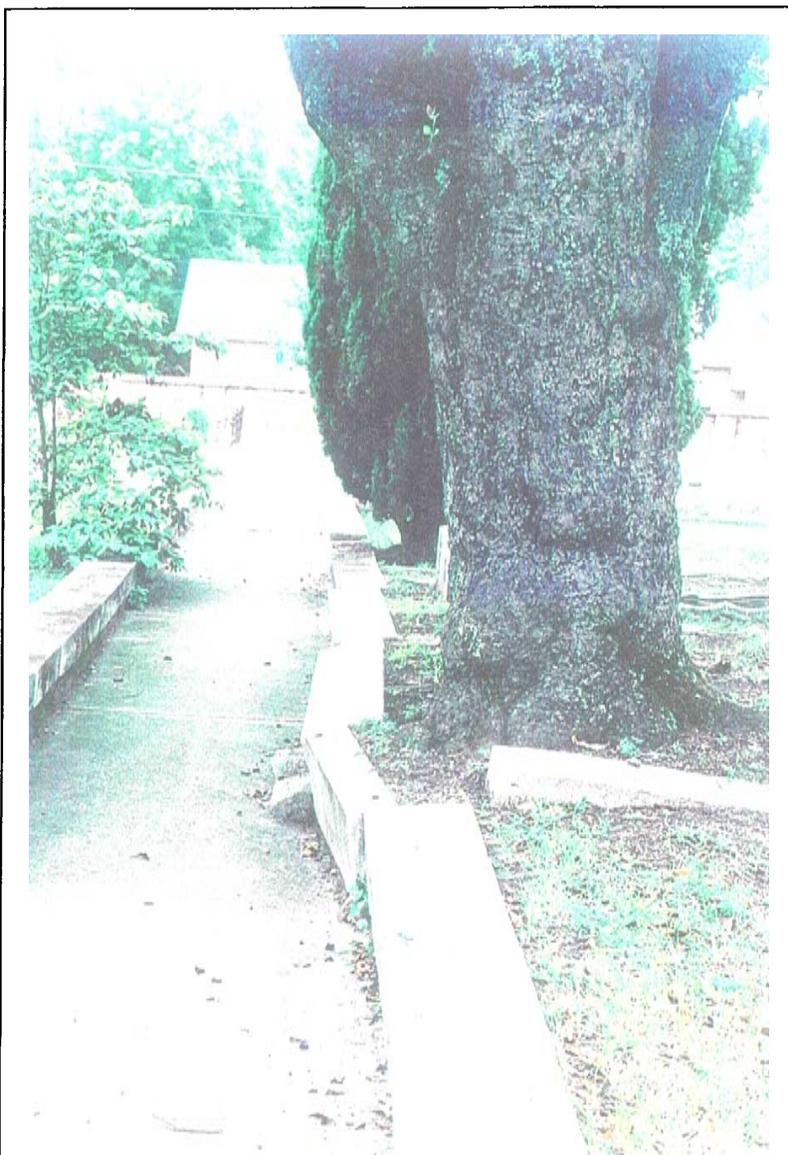


Figure 23. Large tree disrupting coping along the pathway (Lot 50). Removal is not appropriate here since the tree is part of the historic landscape. It may be possible, however, to cut back the roots, allowing the coping to be reset.

cause pavement problems. I do not recommend removal of this tree because of its size — it is a part of the historic landscape and its removal would dramatically change the viewscape. However, I do recommend that a professional tree surgeon be consulted on how much the roots can be safely cut back to allow repair of the coping (at least three sections of which along the walkway and one section dividing the two lots must be reset). This is not a first priority action, but it may be less expensive to have this done with other tree work.

Second Priority Repairs

As explained earlier, these second priority repairs are those where the stone is not itself in immediate danger of further deterioration nor does it pose a threat to visitors. Nevertheless, failure to act causes a deterioration in the historic integrity of the cemetery and may, over time, result in other problems. As a result, while these concerns do not represent a need for immediate action, they should not be disregarded. At times it is possible to integrate some minor secondary repairs in efforts responding to more critical needs. The Board should keep open such options.

Cradle Repairs

Perhaps the most common problem in this category involves at least 26 cradle graves which have sunk as a result of poor foundation preparation. None of these represent

of growth will create a situation where it will likely cause foundation problems and the cost of removal will be much greater.

Finally, a very large oak in Lot 50 is causing extensive disruption of the coping and may eventually

immediate threats to the integrity of the monument, although I expect all to continue their displacement and it is likely, through time, that there will be damage to the joints and/or the headstone. So, while these are placed in the less urgent category, they should

ISSUES ASSOCIATED WITH STONES AND MONUMENTS

Table 4.
Cradle Graves Requiring Resetting

<u>Lot #</u>	<u>#</u>	<u>Lot #</u>	<u>#</u>
B	1	74	1
I	1	89	1
1	1	122	1
12	1	123	1
14	1	126	2
19	1	129	2
50	1	133	1
61	1	150A	1
62	2	159	1
65	5		

become more major and costly repairs.

In most cases the work will involve the excavation of the side rails out of the soil and use of pea gravel or bricks to create a better foundation. Then the cradles can be replaced, probably with no use of adhesives or mortar. This, of course, will depend on their condition as they are excavated. It may be that some exhibit breaks or other problems that will require more effort to repair. Once completed it would be appropriate to replace the soil within the cradles with a rich loam for growth of flowering plants.

Regardless, the Board should resist any suggestions that concrete be used as a means of stabilizing these cradle graves. As I have explained before, concrete is absolutely inappropriate for use in this manner. It is far harder than the stone and will ultimately result in more serious, and difficult to

nevertheless be dealt with in a timely manner before relatively simple, inexpensive maintenance efforts



Figure 24. Example of simple cradle graves almost entirely lost below grade (Lot 65). Here it will take extensive, but careful, excavation to reveal the cradles before they can be raised to their proper level and set on better foundations.

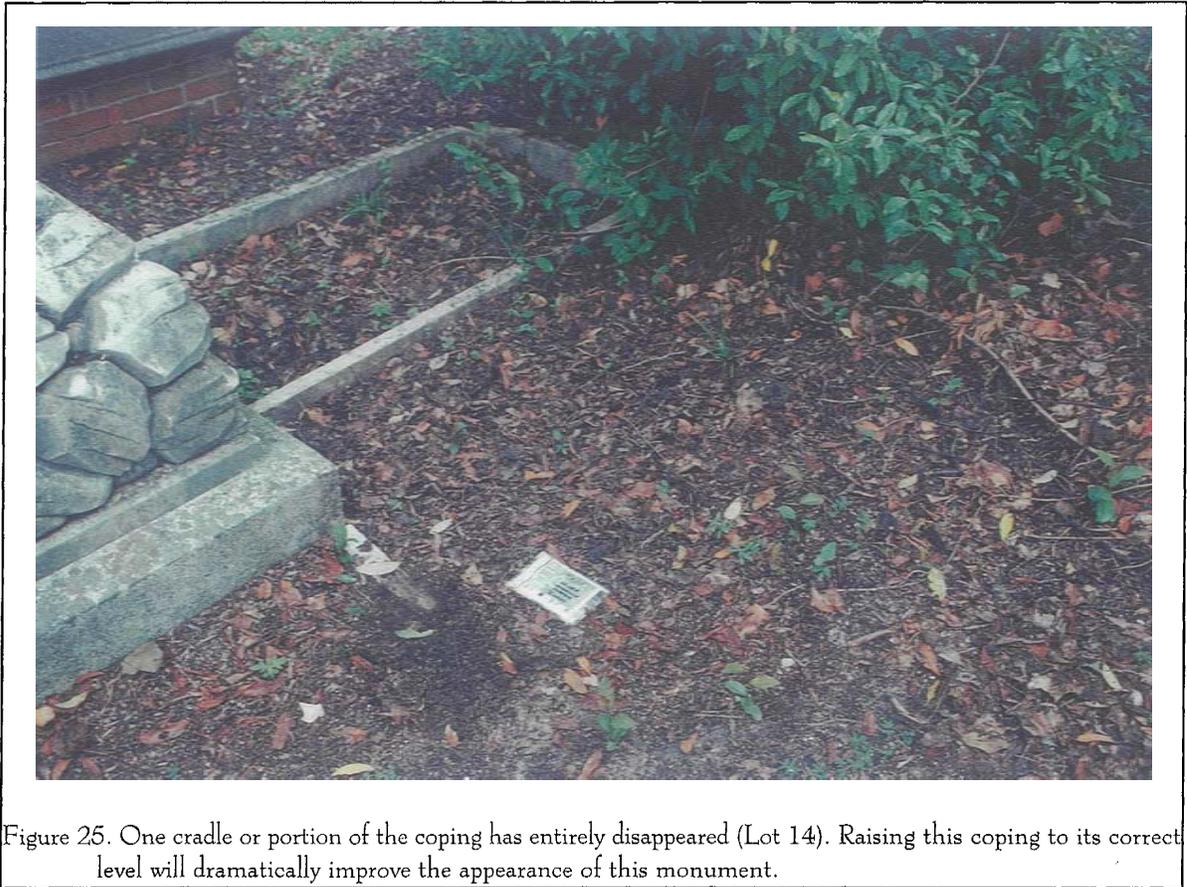


Figure 25. One cradle or portion of the coping has entirely disappeared (Lot 14). Raising this coping to its correct level will dramatically improve the appearance of this monument.

correct, problems.

Correcting Stucco Problems

I identified eight locations where there were moderate to major stucco problems. These include six tombs (two on Lot 23, two on Lot 32, and two on Lot 33), as well as two wall sections (at Lots 60 and 67). These are not critical repairs, but would significantly improve the appearance of the cemetery and the individual lots. In addition, application of stucco on the rebuilt box tomb on Lot C would hide the otherwise mediocre brickwork and improve the appearance of this tomb.

It appears that the brick work in the box tombs on Lot 32 is original and it is certainly clear that the work was originally stuccoed. These tombs should receive the highest priority for reapplication of stucco. I also recommend that a one-component stucco, such as

the Jahn M60, be used. While color matching is possible, there is so little extant stucco (and much of that may come off during surface preparation), that it may be appropriate to use a standard color mix.

Work on the box tomb at Lot 23 should also include lifting the ledger and resetting it so that it no longer allows water to pond. This will dramatically improve the longevity of the stone. Extreme care should be taken in lifting and resetting the ledger since they tend to be very fragile.

If you look carefully, you will notice that the stucco on the walls at Lots 60 and 67 is scored to imitate ashlar block. This scoring is historic and should be preserved. Prior to any work the scoring should be photographed and documented through scaled drawings. Then the surface can be prepared with the removal of loose stucco. Here the Board may wish to use custom colored Jahn M60, although a slight difference in color



Figure 26. Box tombs in Lot 32 which were originally stuccoed.

would help to distinguish the new from the original. Regardless, the scoring should be carefully transferred to the replacement stucco so that this feature is continued in the new work.

Brick Repair

There are seven specific areas noted during this reconnaissance that require brick repairs. Two are associated with walls, three are more minor step repairs, and two involve the resetting of badly deteriorating (but not yet critical) low supports for ledgers.

The two walls requiring attention are at Lots 13/14, where a tree has entirely destroyed the corner, and at Lot 78 where there is a general failure probably brought on by soil weight. In the first case it will be a relatively easy task, once the tree is removed, to rebuild this low wall. In the second case it will be necessary to remove the wall, excavate behind it and replace the soil with gravel, then reset the wall using horizontal and

vertical ties, as well as weep holes. While there are contractors who would be willing to simply build the wall, at less cost, such an approach will only result in failure several years from now. Only by correcting the problem and rebuilding the wall to appropriate specifications is it possible to deal with the problem.

There are bricks loose in steps between Lots 70/75, 76,87, and 175/176. In no case is the repair significant, although all should be done in the near future simply because they represent a liability to the Board. In each case it appears that no more than two or three bricks need to be removed and reset. Consequently, it will likely be more cost effective to have a mason do this work in conjunction with one of these larger projects.

Finally, there are two low brick supports on Lot 147 which are badly deteriorating. It appears that very soft bricks were used and that these bricks are now failing. One corner has already collapsed and as the



Figure 27. Deteriorating brick supports for ledgers (Lot 147).

which should be reset. I also observed several modern box tombs (Lot 37) with ledgers that have been heavily damaged and are now present only as fragments. These are loose on the box tombs. An effort should be made, using a wet, high lime mortar, to adhere these to the box tombs simply to discourage their vandalism or theft.

Stones Requiring Composite Repair

failure spreads the ledgers themselves will be threatened. It will be necessary here to remove the ledgers, remove the brick to below the frost line, and completely rebuild the two supports using appropriate, weather resistant brick.

Other Issues

There are two box tombs (Lot 13) which were originally whitewashed. This original surface treatment should be reapplied for historical accuracy, although the Board should recognize that whitewash was intended to be an annual maintenance project. Consequently, this is an activity which will need to be repeated every few years.

I am not familiar with any modern substitute for whitewash, although there are any number of historic formulas. All involve the use of either hydrated lime or lime putty, usually with some sort of binder and often with whitening. Typically two or three coats were applied, building up the lime as a sacrificial coat to the elements. When well applied the brick work is no longer clearly visible and the boxes take on the appearance of rough marble or limestone (which was likely the original intent of the users).

There is also a concrete bench on Lot 199

There are at least four examples of light colored sandstones that are very badly spalling. One is a headstone (Lot 21) and three are box tombs (two on Lot 9 and one on Lot G).

The cause of this extraordinary exfoliation or delamination is not entirely understood, but generally had to do with the bedding planes and water movement into the stone. In general the only treatment which is used is composite repair, or the application of a natural cementitious material, like Jahn M70 in an effort to slow the deterioration. Short of removing the materials to a protected environment, there is no known permanent or even semi-permanent treatment. Composite repair typically needs to be evaluated and re-applied on an annual basis.

Stones for Which No Treatment is Recommended

There are a limited number of old repairs at Summerville. Although many of these are not aesthetically appealing and several are done with inappropriate materials, they all are at present stable. For example, there is a box tomb in Lot 51 which has been previously repaired using an elastomeric compound, something like crack sealer used on concrete parking decks. This is in the process of failing, but is not currently posing a threat to the stone. An other old

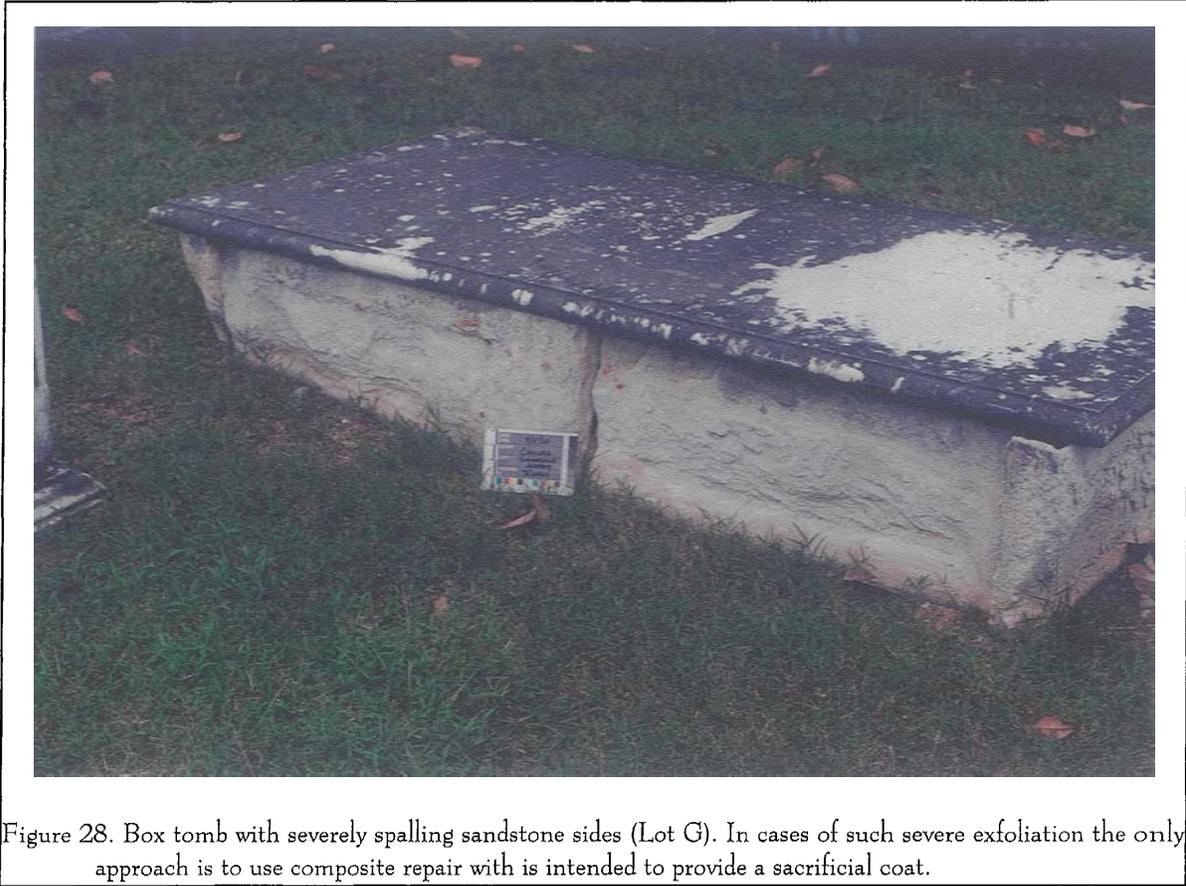


Figure 28. Box tomb with severely spalling sandstone sides (Lot G). In cases of such severe exfoliation the only approach is to use composite repair with is intended to provide a sacrificial coat.

repair is found on a monument in Lot 1. This repair is very poorly joined, but appears stable.

In these cases the best professional approach is to carefully monitor these stones for signs of deterioration or weakening, but to otherwise do nothing. Often it is better to leave stable repairs, no matter how bad they are, then to cause additional damage trying to remove them. Eventually it is likely that these repairs will fail and then we will have the opportunity to replace the old material with a better approach.

There are also stones, such as the obelisk on Lot 4, which have lost details. While these can be fabricated and replaced, I do not feel that this is an appropriate use of what are typically scarce resources. It is far more important to treat priority stones than to reproduce small details.

Finally, there are some stones which are so damaged that no treatment is recommended. An example is a badly fragmented ledger in Lot 7. Only about $\frac{2}{3}$ s of the stone is present and that portion is broken into five fragments. The inscription is entirely eroded and the marble is sugary. While it is possible to pin the individual pieces and then infill the missing sections, I do not believe that this is an appropriate use of funds. This stone needed treatment 20 years ago. Now we must accept its loss.

ISSUES ASSOCIATED WITH FENCES AND IRONWORK

Introduction

A total of 17 fences were included in this preliminary or reconnaissance assessment. Fourteen of these were typical ornamental fences with cast balusters usually set on or in wrought coping rails at the top and bottom. Most of the fences are set in either sandstone plinths or granite blocks. Many have decorative baluster heads. Three manufacturers are identified by their gates,

with the fence at Lot 1 made by Champion Iron Fence Company, Kenton, Ohio; the fence at Lot 28 made by Wood & Perot, Philadelphia; and the fence at Lot 57 was made by R. Wood, Philadelphia.

Two fences are pipe railings, low fences made using galvanized pipes attached to granite posts using brackets set in the posts using lead. Individual pipe sections are attached using connectors with set screws.



Figure 29. Example of tree which has been allowed to damage a fence segment (Lots 16/17). In this case the only choice is to remove the fence section and place it in storage. The aisle way segment should also be reattached to the corner newel post. This photograph also illustrates the large quantity of poison ivy which has been allowed to grow unchecked in the cemetery. This must be removed before any ironwork can begin.

The final fence extends from I to H across a walkway. This fence consists of wrought stock set in granite posts.

In addition to these fences there is also a cast bench between Lots 10 and 27 which was made by David Pettit & Company, Philadelphia. A decorative cast iron urn is also present on Lot 55. With more careful inspection this, too, may be marked.

General Condition Assessment

Table 5 briefly itemizes the condition of these fences and the recommended treatments. A quick review reveals that many of the fences evidence the same general problems. For example, many of the fences' bottom coping rails are today partially buried in soil. This is causing extensive corrosion and the removal of this soil is one of the most immediate needs for the preservation of these fences.

This step is far more complex than it sounds. In general the topography within any lot is level, meaning that it will be necessary to contour the soil for about four feet in from each fence which needs to be exposed. This will entail stripping the sod (or planning on reseeding with a preferred grass), and removing soil to the point where the bottom coping rail is exposed by about 3 to 6 inches. This will generate fairly large quantities of soil that will need to be removed (or stockpiled elsewhere on the cemetery).

It is likely that additional damage and repair needs will be identified once these bottom coping rails are exposed. As a result, it is impossible to project definitive conservation treatments until far more work is done. If the bottom rail is sound, or can be made sound with minimal patching, little more will need to be done.

In addition, virtually all of the fences require

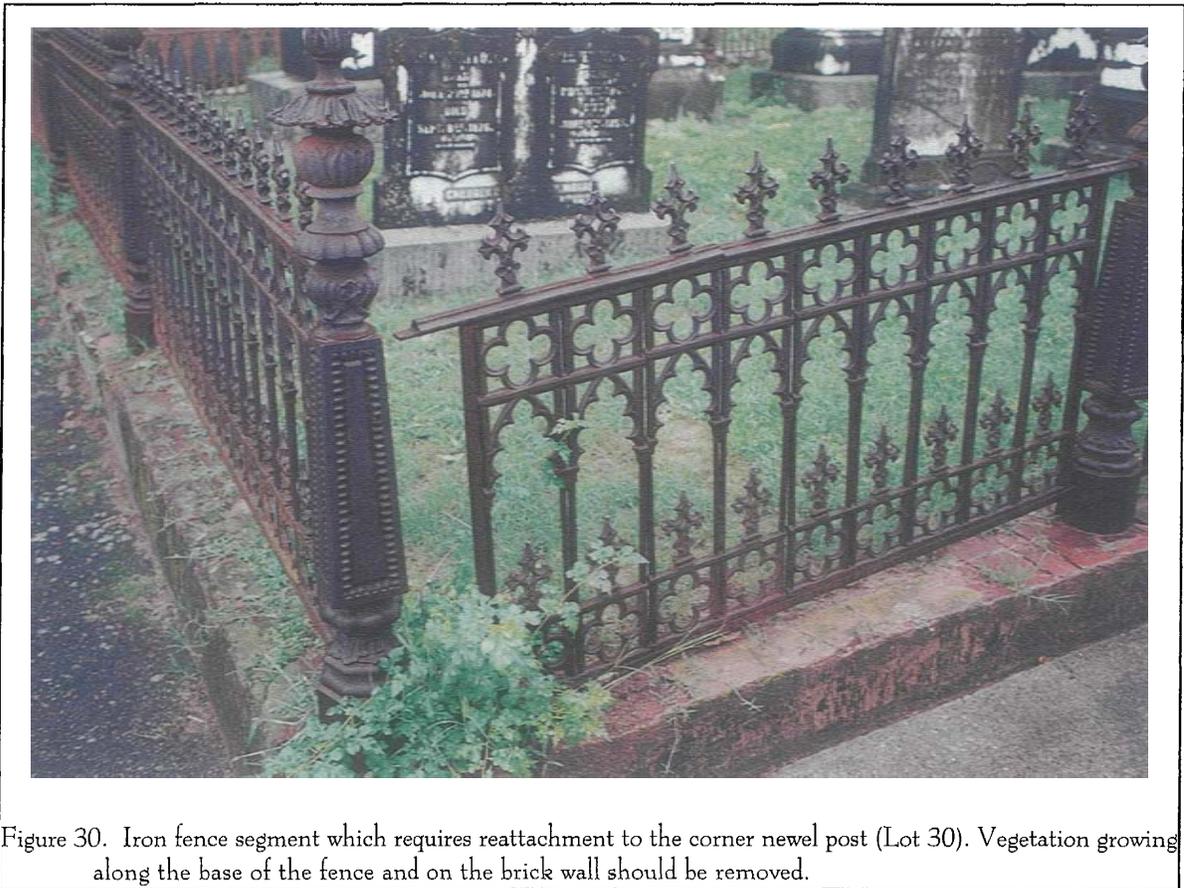


Figure 30. Iron fence segment which requires reattachment to the corner newel post (Lot 30). Vegetation growing along the base of the fence and on the brick wall should be removed.

brushing and or abrasive cleaning, followed by painting. At present only four fences evidence paint. Traces of flat black are found on the fences at Lots 16/17, 31, and 36/C/D, while the fence at Lot 29 has an extensive buildup of a gloss black paint. None of these paints were tested for lead, but testing will be needed, especially for the fence on Lot 29 where the paint is still extensive.

Repainting should take place only after all soil removal is complete. The Board will likely find that it is more cost effective to undertake a variety of similar activities for a number of fences, rather than repair and painting of fences on a lot by lot basis.

As previously discussed, scraping (and use of a paint with a rust converter) is preferred over abrasive cleaning. In general, few of the fences exhibit loose or flaking paint. Nevertheless, surface preparation is critical and the Board should ensure that this step is not shorted in an effort to get a low bid.

While there are a number of possible paints for this application, I suggest that the Board consider using Cortec VCI-386.¹ This is a water-based, air-dry barrier coating that provides extended unsheltered outdoor protection for a variety of metals. It can be applied to pre-rusted surfaces with light preparation and will stop further corrosion. The paint has very good anti-abrasion characteristics and won't chip or crack. It is also UV resistant. Not only can a flat black be formulated, but this paint comes as a clear coating which would be suitable for the galvanized pipe rail fences.



Figure 31. Gate propped up inside the fence at Lot 31. This should receive a very high priority for resetting since it is an attractive target for theft. Similar gates can easily bring \$300 to \$500 in Savannah antique stores.

¹ Cortex Corporation, 800/426-7832.

Table 5.
Summary Recommendations for Ironwork at Summerville Cemetery

Lot	% Present	% Good	% Fair	% Poor	Treatment
1	50	100			• wire brush, prepare surface, paint
16/17	100	90	10		• remove fence section at tree • repair corner post • reattach fence segment • wire brush, prepare surface, paint
13	75	100			• wire brush, prepare surface, paint
31	100	100			• remove soil from bottom coping rail • reattach fence segment • wire brush, prepare surface, paint
32/33	100	90	10		• remove fence section at tree • reset gate • wire brush, prepare surface, paint
36/C/D	75	100			• remove soil from bottom coping rail • remove isolated post on east and use at end of west segment • wire brush, prepare surface, paint
E	75	100			• remove soil from bottom coping rail • reset gate • wire brush, prepare surface, paint
37/53/54/F	85	70	30		• remove soil from bottom coping rail • weld loose pieces • wire brush, prepare surface, paint
52	75			100	• remove soil • wire brush, prepare surface, paint

Table 5, cont.
 Summary Recommendations for Ironwork at Summerville Cemetery

Lot	% Present	% Good	% Fair	% Poor	Treatment
2/29	100	100			<ul style="list-style-type: none"> wire brush, prepare surface, paint
28	75	100			<ul style="list-style-type: none"> remove soil from bottom coping rail wire brush, prepare surface, paint
45	88	30	70		<ul style="list-style-type: none"> remove and reset granite coping and corner blocks reset pipe attachments in lead replace missing pipe segment apply clear coating
63	60			100	<ul style="list-style-type: none"> remove soil from bottom coping rail wire brush, prepare surface, paint
57	95	10	70	20	<ul style="list-style-type: none"> remove soil from bottom coping rail reset gate wire brush, prepare surface, paint
G	75	70	30		<ul style="list-style-type: none"> remove soil from bottom coping rail reattach fence segment wire brush, prepare surface, paint
I/H	100	100			<ul style="list-style-type: none"> wire brush, prepare surface, paint
126	88	100			<ul style="list-style-type: none"> replace missing pipe segment apply clear coating
Urn @ Lot 55					<ul style="list-style-type: none"> remove concrete wire brush, prepare surface, paint set on concrete pad using stainless steel holder
Bench @ Lot 10/27					<ul style="list-style-type: none"> weld or braze repair wire brush, prepare surface, paint silver

SUMMARY

One of the most difficult aspects of turning an assessment into action is knowing where to begin. Even a preliminary preservation plan such as this outlines a great many tasks and the effort can seem insurmountable. At times there may be one of two reactions. The group may fragment into small cliques, each with its own favorite plan of action, often revolving around one or two "special" monuments. Or the group may dissolve into inaction. Of course neither is likely to promote the well-being and preservation of the cemetery.

There is a third option. Like any maintenance plan, there are always more tasks than can be accomplished at any one time. The critical key to success is to identify those actions which are both critical and which the organization can afford, and then begin action. It is really that simple.

Rather than contemplating how much the entire plan will cost, or how many years it may take to achieve success, or where the group may go for additional funds, it is important that the organization take positive, well-directed action.

Action 1a

The first action that I recommend is tackling those stones which present safety hazards to the public or themselves. This largely involves the resetting of loose or tilted monuments.

There are two approaches to much of this work. A stone conservator and his crew can be retained to perform all of the work. Alternatively, much (though certainly not all) of the resetting of these pieces requires little skill and the supervision of a stone conservator will be adequate. Some member of the Board may have a work crew that could be "loaned" to the cemetery for a week to perform the bulk of the labor for the simpler resetting, under the direction of the stone conservator.

There is also the resetting of large monuments which should be handled by a commercial stone company with the tools and equipment for handling the weight of large stones. Again, this work should be under the supervision of a stone conservator, given the historic nature of these materials and the need for great care, but the actual work can be readily accomplished by a commercial firm.

Finally, there are those more complex resetting operations which require a more trained team and should be conducted by only a stone conservator and his crew.

Completely unrelated to the stone conservation, I also recommend that the maintenance shed of the cemetery be renovated during this phase of the work. It could then be used to store conservation equipment and supplies, loose stones awaiting treatment, and could offer safe, secure storage for the fence parts until they are repaired.

Action 1b

Of equal importance to the resetting of loose and tilted stones is the repair of the small number of badly fragmented or damaged stones previously discussed. These require the skill and care of a trained crew and should be contracted out to a stone conservator.

Action 2a

There are those actions which may, with little or no additional cost, be immediately implemented by existing agreements or volunteers. One example of this is to insist that changes be made in the current landscaping activities. The current landscaping firm needs to be far more careful in mowing. There is too much damage being done to stones through careless and inattentive work. There is too much invasive vegetation growing up between plots and in shrubbery because the

current firm is not adequately attending to routine maintenance. In addition, this firm should also be directed not to leave landscaping debris on-site. And a Board Member should be responsible for walking through the cemetery after every landscaping to check for incomplete tasks and damage.

In addition, it is likely for little additional funds the current landscaping company can be responsible for appropriate pruning and the removal of noxious and intrusive plants beyond those it should be addressing through routine mowing and string trimming. If the company desires too much for this service, then it is appropriate to rebid the service. Or it may be appropriate to establish a "Month of Saturdays" where Summerville neighbors are asked to pitch in to clean up the cemetery. It is likely that a crew of five, working 8 hours a day, could completely remove all of the intrusive plants within two or three days. This is also an action which can be undertaken immediately and which will show an immediate difference.

Action 2b

There are those actions which may be undertaken by laborers under the direction of a stone conservator. For example, there is no need to hire a stone conservation crew to excavate out cradle graves and coping — this work can be satisfactorily performed by unskilled or semi-skilled labor working under the direction of a stone conservator to ensure that the workers are careful and that all of the pieces are recovered.

In this same category is the oversight of a brick mason during his resetting of low supports for ledgers, or the oversight of crews directed to remove trees at the cemetery.

Associated with this there are a number of smaller, less critical repairs that could be conducted by the stone conservator at the same time — maximizing his time at the cemetery. This might, for example, include composite repairs of the badly spalling box tombs.

Action 3a

A third stage of action should involve the use of local labor to excavate out the bottom coping rails of the fences at Summerville, resculpting the landscape to promote drainage and ensure that the bottom rails remain free of soil accumulations.

This work should be done under the periodic review of a conservator. During these reviews it will be possible to determine the extent of damage to the rails and the need for additional repair efforts.

Associated with this work, if not done as part of the Action 2a program, all of the poison ivy and other intrusive vegetation around the fences should be completely removed. This will allow access for the following stages of work.

Action 3b

After all of the fences are free of soil and vegetation, a conservator should come in, along with a local welding company, and make the necessary minimal repairs to the fences to ensure their survival. This will include resetting gates, welding broken balusters, repair of loose newel posts, and repair of missing rails.

During this action stage the cemetery should undertake the repair of the bench and resetting of the iron urn.

Action 3c

The final action with the fences will be for a local painting contractor to be retained for the preparation and painting of the fences. This work, too, should be done under the supervision of a conservator who will make certain that the surface preparation is adequate, that the appropriate primers and paints are being used, that adequate steps are taken to protect stones and copings from paint, and that the paint application is adequately performed.

Action 4

One of the final actions at the cemetery should be a continued program of maintenance reviews. This

SUMMARY

will result in the development of new action plans — emphasizing that repairs must be viewed as routine maintenance, not one-time activities. Similarly, it is likely that even with the best coatings, the fences will need at least spot painting once every five years with major efforts perhaps every decade or two.

Estimation of Costs

It is virtually impossible to provide complete cost estimations based on this preliminary reconnaissance.

Some tasks are relatively simple and the costs are easily defined. For example, simple resettings, such as the resetting of the leaning headstones in Lot 5 or 45 would cost between \$100 and \$150 each, if done by a conservation crew. These, however, may be reset by a local labor crew under the direction of a conservator, perhaps for less.

Other tasks should be conducted only by a stone conservator and his crew. For example, the resetting of an urn which requires drilling for a stainless steel pin will likely cost about \$150. The resetting of the crosses, while similar, is made more complex by their size and weight. The cost of resetting these may be \$250 to \$350 each.

There are many tasks that will also require the assistance of a commercial stone company and their crew, such as the resetting of large obelisks on concrete foundations. The conservation cost may be only \$200 to \$300, although it is necessary to include the cost of the commercial monument firm, as well as the cost of concrete and labor in preparing the soil form and pouring the concrete.

There are also many tasks that are quite complex. A good example will be the repair of the box tomb on Lot 20. This work will likely cost \$2,500. The repair to the cross at Lot I will cost \$1,800 and the cost of the repair to the cross at Lot 50 will cost \$2,200. Simple repairs, such as the broken headstone at Lot 56 will cost about \$500.

The cost of some work cannot be completely calculated at this point. For example, under the bottom

coping rails of the fences are exposed, it isn't clear how much damage will need to be repaired. Even for some of the better understood monuments only estimates are possible. For example, the treatment of the box tomb on Lot 20 involves many unknowns, the largest being the exact method by which this tomb was put together. If there are a large number of iron dowels which must be cut, then drilled out and replaced, the cost will escalate.

All of these costs are based on the assumption that a series will be treated in one project. Treating one marker at a time is so inefficient that these budget figures would not apply. In treatments such as adhesive or mortar work, the treatment must set up or cure for a day or more before repair work can be completed. When several markers are being treated, work can continue on other markers; when only one marker is being treated this "down time" is added to the cost of repairing that marker.

One means of getting at a more definitive cost is for the Board to determine the general level of funding that they wish to devote to the work at this point and the priority action they wish to begin with. The Board should also indicate what, if any, local labor supply they can draw on, as well as if they have the ability to procure materials, such as sand, gravel, and brick at a cost better than we might be able to. Then we will be able to calculate more precisely the cost of individual marker treatments.

RECONNAISSANCE PRESERVATION ASSESSMENT OF THE SUMMERVILLE CEMETERY

APPENDIX 1
APT REPOINTING: AN ANNOTATED MASTER SPECIFICATION
FOR THE REPOINTING OF HISTORIC MASONRY



REPOINTING

An Annotated Master Specification for the Repointing of Historic Masonry

NOTES CONTRIBUTED BY THE HERITAGE BRANCH OF THE ONTARIO MINISTRY OF CITIZENSHIP AND CULTURE

The repointing specification that follows is an excerpt from the forthcoming "Annotated Master Specification for the Conservation of Historic Masonry." This specification, commissioned and produced by the Heritage Branch of the Ontario Ministry of Citizenship and Culture, was drafted by Spencer R. Higgins, Architect, of Toronto.

This specification was reviewed by Martin Weaver, Heritage Canada and Keith Blades, Public Works Canada. This document was edited by Mark Fram and Herb Stovel, Ontario Ministry of Citizenship and Culture, and Richard Unterman and Andre Scheinman, Conservation Consultants.

This master specification was developed to assist professionals in masonry conservation to meet the urgent need for a more comprehensive approach to this sensitive facet of architectural preservation.

CSA—Canadian Standards Association—178 Rexdale Blvd., Rexdale, Ontario, M9W 1R3.

PART 1—GENERAL

1.1 Description of Work

- .1 Identify the masonry to be repointed by written description and reference to drawings and photographs in the contract documents.
- .2 Identify the type of mortar existing on the masonry areas to be repointed and any special features or conditions.
- .3 Identify any special areas of masonry requiring repair or consolidation before repointing can take place.

1.2 Related Work

- .1 Cooperate with related trades in locating and accommodating work as it affects this trade.
- .2 List related sections of the specification which affect this trade.
 - Certain operations such as masonry repair, structural stabilization, and cleaning must be done before repointing is started. Partial repointing of defective masonry may be required before water-based cleaning work.

1.3 Qualification

- .1 Provide for all work to be done by skilled and experienced tradesmen specializing in the type of work specified.
- .2 The work of this section shall be executed under the continuous supervision and direction of a competent mason.
- .3 One thoroughly experienced, reliable and competent workman shall be in charge of all mortar mixing for the duration of the job.

1.4 Inspection and Testing

- .1 Routine testing of materials, of proposed mortar mix, and of final work for compliance with the specification will be carried out by the Architect or his/her appointed representative.
- .2 If test results show that performance

criteria are not met, removal and repair of rejected work shall be performed at no additional cost to the owner. All work must be done to the original specification.

- Care must be taken in choosing test methods to analyse lime-based mortars, as standard CSA and ASTM Tests for mortar strength are based upon the use of portland cement and sand-based mortars which set quickly. A discussion of this problem is to be found in Moore and Stewart, "Chemical Techniques of Historic Mortar Analysis," Association of Preservation Technology Bulletin, XIV, 1 (1982).

1.5 Test Panel

- .1 Before commencement of work the contractor shall complete a 1 m² test panel demonstrating all aspects of the repair procedure for each type of masonry material specified.
- .2 The panel(s) shall be located as directed by the Architect.
 - The panel should be located in an inconspicuous place so that unsuccessful repointing attempts will not be noticed by the public.
- .3 The completed panel is to be used as the standard reference for acceptance or rejection of all repointing work on the job.
 - The test panel should be prepared under the supervision of the Architect, to ensure that a full understanding of the procedures, techniques and formulations specified is achieved before work commences.
- .4 Start work only upon receipt of written approval of the test panel by the Architect.

1.6 Samples

- .1 Clearly labelled samples of all materials to be used on the job shall be submitted to the Architect for approval before work starts.
- .2 The approved samples shall become the standard materials used on the

job. Substitutions shall not be permitted without written approval from the Architect.

1.7 Storage and Handling of Materials

- .1 Store cementitious materials in accordance with CSA A5. Store aggregates in accordance with CSA A23.
- .2 All materials are to be kept dry and protected from weather and contamination. Masonry units are to be stacked on pallets.
- .3 Manufacturers' labels and seals must be intact upon delivery.
- .4 Any material that has deteriorated or has been contaminated shall not be incorporated into the work, and must be removed from the site.
- .5 Store lime putty in plastic-lined scaled drums. Do not allow lime putty to freeze at any time.
 - Lime putty is destroyed by frost and loses its ability to harden.

1.8 Environmental Requirements

- .1 All materials must be kept above 4°C (40°F).
- .2 No mortar may be placed when the temperature is below 0°C (32°F), or below 4°C (40°F) and falling. Repointing must not be done at temperatures above 27°C (80°F) unless shading and water-misted burlap over new work is provided.
 - All work must be suspended during frosty weather unless a heated enclosure is provided. Work should not be done in full sun at temperatures above 27°C unless shading of the walls is provided and the masonry wall temperature is kept below this point. Burlap sacking and water misting may be necessary to control evaporation. High temperatures can cause flash setting of cements and rapid evaporation of water in the mix, leading to lack of development of final strength by the cement.
- .3 All newly laid masonry mortar shall be protected against freezing until it is set and dry.

*The initial set of lime putty takes at least three days; mortar should be allowed to dry out slowly after this time. Enclosure and temporary heating may be required to prevent freezing.

1.9 Protection

- 1 All methods of enclosure and protection shall be to the approval of the Architect.
- 2 Newly laid mortar shall be protected from excessive exposure to rain and full sunlight until the surface is thumb-print hardened.
- 3 Provide and maintain protection for masonry walls at all times when work is suspended to prevent water from entering partially repointed masonry.
- 4 Protection shall consist of non-staining plastic sheets, tarpaulins or burlap, secured to prevent lifting in high winds.
- 5 Provide protection boards to exposed corners, vulnerable decorative work and all openings such as doors and windows which may be damaged by construction activities. Maintain protection for the duration of operations. Remove and dispose of protective material as directed by the Architect.
- 6 Rainwater leaders, eavestroughs and gutters shall be protected against blockage and damage by wastes and residues before work begins. Suitable protection must be installed over drains while maintaining normal water flow at all times.
- 7 Provide protection against the spread of dust, debris and water at or beyond the work area by suitable enclosures of sheeting and tarpaulins.
- 8 Prevent the entry of dust, debris and water into the building by sealing all openings.
- 9 All workmen must be protected from the effects of dusts during cutting-out operations. The contractor shall ensure that all workmen wear adequate, approved protective equipment during these operations and as required at other times.

1.10 Existing Conditions

- 1 The contractor shall report to the Architect in writing all areas of severely deteriorated masonry revealed during the work, and shall await instruction regarding repair or replacement of masonry units.

PART 2—PRODUCTS

2.1 Water

- 1 Water shall be potable and free from contamination.

2.2 Cement

- 1 Cement shall be white portland cement, as manufactured by Federal

Cement Ltd., Ingersoll, Ontario.

*Low-alkali cement would be a better choice, but is not available in reasonable quantities in Ontario. Grey portland cement, though less expensive, is generally not suitable for use on historic masonry because of the high content of soluble salts that cause staining, efflorescence and crystallization stresses in weak masonry, salts such as sodium and calcium sulphates and hydroxides, and sodium silicates. Grey portland cement that includes hydrated lime and cement in a pre-mixed state may also be suitable, provided that the ratio of mix constituents conform generally to those established in table 3.6.1. Its use is suggested where excessive moisture in masonry is a problem.

2.3 Lime

- 1 Lime shall be preferably slaked quicklime putty made from finely ground crushed quicklime conforming to CSA A82.42 (quicklime for structural purposes, as manufactured by Domtar Chemicals Ltd., Beechville, Ontario: (3/16"-fines, dry-bagged quicklime).
- *Lime putty slaked from fresh quicklime produces a superior, stronger mortar with greater plasticity and workability than putty run from hydrated lime (CSA A82).

2.4 Pigment

- 1 Pigments shall be dry, powdered, inorganic pigments, such as manufactured by Northern Pigment Ltd., Toronto, Ontario.

*Pigments have traditionally been made by heating various natural earth and metal oxide compounds to achieve various colours. Ochre, sienna and umber are examples of natural earth pigments. Yellow, brown and red tones are produced by heating iron oxides. Most pigments tend to fade under UV exposure.

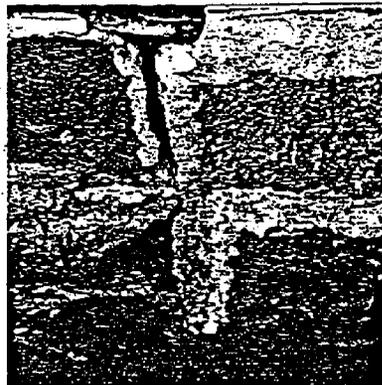
2.5 Aggregate

- 1 The aggregate shall be a well-graded washed sand matching the texture and range of sizes found in the mortar to be matched. The colour of the sand shall be an exact match of the original; a blending of sands may be required where appropriate. The colour of the mortar should ideally be achieved through the sand only.
- *The sand should contain a full range of sizes from fine to quite coarse. Asphalt sand is a readily available grade that gives such a range. Brick sand is generally too homogeneous in grain size. The addition of pigments for special effects is normally restricted to tuckpointing, sand being the general colouring agent.

2.6 Bonding Agent

- 1 Bonding agents should be used with caution: synthetic admixtures can cause the formation of soluble salts, and increased shrinkage through the added water. Pure acrylics such as Acryl 60 (Thorosystems Ltd.) or equivalent are superior to the polyvinyl acetate (PVA) type, which break down under ultraviolet exposure.

...to be continued



An example of the liberal "over-buttering" of mortar joints in a field stone foundation.

Note:

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Herb Stovel, Publications Chair

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REPOINTING

An Annotated Master Specification for
the Repointing of Historic Masonry

Technical Notes 5 cont'd.
COMMUNIQUE
VOL. XIV (3)

NOTES CONTRIBUTED BY THE HERITAGE BRANCH OF THE ONTARIO MINISTRY OF CITIZENSHIP AND CULTURE

PART 3—EXECUTION

3.1 Preparation of Lime Putty

- .1 Estimate the quantity of lime putty required to complete the work.
- .2 Allow at least two weeks' storage time for slaked lime putty before it is used.
 - It is strongly recommended that slaked quicklime putty be used for all repair work. Its advantages over mason's hydrated lime are well worth the extra trouble of preparation and storage. All putty must be stored under water in sealed containers to prevent absorption of carbon dioxide gas from the air and the consequent hardening of the lime.

3.2 Slaked Quicklime

- .1 Slaked quicklime is prepared by filling a tank with approximately 300 mm of hot water. Lumps of fresh quicklime are added to the water, taking care that the water covers the lime.
- .2 Stir and hoe the mass while the lime splits and breaks up with the generation of heat and carbon dioxide gas. Further water and quicklime are added until a sufficient quantity is produced.
- .3 The reaction between the lime and water may be fierce, and slaking operations must be carried out under strictly controlled conditions. Protective clothing, especially safety goggles and gloves, MUST BE WORN.
- .4 The slaking operation produces a thick, creamy liquid which must be run through a 3 mm mesh screen into plastic-lined drums when cool. The putty is stored under 100 mm of water and left to cure, for at least two weeks, undisturbed.
- .5 During this time the consistency of the putty develops and the water over it clears. (The standing water over the putty is limewater, an excellent preservative for limestone, and should be siphoned off and stored for future use.)
- .6 The drums should be dated and labelled, and the tops sealed.

3.3 Hydrated Lime

- .1 Putty can be made from hydrated mason's lime by adding dry bagged hydrated lime to water. The mass is stirred and hoed to form a thick

cream. Allow to stand at least 24 hours before use—preferably longer.

- Hydrated limes are produced from quicklime by the addition of a limited amount of water. The resulting dry powder is bagged. Dolomitic Finishing Hydrated Limes (Type S) develop superior plasticity than Mason's (Type N) Hydrated Limes.

It is very important that quicklimes be fully slaked, as any unslaked particles will subsequently expand and disturb the rest of the work. It is for this reason that all putty be allowed to temper for at least two weeks before use.

3.4 Preparation of Roughage

- .1 If the contractor desires, the lime and aggregate may be pre-mixed to produce what is known as roughage or coarse-stuff. This compound may be stored indefinitely if kept sealed from air and kept from freezing.
 - Lime hardens slowly through the absorption of carbon dioxide (carbonation), in contrast to hydraulic cements that set quickly through a reaction with water.
- .2 The sand and lime should be accurately proportioned using measuring boxes constructed to contain the exact volume of each ingredient required to make one batch. These materials are to be thoroughly mixed for about ten minutes, then stored in plastic-lined drums and sealed until required.
- .3 When required for use, the correct portion of gauging cement should be added, and the mix worked up as specified and used immediately.
- .4 As the strength and colour of even slightly different mixes varies dramatically, accurate portioning is a strict requirement of this specification.

3.5 Cement Gauging of Mortars

- .1 The addition of hydraulic cements to lime and aggregate mixes must be done immediately before the use of the mortar.
- .2 All mortar must be used within two hours of gauging; do not retemper mortars after this time has elapsed.
- .3 All batching is to be done with wooden boxes or plastic pails of known volume to ensure standardization and conformity of measure-

ment. Shovel measurement of materials is not permitted. Boxes should be of such a size that a batch sufficient for one mixer load is measured out.

- .4 Initially, mortars should be mixed for five minutes without cement or the addition of water. Careful addition of a small amount of water should produce a mortar that is just wet enough to hang on a trowel. Excess water creates a shrinkage problem, and water content in excess of 5% will retard carbonation significantly.
- .5 Cement should be added and mixed for about two minutes before use.
- .6 The amount of water required should be recorded and added at the start of mixing for future batches.
- .7 Mortars must be mixed a total of at least 10 minutes before using to improve workability, increase air entrainment and plasticity, and ensure thorough mixing.
- .8 All mixing boards and mechanical mixing machines must be cleaned between batches.
- .9 Strict control must be exercised so that masons refrain from using too wet a mix. The addition of water does improve workability, but does so at the sacrifice of mechanical strength and the increase in final shrinkage. Mortars must be just damp enough to hang on a trowel. Only water lost through evaporation should be replaced at the mortar-board by the mason; a spray bottle of water is used for this purpose.

3.6 Mix Formulae

- .1 For repointing of smooth, hard materials such as polished granite, the mix water should be replaced with a 1:1 bonding agent: water solution, to improve edge adhesion.
 - Addition of a bonding agent is not recommended for softer masonry as the strength of the mix is increased substantially and an excessive concentration of salts may be formed in the mortar. These formulae are based upon the use of lime putty and white portland cement. The use of lime-based mortars requires considerable skill on behalf of the mason to produce first-class work. Lime-based mortars are extremely slow-setting, progressively developing strength over several months.

The initial set of the lime takes about three days under good conditions. The small amount of white portland cement provides a fast initial set to the mix; it requires however, a moist cure for about two days to achieve a reasonable strength. After this time the masonry should be kept quite dry, to assist in the carbonation of the lime. Carbonation requires the entry of carbon dioxide gas in air to enter the mass through the porous structure of the mortar and masonry. Heavy buildups of mortar should be avoided if possible; where deep, thick joints are necessary, the backup mortar should be mixed with an aggregate of broken, porous brick chips or other suitable material to aid in the aeration of the mass. They should be added to the mix just before placement. The presence of large amounts of water in the masonry hinders carbonation by filling the pores and preventing access of carbon dioxide to the interior.

3.7 Colouring of Mortars

- .1 If it is necessary to match existing coloured mortar, samples of freshly-broken mortar from the original masonry pointing must be obtained.
 - All matching must be done with unweathered samples of mortar to determine the exact colour used. Final shading to match adjacent weathered mortar can be obtained by using less colourant in many instances. Soiled mortar should not be used as a match, because if the soiled mortar is cleaned at a later date, any new repairs will show up as dirty. The overall colour of mortars should come from the aggregate, not the binder. As mortars weather, the aggregate is gradually exposed and etched, and becomes the principal element affecting the overall colour.
- .2 A test patty of mortar must be prepared, accurately proportioned to represent the final mix formula and amount of pigment.
- .3 The final colour of the patty must be determined only when it is dry. Accelerated drying of the sample can be accomplished by drying the patty in an oven or over a hot-plate.
- .4 No more than 10% by volume of pigment shall be added to mortars.
- .5 Once proportions are determined, careful control during mixing is vital to ensure quality control. A measuring box should be made to hold the specified amount of pigment for each mortar batch.

.2 (The appropriate mix formula should be selected by the Architect and included in the specification.)

Mortar Designation	Cement:Lime Aggregate	Masonry Material	SELECTED EXPOSURE		
			Sheltered	Moderate	Severe
ii	1 : ½ : 4-4½	Highly durable: granite, hard brick, etc.	iv	iii	ii
iii	1 : 1 : 5-6	Moderately durable: stones, bricks, etc.	v	iv	iii
iv	1 : 2 : 8-9				
v	1 : 3 : 10-12	Poorly durable: soft brick, friable stone, etc.	vi	v	iv
vi	0 : 2 : 5				

The mix recommendations are conservative; old, valuable masonry should be repointed with a mix one grade weaker than that shown.

- Suitable pigments to obtain certain colours are suggested below. The exact amount of each pigment to match existing samples must be determined by experiment.
 - Yellow-Beige...Sienna
 - Brown-Beige...Brown Umber
 - Red-Terra-cotta...Burnt Sienna-Brown Umber
 - Limestone...Bone Black-Brown Umber
 - Grey Sandstone...Green Umber

3.8 Cutting-out of Deteriorated Jointing

- .1 All seriously deteriorated joints are to be cut out to the full height of the joint and to a minimum depth of 25 mm.
 - Cutting-out to this depth is not generally accepted practice among contractors in Canada. Some authorities recommend cutting out to a depth of 50 mm minimum. Twenty-five mm should be considered an absolute minimum. Pointing should depend upon a mechanical bond between the masonry and body of the mortar, not upon adhesives or high-strength portland cement mixes. Shallow pointing will let water into the wall. Cut out at least twice the width of the joint in most instances.
- .2 Seriously deteriorated joints are defined as having: loose or missing mortar; excessively soft mortar; powdery or crumbling mortar; cracks

that weaken the bond between units; voids; or badly-stained pointing.

- .3 Metal fittings such as nails, brackets, clips and the like should be removed from wall areas as cutting-out proceeds.
- .4 Sound adjacent joints are not to be cut out, but left in their present state.
 - Some judgement will be required where major percentages of jointing on a wall are being cut out, to determine if 100% repointing is required for aesthetic purposes.
- .5 Areas of jointing previously repointed using a hard cement and sand mix are to be treated as defective jointing and cut out.
 - Hard mortars lead to spalling and crumbling of the edges and faces of masonry units due to stress transfer during settlement and thermal expansion of units, especially when the units are set in a bed of soft mortar, or have a leached-out core.
- .6 Fine joints (less than 3 mm) need not be raked out more than 10 mm, in order to reduce the danger of chipping of masonry edges. If cutting out with power saws is necessary, less damage will occur.

to be continued...

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**CEMETERY PRESERVATION
PLANS**

HISTORIC RESEARCH

**IDENTIFICATION OF GRAVE
LOCATIONS AND MAPPING**

CONDITIONS ASSESSMENTS

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