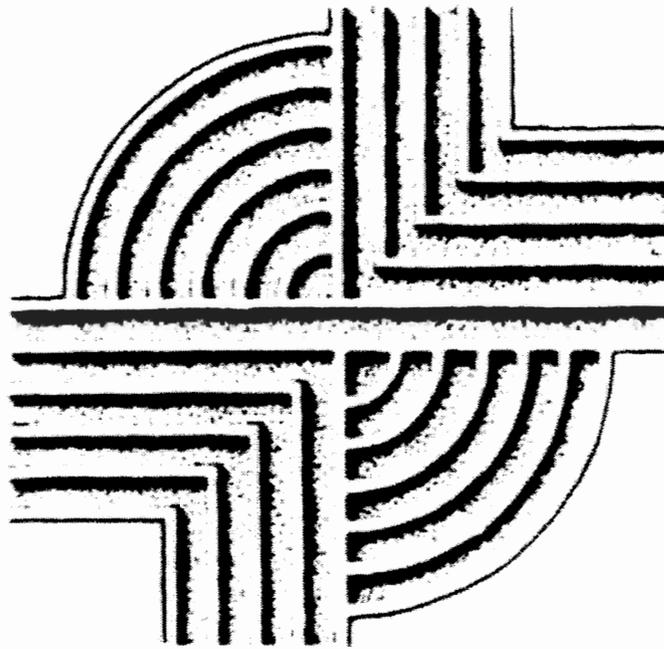


RECONNAISSANCE PRESERVATION  
ASSESSMENT OF ST. PAUL'S CHURCH  
CEMETERY, AUGUSTA, GEORGIA



CHICORA RESEARCH CONTRIBUTION 319

**RECONNAISSANCE PRESERVATION ASSESSMENT  
OF ST. PAUL'S CHURCH CEMETERY,  
AUGUSTA, GEORGIA**

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## ABSTRACT

The cemetery at St. John's Church in downtown Augusta has been affected by a series of church rebuilding episodes, so it is likely that a number of graves have been lost. In addition, it is likely that many of the remaining graves are unmarked. Those which remain are of very special importance and contribute to the site's National Register status.

Previous preservation efforts have been sporadic and, as far as can be determined, not well coordinated. A previous preservation assessment by Lynette Strangstad appears not to have generated any additional preservation concern and a number of the stones have significantly deteriorated since her visit. Both the Church and Oglethorpe Foundation should do more to ensure the preservation and protection of this cemetery. This preservation assessment is a first step toward a more comprehensive understanding of the preservation concerns and needs at St. John's.

This study identifies a range of broad issues concerns, focused on general preservation/conservation procedures, improved maintenance, care of the churchyard wall, the need to evaluate replacement stones, and a range of specific treatment issues.

It is important that the Church and Oglethorpe Foundation 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 brickwork, 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 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 repointing of the churchyard wall) 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. The Church should also develop a tree care plan and take steps to ensure that the mature trees present are well cared for and, when necessary, replaced by appropriate trees. remove several trees that are threatening monuments. Loose stones should not be allowed to be scattered across the cemetery, but should be collected for safe keeping.

This study also found that the cemetery was subjected to unnecessary and inappropriate intrusion with secular signage. We recommend that only appropriate historical and regulatory signage be allowed in the cemetery. It is critical that visitors be constantly reminded that this is not a park, but sacred ground. We recommend that visiting groups be required to check in with the Church and be escorted by a Church volunteer, to ensure that the proper use of the cemetery is respected. Absolutely no rubbings should be allowed of any stone in the cemetery. The cemetery should also be closed between dusk and dawn whenever there are not evening services. This closure should be reinforced by the closing of the Churchyard gates.

We also found that Church maintenance activities, such as painting, were adversely affecting the cemetery stones. A much greater effort should be made to ensure that future activities, whether painting,

drainage, or the construction of new buildings, not adversely affect the cemetery.

In terms of **stone replacement**, we find that the Church and Oglethorpe Foundation should establish a clear policy in writing. The placement of new stones to help visitors understand worn and eroded inscriptions is appropriate and entirely within good preservation practice — so long as the replacement respects the visual artistic, and historical integrity of the churchyard. The use of granite stone should be prevented or strictly limited to flush mounted (i.e., lawn type) types. All new markers should respect the scale and mass of the old monuments. The inscriptions should be carefully checked to insure that they are complete and accurate.

The **churchyard walls** are also in need of considerable maintenance. This work involves the complete rebuilding of multiple sections. This work should involve a conservator and skilled mason. The walls should be taken down with all brick salvaged. The reconstructed walls should respect the original bonding pattern and joint appearance. An appropriate high lime mortar should also be used. Most importantly, the conservator should verify all of these operations and ensure that the work is conducted in an appropriate fashion and is completely documented. To prevent future damage, at least on the parking lot side, concrete or plastic stops must be installed at all parking spaces.

In terms of **stone and monument issues having the highest priority**, this assessment identified between 10 and 15 stones which require mechanical repair. This work ranges from minor repairs to very major operations to ensure the long-term preservation of the monument. Perhaps the single highest priority is work on the brick obelisk and base. This monument should be considered an emergency and work should be funded for this spring, without delay. This document provides a general outline of the work, which largely follows that previously recommended by Strangstad over a decade ago.

In terms of **stone and monument issues with a secondary priority**, we recommend an investigation of the probable hogback brick vault to determine if there is enough remaining to allow repair.

We also recommend that additional historic research be undertaken on the surrounding brick walls to help in their repair and future maintenance. We also recommend that the growth on the bricks walls be removed. If it is desired to have vines, then a trellis must be devised and installed to support them.

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# INTRODUCTION

## Nature of the Project

Those responsible for the care of St. Paul's cemetery are concerned with a number of distinct issues, including the condition of the walls surrounding the churchyard, the care and treatment of the monuments in the cemetery, defining appropriate signage for the cemetery, developing meaningful maintenance and landscape plans and guidelines, care of ironwork, how to select aesthetically and historically appropriate new monuments when the need arises, developing security guidelines for the churchyard, and better understanding conservation/preservation principals that could help in determining appropriate courses of action. This reconnaissance assessment is intended to help organize preservation efforts at St. Paul's 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 St. Paul's where it would be imprudent to treat a monument without first better controlling landscape maintenance practices. Many issues are also far more complex than they seem on the surface. For example, there are cases where the historic monument is in such a deteriorated condition that its long-term preservation may be impractical. In such circumstances what is the best course of action? What sort of replacement marker is appropriate to maintain the dignity and character of the churchyard? There are other cases where the care of landscape is having detrimental effects on the preservation of the monuments. Which is to take priority — monuments or landscape — or can the two live in harmony?

There are a number of difficult issues which the caregivers (such as both the Church and the Oglethorpe Foundation) 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 December 6, 2000, did not attempt to assess the condition of every stone or conduct a detailed survey of the churchyard's surrounding brick wall. Instead, a more rapid — and admittedly superficial — survey attempted to “lump-together” monuments and wall sections with similar problems and concerns.

The cemetery survey focused on those issues defined as critical during an initial meeting on December 6. These include:

- The condition of the brick walls on the northwest, southwest, and southeast sides of the churchyard and cemetery (including gate care and stucco);
- The condition of the monuments in the churchyard cemetery;
- The signage that might be appropriate for the cemetery and that which is clearly inappropriate;
- The condition of the grounds and recommendations for improving landscape maintenance;
- Recommendations for the selection of new or replacement monuments; and
- General preservation/conservation principals that are appropriate for the cemetery.

To accomplish this a two-stage survey was conducted. First, the cemetery was walked with members of St. John's and the Oglethorpe Foundation to better understand the nature of their concerns. Second, after this initial walk-through, I went over the cemetery in more detail, photographing areas of concern and making notes on issues that require immediate

## RECONNAISSANCE PRESERVATION ASSESSMENT OF THE ST. JOHN'S CEMETERY

attention. To assist in the completion of this study I also had access to a previous report on maintenance and conservation guidelines provided by Lynette Strangstad in 1989.

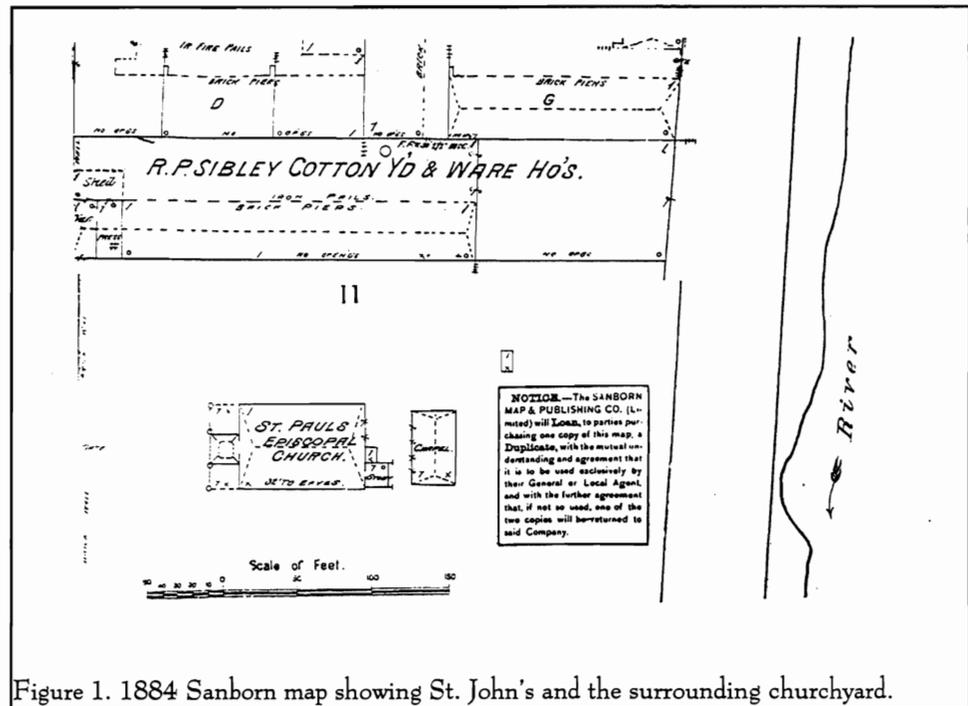
Readers should be forewarned that this study does not provide specific treatment plans for any of the monuments. The report does, however, provide guidance, in general terms, on which treatments should receive priority, and why. It also offers some general technical comments on treatments and outlines appropriate conservation/preservation strategies, materials, and techniques that should help the Church and the Oglethorpe Foundation judge the appropriateness of different treatment options and proposals in the future.

St. Paul's Church and the cemetery grounds<sup>1</sup> are currently listed on the National Register of Historic Places. This documents the uniqueness of this resource and the history that it represents. It

should be treated as the fragile resource that it is. This has not always been the case. Many actions have been undertaken without any clear understanding of their consequences. This section of the report will help explain why some activities and some "repairs" are inappropriate.

### St. John's Church Cemetery

The first church on this property was built in



<sup>1</sup> It is important that the Church and its caregivers understand this point. The nomination, characteristic of those prepared prior to the 1990s, is unfortunately vague. Nevertheless, throughout the text it makes reference to the graveyard, different monuments, and the historical significance of those buried there, leaving no doubt that the intention was to include the church building and all surrounding property in the nomination. This is a critical issue since the Church and Oglethorpe Foundation should ensure that different church activities and undertakings are consistent with the Secretary of Interior's Standards and Guidelines and don't compromise the integrity of the property (which could lead to delisting).

1750 and it appears, even then, to have been associated with a cemetery. Adjacent to Fort Augusta, the church was destroyed in 1777, during the American Revolution when Colonial forces attacked the British held fort. The second church is described as small and ordinary and was built ca. 1789 as a replacement. The third church building was begun in 1818 and completed in 1820.

I have been provided a Sanborn fire insurance map dated 1884 which shows this building, as well as a chapel building constructed ca. 1843 behind the church (Figure 1). It seems likely that this 1820 church closely followed earlier building patterns in order to avoid the cemetery which I believe grew up around the building. It

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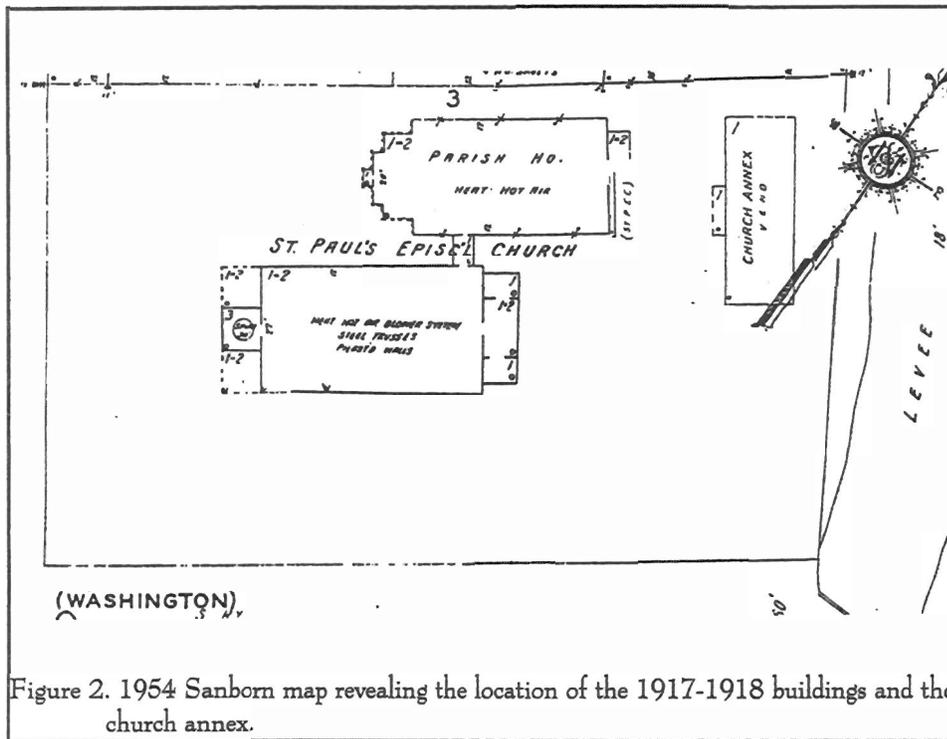


Figure 2. 1954 Sanborn map revealing the location of the 1917-1918 buildings and the church annex.

shown on a 1954 Sanborn map, along with a church annex placed in the rear northern corner of the church lot (Figure 2).

Today, this annex has been demolished and a new church building is under construction (Figure 3). While I am sympathetic to the needs of a growing congregation, I am also concerned that the construction is not only dramatically changing the visual integrity of this National Register property, but it is also likely being built on pre-existing graves. In-town church cemeteries

is, however, possible that the 1843 chapel was placed over graves. Regardless, the 1884 Sanborn reveals a brick wall on the southwest edge of the property (bordering Reynolds Street), while the northwest property edge was marked by a continuous brick wall (with no openings according to the Sanborn map) associated with the R.P. Sibley Cotton Warehouse.

tended to be very heavily used and our experience is that

In 1916 this third church as destroyed by fire. It is my understanding that the current linked parish house was built in 1917, with the current church built in 1918. These are

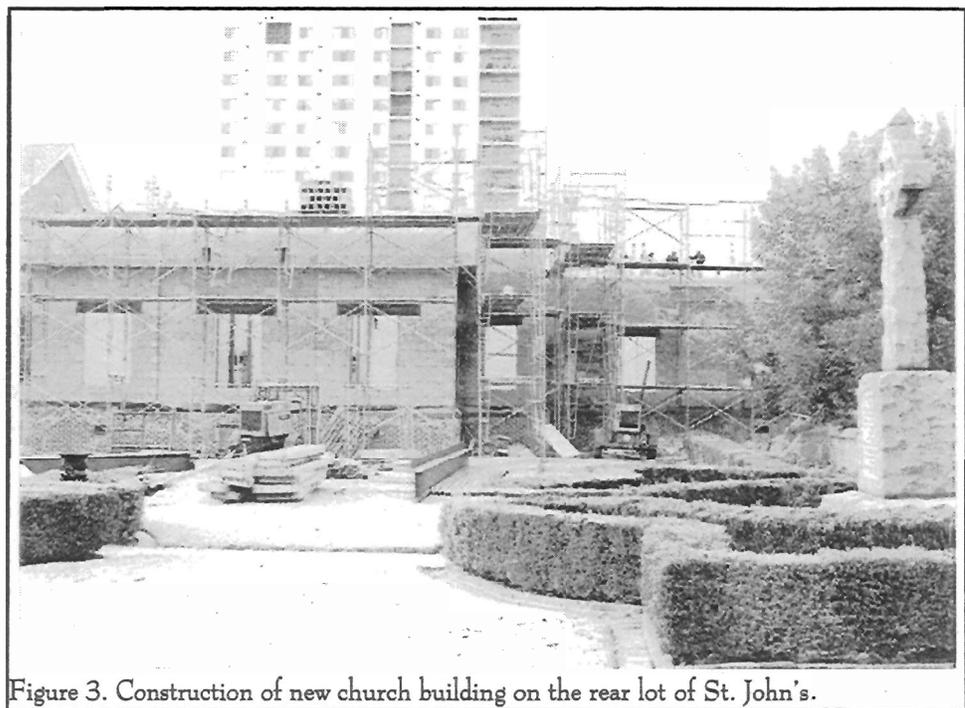


Figure 3. Construction of new church building on the rear lot of St. John's.



Figure 4. Area of new walkways and underground drain running through the cemetery. Arrows point to graves now covered or disturbed.

these churchyards contain far more graves than anyone would immediately suspect. For example, at the Colonial Cemetery in downtown Savannah, Georgia, we identified 8,678 probable graves, although only 560 monuments still exist.

But major construction such as this is not the only activity which has taken place in the churchyard which may have disturbed human remains. Over time the Church has made changes to both its pathways and drainage system (Figure 4). Both have the potential to

not only disturb underlying remains, but to also change the character of the churchyard.

I caution the Church and Oglethorpe Foundation that **any future ground disturbing activities — regardless of how innocuous they may seem at first — should be investigated by an archaeologist with experience in cemetery preservation.**

There is no historically adequate history of the churchyard. I strongly recommend that the church undertake or contract to have conducted a detailed evaluation of its land use activities over time. Although I am not intimately familiar with the available resources, such a study should minimally include all versions of the Sanborn maps, aerial photography (available from ca. 1939 on), historical photographs of the street and church, deeds and plats, and other documents. The goal should be to address questions such as exact construction footprints, origin and modifications of walls and other landscape features, and the condition of various markers in the churchyard. **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 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.

In addition, it is not adequate for a material or technique to be specified. The architect and/or engineer responsible for the work should make certain that the specified work is conducted in the specified manner. It should never be assumed that contractors are willing to

## INTRODUCTION

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use, capable of using, or knowledgeable concerning appropriate preservation techniques or materials. Someone who does have this familiarity must be assigned to constantly oversee the work and certify that it has been correctly performed. Unless this level of oversight is available, no work should be contracted.

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 and better.
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 brickwork.

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.

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 repointing brickwork we may slow deterioration and often prevent more drastic intervention, such as rebuilding wall sections. 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 caregivers at St. John’s and the Oglethorpe Foundation to likewise avoid efforts of “restoration” that are likely to cause more harm than good.

Finally, the Church and Oglethorpe Foundation must understand that all conservation repairs or treatments are routine maintenance — they must not be considered permanent. There is virtually nothing which can be “done” and then forgotten. Just as a home or building requires constant attention and repair, so too will objects that receive conservation attention.

### Acceptable Conservation/Preservation Procedures

I will briefly outline a few critical issues for different conservation or preservation approaches at St. John’s. In some cases volunteers may be able, with training, to carry out simple activities. In many cases, most particularly conservation of 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 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



Figure 5. Loose stone found cradled in pruned bush, suggesting it may have been dropped there by an individual scaling the wall.

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. I found bits and pieces of stones in different locations throughout the cemetery. In one case a stone fragment was located in the branches of a pruned shrub — suggesting that it might have been dropped there as someone was attempting to go over the churchyard wall with it (Figure 5).

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 St. John's a perfect storage solution would be basement of the church building, once it has been cleaned up.

*Resetting* is a common need at many old cemeteries, however I saw only a few cases at St. John's where resetting was a priority. 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 stones are loose in a supporting base, 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.**

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.

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Commercial stone cleaning methods are 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 St. John's Cemetery. Commercial cleaning agents should only be used under the direction of a stone conservator.**

*Coatings* are not recommended for any stone material at St. John's. 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.

*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.

In some cases concrete has been used to effect repairs of broken stones. This is inappropriate. Not only is the result aesthetically unappealing, but the concrete is far harder than the stone and can cause long-term deterioration. Because the concrete is very difficult to remove, I generally recommend that stones repaired with concrete be left as they are, as long as the old repair is stable and causing no immediate damage or problems. Such repairs, however, should be carefully monitored. It is likely that the time will come when these old repairs will fail and a more appropriate repair will become possible.

*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 and is often used to help slow spalling of bedded sandstone exposed to the elements. **There is a need for a great deal of composite stone repair at St. John's.**

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, contains no synthetic polymers, exhibits good adhesion, and can be color matched if necessary.

Such work, however, is likely to only slow down the natural deterioration of sandstones and some stones are already so damaged that no intervention will likely provide satisfactory results.

### Brick Conservation

There has been much rebuilding of box tombs using modern bricks and mortar. Based on the condition of the original brickwork, this may at times be necessary. Nevertheless, this treatment is not to be

paint. Typically a stiff wire brush is adequate for this.<sup>5</sup> 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 is 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 avoided.

Repair may include reattachment of elements. Ideally repairs should be made in a manner consistent with original construction. While welding is often expedient (and may be better than inappropriate mending), this approach causes a radical change to the ironwork. 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.<sup>6</sup> 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 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 Church.

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 poor 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 Church establish, as their third priority, a preventative maintenance program that will help to ensure that appropriate maintenance is

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<sup>5</sup> 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.

<sup>6</sup> 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.

## 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. Fortunately, little additional time is needed to appropriately mow a cemetery setting such as St. John's where there is far more open space than at many cemeteries. While the layout may seem to allow the use of riding mowers, I discourage this practice. It is much easier on a riding mower to make an error in judgement and cause damage. I recommend that only hand operated mowers be allowed on the church property.

**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**. I realize that this level of hand work is costly; it is, however, the only safe and appropriate means of dealing with lawn care if grass is to be used.

Strangstad has suggested that a safe groundcover be used around stones to eliminate the need for mowing. This remains an option. Under this scenario, an area about 12-18 inches around a fragile or friable stone has the grass



Figure 6. Reverse of a marble tabletstone showing mower and nylon trimmer damage. The striations on the upper two-thirds are likely from riding mower damage. The numerous parallel striations at the base are from nylon string trimmers.

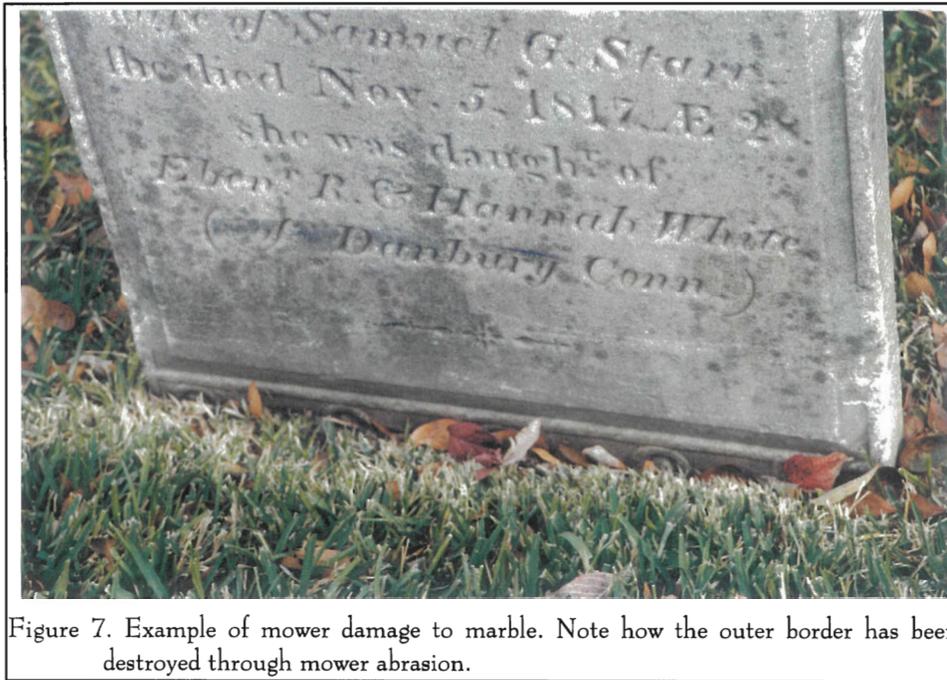


Figure 7. Example of mower damage to marble. Note how the outer border has been destroyed through mower abrasion.

with clear evidence of recent mower damage (Figures 6 and 7). This suggests that mowing is aggressive.

### Shrubbery and Vines

At the time of this assessment the various plantings in the cemetery are limited and are generally well maintained.

My one, greatest concern, however, involves the growth of vines on the historic brickwork. Vines

manually removed. Planted instead is a ground cover which will not require trimming and which will not grow on the stone itself. Suggested groundcovers include creeping phlox and creeping sedum. Although centipede grass has been suggested, it too must be cut and is not a very good choice.

There is, of course, a third option. The Church may wish to consider the replacement of its existing lawn with a specially formulated 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 St. Augustine and Zoysia varieties that might be suitable.<sup>1</sup> 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.

At the time of this assessment the grass had been recently mowed, but I did not observe the mowing actually in process. I did, however, observe several stones

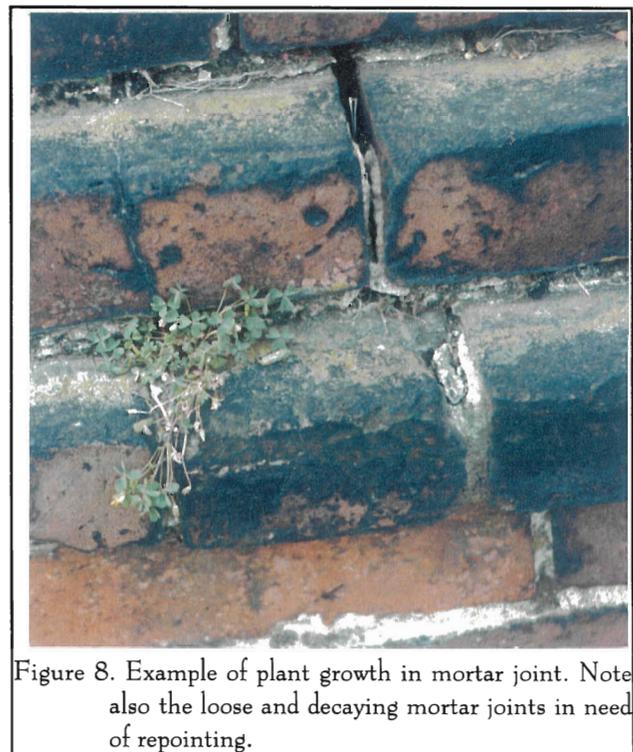


Figure 8. Example of plant growth in mortar joint. Note also the loose and decaying mortar joints in need of repointing.

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

cause a wide variety of problems. Their root systems focus on mortar joints (Figure 8) although soft brick



Figure 9. Vines attached to the brick wall along Reynolds Street should be removed to protect the stability of the brickwork.

itself can be penetrated. The dense growth holds moisture, further promoting the deterioration of the joints. Through time the joints are eroded out and the stability the brickwork suffers. In the case of the Ashton monument this process has proceeded so far that the Church is facing a clear crisis.

In particular, I am concerned with both the cemetery wall along Reynolds Street (Figure 9) and also the Ashton brick monument (Figure 10).

As will be discussed in a following section, the Ashton monument requires immediate intervention which includes removal of all vines and complete conservation treatment, if only to stabilize what is a very dangerous monument.

The brick wall should also have the plants removed for its long-term preservation. If the effect of the vines is desired, then it will be necessary to use a system of support that allows airflow between the vines and the brickwork. For this to work, it is necessary to select a type of vine and a support system that work well together. The structure must be strong enough to support the weight of the vines, yet must not damage the brickwork. Clinging vines, such as ivy and Virginia

creeper can be given a trellis to cling to instead of the brick wall.

### Tree Care and Developing an Appropriate Plan

St. John's has relatively few trees, although most of those present are mature. This condition was observed by Strangstad in 1989. At that time she noted that many of the oaks had been determined to be dying. I did not notice evidence of this, although my expertise is not in silviculture. I recommend that all of

the trees on the property be evaluated by an individual trained in this field.

A long-term tree maintenance plan should be developed. Diseased trees should be professionally removed since they endanger stones. It is generally a bad idea to simply allow trees to "die." They should be removed before they become hazards to stones or more difficult to safely remove.

Trees that have been removed should be replaced with trees that are both historically appropriate to the cemetery and which have good characteristics. So called "good" trees are those that lack suckers, have little or no sap drippings, have a deep (not shallow) root system, and that produce limited, small leaves and allow light to filter through to the grass.

New trees should 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 simply for landscaping or aesthetics since this dramatically alters the character of the cemetery. It is very important to understand that this is a cemetery, not a park. While cemeteries may

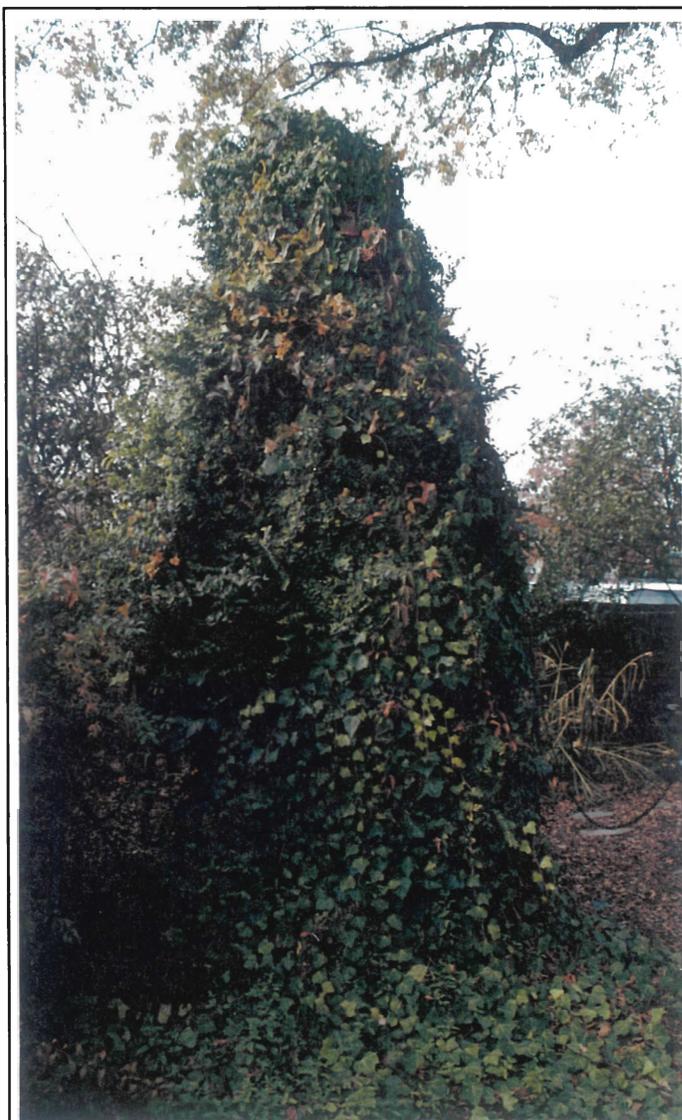


Figure 10. View of the vine covered Ashton brick monument. The deterioration of this monument is severe and requires immediate attention.

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.<sup>2</sup>

A common question concerns what to do if a tree is in conflict with a monument or fence. Should the tree be removed or should the stone or fence be relocated? There is no one single answer.

The determination 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.

### Use of the Cemetery

As previously mentioned, there are several

often serve park-like functions, this should be allowed only so far as the park setting does not compromise the historical integrity or the condition of the monuments.

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

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<sup>2</sup> 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.



Figure 11. Stone "bench" that is poorly arranged and essentially non-functional. With a little additional effort these can be made into useful additions to the cemetery landscape.

areas in the cemetery where it appears a very concerted effort has been made to create a "parklike" setting. The cemetery is also reported to be used by non-church groups for education or other activities. I am supportive of cemetery use, since this tends to help address both maintenance and security issues. Moreover, educational programs, if appropriately designed and implemented can help teach children the value of cemeteries and their appropriate care. Nevertheless, I caution the Church and Oglethorpe Foundation that cemetery uses are not always harmonious.

In particular, I

by this practice.

The Church should establish these procedures

would discourage any use of the property which was not in keeping with its sacred character. Those visiting should be constantly reminded that the grassed lawn is not that of a park, but rather that covering hundreds of graves. Individuals should, whenever possible, keep to established paths and walkways. Care should be taken to never disturb or damage monuments. The Church should establish a strict policy that prevents any rubbings whatsoever. There are far too many stones in the cemetery which will be endangered



Figure 12. Cluster of signs at the corner of Reynolds and Sixth streets. The historic sign is verbose and difficult to read.

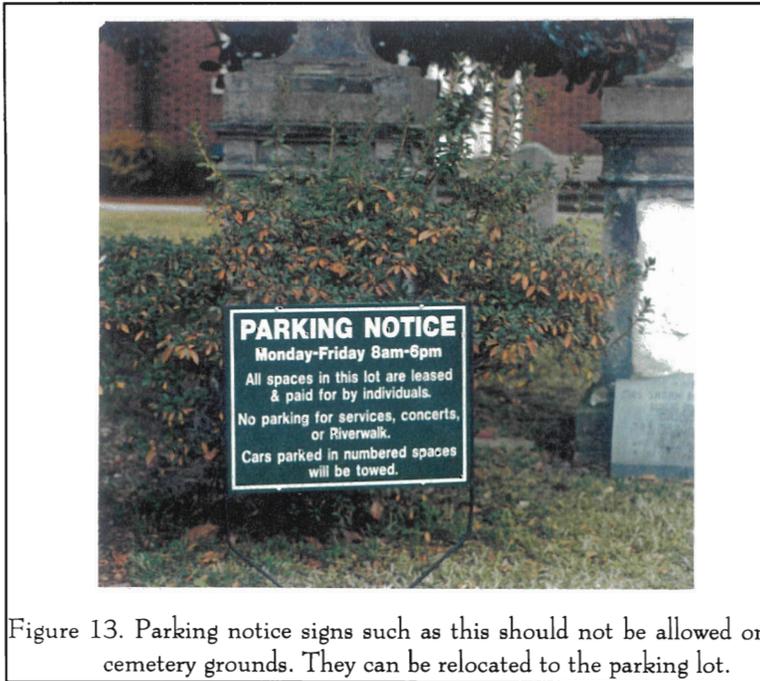


Figure 13. Parking notice signs such as this should not be allowed on cemetery grounds. They can be relocated to the parking lot.

through both formal letters to groups and organizations which use the cemetery on a routine basis, as well as through appropriate on-site signage (discussed in more detail below). Moreover, each group visiting the cemetery should be required to make an appointment for the visit so that they may be accompanied by a Church volunteer. This volunteer should have the authority — and willpower — to terminate any visit or activity which is inconsistent with acceptable use practices.

The issue of benches also came up. It seems to me that there are, at present, more than enough benches. I would refrain from adding any additional site furniture.

I also encourage the Church to make better use of the stone blocks which were salvaged from the burned 1820 church. With better planning these can be made into very functional benches that provide a resting place but which do not encourage loitering. At the present they are underutilized and barely functional (Figure 11).

Signage

At the present time the cemetery lacks any meaningful signage. I classify signage into two broad groups: historical and regulatory.

The one historic marker (Figure 12) is both so wordy and, in all honesty, so boring, that I can't imagine that it gets more than an occasional glance. In addition, it is placed in a location where it is "lost" among a variety of other signs.

I strongly encourage the Church and Oglethorpe Foundation to develop a series of educational or historical signage that begins to tell a unified, and interesting, story. For example, I suggest that it explain the different churches present on the property through time, with a constant focus on the cemetery. I hope that additional historical research will reveal photographs and other graphics that can help make the signage interesting, as well as informative.



Figure 14. Special event signs should also be relocated from the cemetery to inside the Church.



Figure 15. This stone is not only leaning dangerously, but is also located too close to the impulse sprinkler head (see Figure 16).

There are a variety of sign types, each with benefits and limitations. The one that I would consider is fiberglass embedment. This type of sign allows use of detailed graphics, including photographs, although colors are subject to fading and the signage requires backing and framing.<sup>3</sup> Another that I have used in the past is metal-micro imaging. Unfortunately, I have been unable to locate anyone dealing in sign type during the past couple of years, so I don't have any recommendations for sourcing.

I also recommend that the cemetery develop signage outlining appropriate behavior in the cemetery. Key elements would include that all groups need to check in, that the cemetery is closed from dusk to dawn, that rubbings are absolutely forbidden, and that many monuments are fragile and should not be touched, climbed on, or disturbed. This "regulatory" signage should be immediately visible at all entrances to the cemetery.

<sup>3</sup> One company providing this type of sign is GS Images, 255 S. Potomac Street, Hagerstown, MD 21740, 800/223-6920, [www.gsimages.com](http://www.gsimages.com).

I also observed that there were several inappropriate signs in the cemetery. These included a "parking notice" (Figure 13) and an event notice (Figure 14). All caregivers should realize that it is very likely that the cemetery contains a large number of unmarked graves. Consequently, every sign should be assumed to be placed on someone's grave. Moreover, signage has a way of making the cemetery less sacred, making it easier for people to lose sight of the property's purpose.

Signage, therefore, should be strictly limited.

The "parking notice" can be placed outside the cemetery on the brick wall adjacent to the entrance from the parking lot, as well as at the entrance to the lot itself. It should not be placed in the cemetery. Likewise the special event sign can be placed inside the Church on a bulletin board, but not on the cemetery grounds.

### Sprinkler System and Other Utilities

Sprinkler systems pose a variety of concerns in cemeteries. First and most fundamentally, they have to be placed through graves and I do not believe that this demonstrates the level of care and dignity appropriate for these sacred spaces. In addition, sprinklers require constant maintenance and, if allowed to leak, can cause serious waterlogging problems. Sprinklers also encourage the use of grass — which is unable to withstand even mild droughts. This increases water use, as well as mowing maintenance. In addition, industrial landscape sprinklers often use far too much water pressure and direct the water onto stones that are not able to withstand this routine damage. Figures 15 and 16 illustrate this problem well.

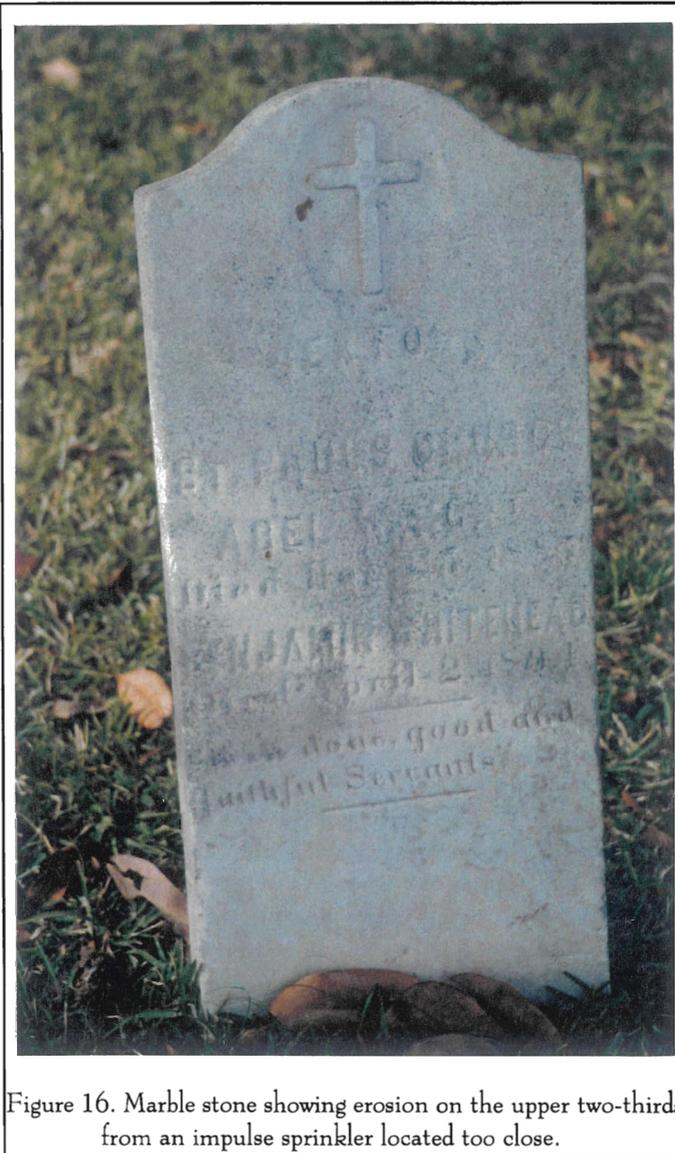


Figure 16. Marble stone showing erosion on the upper two-thirds from an impulse sprinkler located too close.

Figure 15 reveals that not only is this stone badly leaning (and requires resetting), but that it is within feet of an impulse sprinkler head. Figure 16 is a view showing the exceptional erosion of the upper two-thirds of the stone where it has been subjected to water spray. This damage cannot be reversed — it is permanent.

Obviously, the immediate fix for this situation is to relocate this sprinkler head (gravestones themselves should *never* be relocated). But just as importantly, the location of every sprinkler head should be marked and

their effect on monuments throughout the cemetery should be evaluated. In the long-term I recommend working to reduce, or preferably eliminate, the need for irrigation.

Other utilities, such as underground electrical lines and drainage lines may also have detrimental effects on a cemetery by disturbing individual graves. As I have recommended earlier, any ground disturbance in the cemetery should be coupled with an archaeological study to ensure that human remains are not impacted.

### Building Maintenance Activities

Figure 17 reveals one problem which can occur during maintenance of buildings in a cemetery. Splatters from overhead painting have disfigured the stone. Since marble is a porous stone and since this paint has been embedded for a number of years, removal would be an involved process. It would have been far easier to prevent the damage.

All maintenance activities on and around the church must be conducted in a manner that ensures no stones or monuments are damaged. This may involve covering with fresh dropcloths, building wood cribs around and over monuments to prevent damage from falling materials, or other actions. In addition, all maintenance firms should have sufficient insurance to cover professional conservation repair of any damaged stone.

### Security

I understand that St. John's desires to have an "open" churchyard and that the cemetery has suffered episodes of vandalism. It is impossible to eliminate vandalism without far more stringent security measures that I feel certain would be found unsatisfactory.

The use of security lighting in cemeteries can be controversial. It may stem vandalism, although it may also raise complaints of light pollution at night. Where such lights are used they should be mounted on independent poles, not on the church building. At St.



Figure 17. Splatters from overhead painting on a marble stone near the Church building.

John's I believe that additional lighting would be appropriate. If the vandalism tends to occur during certain periods (spring break for instance) or seems to be concentrated on particular days (such as Fridays and Saturdays), then it may be possible to limit the light use to those high threat periods.

I believe that the gates to the cemetery should be closed and locked between dusk and dawn when there are no evening church services. I realize that the wall itself can be easily scaled, but the closed gates provide a visual indicator that the churchyard is not open. I also don't believe that the gates being closed will noticeably reduce police presence. I wasn't told, for example, that the Augusta police have foot patrols which walk through the cemetery. If

the police have reason to believe that they need access to the cemetery, they too can scale the wall. Alternatively, you can install a special key box that would provide the police (and fire department) with keys for the gate.

The Church itself needs to make periodic tours of the cemetery to help detect any damage or vandalism. When identified it should be immediately reported to the police. Not only will this help determine when

vandalism is taking place, but the increase in crime reporting may encourage the police to increase patrols. Vandalism should also be reported to the local media and an effort should be made to determine those responsible. The bottom line is that crimes unreported are crimes which never occurred and which will be

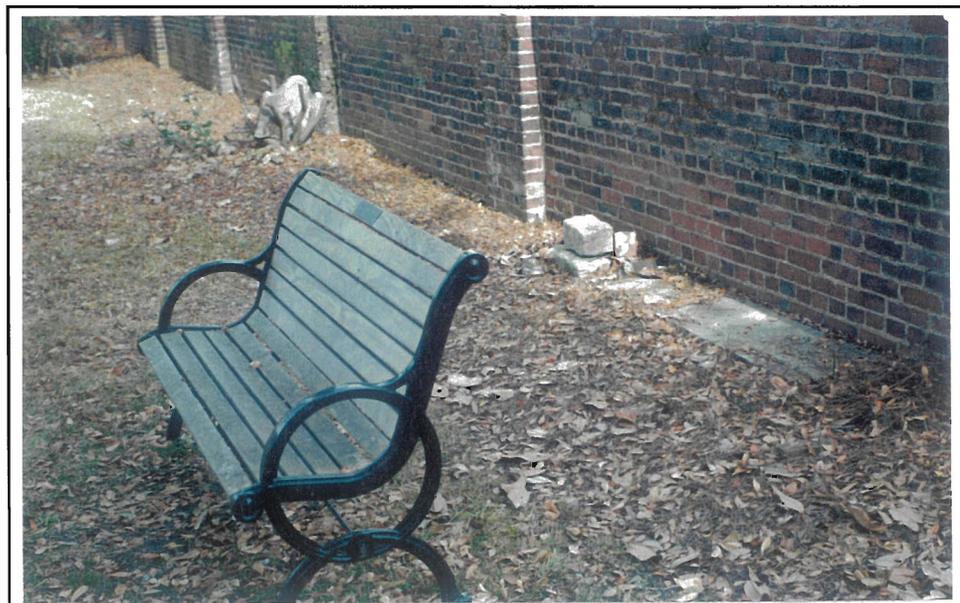


Figure 18. Broken markers stacked up against brick wall.



Figure 19. Tabletstone leaning up against support for a different marker.

the Church wall.

The problem with this approach is that it provides an opportunity for marker fragments to be stolen or removed as “souvenirs.” It also places the fragments in further danger of damage through routine lawn maintenance.

It is critical that all of these parts be collected and stored in one location for safe keeping. Even more importantly, all of these stones should be repaired — they should not be left as “orphans.” The issue of repair will be discussed in a following section of this report.

repeated.

In addition, the Church should make a special effort to repair any vandalism related damage in a timely fashion. Like graffiti, damage which goes unrepaired encourages more damage. When there is clear evidence that damage will be identified and immediately repaired, the incidents seem to decrease.

### Loose Stones

As I toured the cemetery I noticed a number of places where displaced stones had simply been placed to one side or stacked against the church walls. Figure 5 shows a stone discarded in the branches of shrubbery next to the Sixth Street wall. Figure 18 not only shows this same stone in the background, but several others stacked against the wall. Figure 19 shows a broken tabletstone leaning against another stone's support. Figure 20 shows several stone fragments leaning against



Figure 20. Broken markers leaning up against Church wall.

## REPLACEMENT STONES

There are times when replacement stones are entirely appropriate in a historic cemetery. The most common situation is when a historic stone is no longer easily legible. The historically sensitive solution is to leave the original stone in place and, somewhere discretely beside it, erect a small, plain marker providing the original inscription. The goal in such circumstances is to ensure that the original stone is not “upstaged,” that the public’s attention is not directed away from the original monument. The new marker should be seen only as the media necessary to provide a message which is no longer easily decipherable.

Unfortunately, the character of St. John’s Cemetery has been compromised by entirely inappropriate monuments.

The most obvious is the granite monument to Colonel William Few. Not only is the material itself (granite) inappropriate for the age and character of the cemetery, but the marker’s style, and particularly size, is entirely out of scale. Had it been smaller in scale, it’s possible that the incorrect material and design could have been overlooked. But this monument detracts from the overall age, beauty, and significance of the cemetery.

The situation is made all the more troubling by my understanding that it essentially “appeared” one day without any effort to evaluate its appropriateness. This is

further compounded by the Church allowing it to remain, to the point that removing it today is likely impossible.

A somewhat similar situation is found at the two Phinizy monuments. Because of loss at those monuments, the inscriptions were replicated and placed at the base of the original monuments. Again, the use of granite is inappropriate. This material has no place in a cemetery the age of St. John’s. In addition, the plaque marker style overwhelms the grace and art of the original monuments. As a result, it appears that the monuments have had “bumpers” installed on them. Far more appropriate would have been deeply cut marble installed as small ledgers, flush on the ground. This would have allowed the original wording to again be read, but would not have distracted the viewer from the beauty of the original monument. What were once stunning pieces that caught your attention as you entered the cemetery from the parking area have been

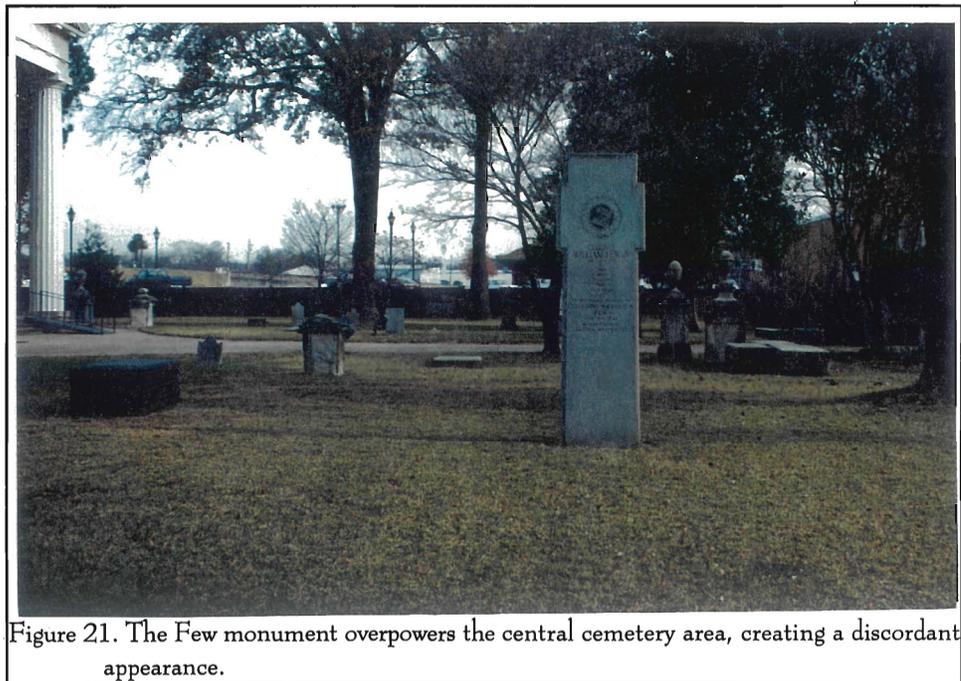


Figure 21. The Few monument overpowers the central cemetery area, creating a discordant appearance.



Figure 22. The installation of granite plaque markers on both sides of the Phinizy monuments makes it appear that they have "bumpers." Flush markers would have been far more appropriate and in keeping with the cemetery.

but also to prevent them from covering or interfering with other grave sites.

The installation of these stones should be overseen by a representative of the Church, whose responsibility it should be that no damage is done to any historic stone in the process. Often the equipment needed for the placement of modern stones has a potential to interfere with or damage historic markers. Every effort should be made to prevent this damage.

significantly reduced in aesthetic and historical appeal.

I strongly recommend that the Church and the Oglethorpe Foundation develop very stringent guidelines on the size, shape, and material suitable for additional markers placed in the cemetery. While the exact details have some flexibility, the key points should include a recognition that only sandstone or marble should be used. These are materials which were used originally and which blend in with those that remain. New markers need not "appear" old, that is, they don't need to be cut in old styles, but they should be in keeping with the mass and size of the old markers. New monuments should not overwhelm the historic character of the cemetery. Replacement markers, intended to provide continuity in inscriptions and the memory of the individual, should be flush to the ground. They should also be independently checked and verified that the wording is identical in spelling and arrangement to the original marker.

Replacement stones should be kept as small as possible, not only to fit into the scale of the cemetery,

## THE CHURCHYARD WALLS

St. John's Church is surrounded by walls on three sides. On its northwest side the wall consists of remnant wall sections originally associated with structures built on the property line. This wall is about 5 feet in height and portions are laid up in American Common Bond with headers every sixth course. On the Reynolds Street frontage the wall consists of a ca. 5 foot high wall also in American Common Bond with headers every sixth course. There is a central, gated entrance. The columns and wings of this entrance have a stucco applied which is scored to resemble ashlar block. Much of this today is covered with ivy (this problem has been previously discussed). This is a 9-inch wall, periodically buttressed by 13-inch brick columns. On the top of this wall there are four decorative courses. These are of a different brick, harder and with much evidence of blackening. I believe that these bricks were salvaged from the church burnt in 1916 and were added to the wall which was present at least by 1884 (when it is shown on the Sanborn map).

The Reynolds Street wall continues along



Figure 23. Interior damage to wall bordering the parking lot.

Sixth Street, evidencing identical construction. Because of fill episodes along Sixth Street, the wall as it extends northeast, becomes no more than about 1 to 1.5 feet above exterior grade, while it is about 4 feet in height on the interior of the churchyard. In other words, over time this privacy wall has been converted into a retaining wall. There is a section of noticeably different height (but similar construction) near the modern entrance gates off Sixth Street. This section may represent something approaching the original height of the wall, although I am uncertain why it has differentially survived.

Clearly additional research, incorporating a detailed examination of the wall, its bricks, bonding pattern, and mortar, as well as an examination of historic maps and photographs, is necessary. Since we don't know as much about this wall as we should, any repairs must be conservative, focusing on maintaining the current appearance and avoiding any significant changes.

The wall is showing problems in a number of areas. Along the parking lot many mortar joints are badly deteriorated. They are recessed by as much as an inch and are little more than sand. These walls require immediate attention with the repointing of most of the mortar joints.

There is also a badly damaged section of this wall. While from the interior of the churchyard it appears that the wall has simply collapsed, if the damage is examined from the parking lot it becomes



Figure 24. Damage on the parking lot side of the brick wall section shown in Figure 23. Note that the wall is bowed inward for a distance about 20 feet. All of this will need to be taken down and reset. There is no "simple fix" for this impact damage.

clear that the wall was hit by an automobile. This impact has caused a significant loss of integrity and this portion of the wall will need to be taken down and rebuilt.

I am not an attorney and I don't offer this as legal advice. I would, however, determine who owns this wall. It is possible that a claim against an insurance carrier can be made for cover at least a portion of the repair. Regardless, to avoid this problem in the future, it is critical that all parking spaces against this wall have concrete or plastic stops installed.

Along Sixth Street there is another area with extensive brick loss. Again, the damaged sections will

need to be taken apart and rebuilt.

For these repairs to look appropriate, it is essential that the correct techniques be combined with appropriate materials and good workmanship.

I was told that some work has been done on this wall in the past, using specifications that were described only as "using the correct mortar." There is, however, no documentation of the wall either before or after this work; there is no drawing or series of photographs showing the area of work; there are no surviving written

specifications for this work; nor is there any evidence that the specifications were enforced.

The Church and Oglethorpe Foundation must



Figure 25. Damaged wall section along Sixth Street. About 25 feet of the top four to five courses will need to be disassembled and reset.

take a much more proactive involvement in overseeing work. If this level of involvement is not possible, then an individual skilled in preservation/conservation should be retained as project manager to oversee the work.

I have previously offered some general principals, but will briefly apply those to this current situation.

All repair sections must be photographed in B/W and color — both before the work is done and after its completion — with these photographs becoming part of the Church's building record. A decision must be made of how much brick work will be taken apart and this should be clearly indicated to the contractor.

For repointing, it is critical that the old joints be cleaned out to a minimum depth of 1-inch. Given the deterioration I observed, it is likely that many of the joints will need to be cleaned out to 1.5 to 2 inches. Sound mortar should not be cut out, unless it represents recent repointing using hard portland cement mortar, in which case it, too, should be removed.

It is possible to mix an appropriate high lime mortar on-site and the process is well outlined in the APT guide on repointing (Appendix 1). As an alternative, I recommend consideration be given to using a ready mixed mortar, specially formulated for such work. One such material is Restomix 1-2-6 distributed by Cathedral Stone.<sup>1</sup> The value of using a ready mix material over field mixing is uniformity, certainty that the materials have been properly stored, and a greater certainty that the formula is appropriate for the job. In the long-run the Church may find this, while a little more costly, far more acceptable in terms of oversight and quality control.

The repointing should also be performed in a

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<sup>1</sup> Cathedral Stone, 800/684-0902. Restomix is a high lime mortar especially designed for repointing historic structures. It comes in a light gray or off-white color, or can be color matched. The cost ranges from about \$30 to \$42/48 pound bag, not including shipping.

professional, workmanship-like manner. There are companies that provide workshops in repointing. One is the US Heritage Group<sup>2</sup>, which offers 2-day workshops on appropriate techniques. It may be that the Oglethorpe Foundation or perhaps Historic Augusta will want to send a representative to the workshop.

For those sections where the walls are damaged, an effort should be made to salvage all of the suitable bricks. In so far as possible, the old bricks should be reused. It is, however, important to keep the bricks from the decorative top separate from those forming the wall. Not only is the firing distinct, but so, too, are the colors. They should not be mingled together.

Where bricks are damaged, you should try to match replacements by color and, especially, size and strength. Historic Augusta may have a stockpile of old bricks, or may be able to provide assistance in obtaining replacements.

It is possible to use the previously discussed Restomix 1-2-6 mortar for rebuilding the wall sections. Whether this premix is used or the materials are site-mixed, you should be certain that a high lime mortar is used in the work. You should avoid modern portland cement mortars.

I have previously suggested that the ivy on the brick walls be removed. If the greenery is an aesthetic effect which the Church desires to promote, then it will be necessary to install a lattice work on which the ivy can be allowed to grow. This lattice should be off-set from the brick by at least an inch to allow air circulation. The lattice can be of wood construction, although you may find that it would be less costly (and easier to maintain) to fabricate aluminum panels with aluminum wire for the plants.

I recommend reapplying a stucco where it is clear that stucco once existed. Prior to this work, the brick needs to be in sound condition and the joints

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<sup>2</sup> U.S. Heritage Group, 3516 N Kostner Avenue, Chicago, IL 60641, 773/286-2100.



Figure 26. Example of deteriorated stucco at entrance. Here the vines need to be removed, the stucco documented, and then replaced with a product such as Jahn M60.

Application requires that all loose or deteriorating stucco be removed and squared up. The Jahn M60 needs to be applied as two coats with the skim coat scratched using a plasterer's comb after the initial set. The second coat should be applied in 48 to 72 hours.

It is critical that this process include the rescoring of the lines used to simulate ashlar block construction. All evidence of these original lines should be documented (using both photography and scale drawings) before any work is conducted. As with the brickwork, there should be a photographic record of the stucco work.

repointed. Afterwards, I recommend using a one-coat product such as the Jahn Exterior Stucco M60.<sup>3</sup> This is a natural cementitious product with no acrylics or synthetic polymers. The Jahn stucco can be color matched and the cost is not that much greater.

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<sup>3</sup>This is also available from Cathedral Stone, 800/684-0902.

## TREATMENTS

When the Churchyard was examined by Strangstad in 1989 only four monuments were apparently involved in the assessment: the Cormick and McKinne pedestal tombs, the brick Ashton obelisk and one or more eroded marble markers. It does not appear

that any action was taken regarding treatments of any of these monuments. Some are today in far worse condition. In addition, there are today a number of monuments which are in very bad condition which were either not included in that earlier assessment or which have deteriorated very dramatically in only the past decade.

Regardless, the cemetery contains a number of monuments which require immediate attention (for some it is likely too late). It would be poor stewardship to ignore these needs and I urge the Church and Oglethorpe Foundation to budget for treatments in the very near future (i.e., within the next 6 months to 2 years). Further delay will result in additional loss and far greater costs.

### Resetting

There are a few stones in St. John's which would benefit from resetting. One has been previously illustrated in Figure 15. Several others are shown in Figure 27. While these are not among my highest priority for treatment, the work could be done by the Church or volunteers with relatively little training or, if done professionally, would not be terribly costly (typically under \$200 per stone of these sizes, depending on condition and associated needs). Resetting might prevent additional damage, so it would be wise to schedule the work.

Figure 28 reveals a different type of resetting. This stone is currently leaning against a brick pillar. Unattached, this unusual stone is in danger of theft. In this case, resetting the stone may require some physical attachment to the brick column, or there may be a below grade base from which it has been broken. Regardless, this stone require immediate attention before it is lost. It is not possible to estimate a cost since its original attachment, hidden by landscaping, was not examined.



Figure 27. Leaning and sunken stones which should be reset.



Figure 28. Unusual marker which needs to be reset to prevent theft.

### Mechanical Repairs

There are several stones which are broken into one or more pieces. In these cases mechanical repair is appropriate to reduce the potential for loss or theft of individual fragments and to reduce the potential for additional damage. This is a particularly significant issue for tabletstones which are now lying flat on the ground. This places them at greater risk of damage through landscaping activities (especially mowing) and pedestrian traffic.

Broken stones will need to be aligned, have matching holes drilled in the different pieces, threaded nylon rods inserted and adhered using an epoxy

and reassembled. In some cases the Jahn Stone Adhesive may be used. In other cases there may need to be some infill to replace missing stone fragments, probably using the Jahn M120 (Marble Patching Mortar). The size of the rod used, the exact epoxy chosen, and the number of dowels used are all dependent on the stones. Consequently, each stone will need to have a specific treatment proposal and this is intended only as a general description of the work.

Figure 29 illustrates significant breaks on a marble ledger which is laid flush with the ground. There are at least three different pieces and, to make the repair somewhat more complex, there is evidence of a previous, failed repair using concrete. This old repair will need to be completely removed before any new repair can be contemplated. However, repair is critical before additional damage is done.

Figure 30 is an example of a very low box tomb with a badly broken ledger. This stone also requires mechanical repair. It will also likely require leveling on its brick base. In addition, the stone is very weathered and it is likely that additional infill will be



Figure 29. Example of broken ledger (Alexander McLaws) with failed previous repair. This stone requires mechanical repair before it suffers additional damage.



Figure 30. Broken ledger set on a low box tomb. This stone also requires extensive mechanical repair before fragments are lost or suffer additional damage.

required. This is another example of a critical repair before fragments are lost or stolen.

Figure 31 is an example of a tabletstone with multiple breaks that is now lying flat on the ground. This stone should be repaired and replaced in an upright position. By laying flat the stone is subject to additional damage from mowers and pedestrian foot traffic. In addition, the stone will erode far more quickly since acidic rain water will pond or puddle on the stone and in the carvings and etch away the carbonate stone.

Tabletstones with multiple breaks almost always require additional support beyond the nylon rods. With a flush ground break, the stone will be top heavy, placing a great deal of stress on the repaired break; there is a tenancy for this repair to fail and, in falling a

second time, the other repairs will also be caused to fail. While the additional structural support may be viewed as detracting from the aesthetics of the stone, it is critical to minimize the need for frequent additional repairs.

In the case of this stone there may also be a footstone (seen in the foreground of the photo). It appears that the footstone has sunk and has been badly damaged by lawn mowing activities. While repair may also be needed, at the very least this footstone should be reset, bringing it up, out of the



Figure 31. Broken tabletstone (Elizabeth & Charlotte Issacs) which needs to be repaired and reset with additional support. The footstone also needs to be reset.



Figure 32. Example of an inappropriate, poorly executed repair. It is, however, stable and should be left alone until such time as it fails.

grass.

There are some examples of previous repairs (generally bad) which are still stable. Figure 32, for example, reveals an exceptionally poorly executed repair of a ledger using portland cement. No effort was made to fit the individual pieces, so the result is disfiguring and detracts from the appearance of the stone. The use of cement was inappropriate. It is far harder than the stone itself and attention is called to the repair. Nevertheless, the repair is stable. This means that it is likely far more damage would be done to the stone attempting to “undo” this repair than would be acceptable. In such cases my recommendation is to leave the repair alone for as long as it remains stable. If and when the repair fails, the cement must be removed and a more appropriate repair made. But until the repair fails, I recommend no action.

Figure 32 provides an opportunity to clearly

illustrate to the churchyard caregivers and Oglethorpe Foundation what a “bad” repair often looks like. Figure 33 is also a “bad” repair since it, too, relies on the use of inappropriate portland cement to affect the mend. Nevertheless, in this case the repair has been made in a far more workmanship manner and use of an inappropriate material is forgivable. Like the example in Figure 32, the repair is stable and I recommend that the stone be left alone. If the repair eventually fails, it can then be removed and replaced with more appropriate materials.

#### Brick Monument Repairs

Strangstad has previously provided very urgent and clear instructions regarding the need for conservation treatment of the Ashton brick obelisk and base. It is tragic that this advice was not followed a

decade ago since the situation has not only gotten much worse, but the monument is now covered with ivy. Removal of the ivy may very well result in the complete failure of the obelisk.

**I can't say in a forceful enough way that this monument (shown in Figure 10) requires immediate intervention.**

Strangstad's recommendations are exactly those I would give and I'll briefly outline the process again, adding additional features of treatment which are necessary today because of the decade of delay.

- A scaffold needs to be erected around the monument to assist in the evaluation process. This process should be lead by a conservator.
- All ivy needs to be painstakingly removed by clipping individual, small sections. No ivy should be “pulled” off



Figure 33. Although concrete was also used in this repair, the workmanship is far superior to the repair shown in Figure 32. The repair is stable and should be left alone until such time as it fails.

since this could result in the monument's failure.

- Once the ivy is off, the monument needs to be completely measured for the creation of scaled drawings. Notations need to be made concerning bonding patterns and other details such as changes in brick pattern and set-backs. I agree with Strangstad that the brick mason selected for this work would be involved throughout this process.
- The scaffold should be removed and the monument documented in both B/W and color photographs.
- There should be a very intensive effort made to

identify historical photographs of this monument. It is critical to know what it looked like when it was in good condition. As Strangstad notes, the combination of measured drawings and historical photographs should be used to search for similar monuments elsewhere that may be in better condition and which could help determine the exact conservation efforts.

- The monument should be carefully dismantled. All bricks should be cleaned and saved by design level for eventual reuse in that level.
- A new subsurface concrete base will need to be prepared and poured. This work should be closely supervised to prevent any damage to the underlying graves.
- The mortar used for reconstruction should be a 1:4:8 mix (white portland cement : hydrated lime : clean sand). Joints should be slightly recessed to leave the brick faces free of mortar. The masons must keep their work clean as it is being rebuilt since it will not be acceptable to use muriatic acid or other chemicals to clean up mortar at the conclusion of the work. Moreover, the work should be performed to the highest conservation standards.
- If additional brick is needed, and it likely will, then it may possibly be obtained from

local salvage sources. If it is not possible to match the bricks in size, appearance, and strength, then it will be necessary to expand the search.

- Once rebuilt, Strangstad had recommended the application of a white stucco. While I agree that a stucco was likely, I wonder if there was still stucco adhering when she examined the monument? Ideally we'd like to know, for example, if the monument was scored to resemble ashlar blocks, similar to the front gates. Regardless, Jahn M60 Exterior Stucco would be a good choice.

There appears to be another brick monument



Figure 34. Probable hogback brick vault at St. John's. Additional investigation is necessary to determine whether enough of this vault has survived to allow reconstruction.

(Figure 34) situated in a landscaped area north of the gate into the parking lot on the northwest side of the cemetery. This linear scatter of brick, although requiring additional investigation, appears to be the remains of a hogback vault. This is a variation of the individual burial vault which has rounded ends. They are found at scattered churches in the Coastal Plain of North and South Carolina and into Georgia, I believe. While I haven't seen them to the Fall Line, it wouldn't surprise me to discover at least a few as far inland as Augusta.

There is relatively little left of this vault above grade and it will require some exploration to determine if enough remains to allow reconstruction. Some effort,

however, should be made to mark the presence of this grave and protect it from further landscaping.

### Delamination and Composite Treatment

There are a number of stones at St. John's which exhibit moderate to very serious delamination. These include both red sandstones and also stones that appear to be a local schist (although I have not attempted to obtain a specific identification).

Sandstones are known to have very significant problems when improperly bedded. Bedding is a unique characteristic of sedimentary rocks and we know that bedded stones will resist weathering far better if they are "in bed." In general, the thrust on the stone should be at a right angle to the bedding.

The problem I observed with at least one sandstone monument, however, does not appear associated with bedding. Figures 35 and 36 reveal spalling from both faces and a decorative element of a marker at St. John's.

In this case it appears to me that the issue is one of contour scaling. In this deterioration process, a crust of sandstone breaks away at an approximately constant depth of 5 to 20 mm. The crust follows the man-made contours of the piece rather than any of the natural bedding planes. There has been considerable investigation of this process and research is still continuing.

Thus far the best explanation is based on observations that the detached surface of the sandstone has become completely blocked with gypsum, with the separation occurring as a result of fatigue failure of the stone just behind the choked layer. The best research suggests that this phenomenon is related to air pollution. The working hypothesis is that rainwater may contain dilute solutions of calcium sulphate. This soaks

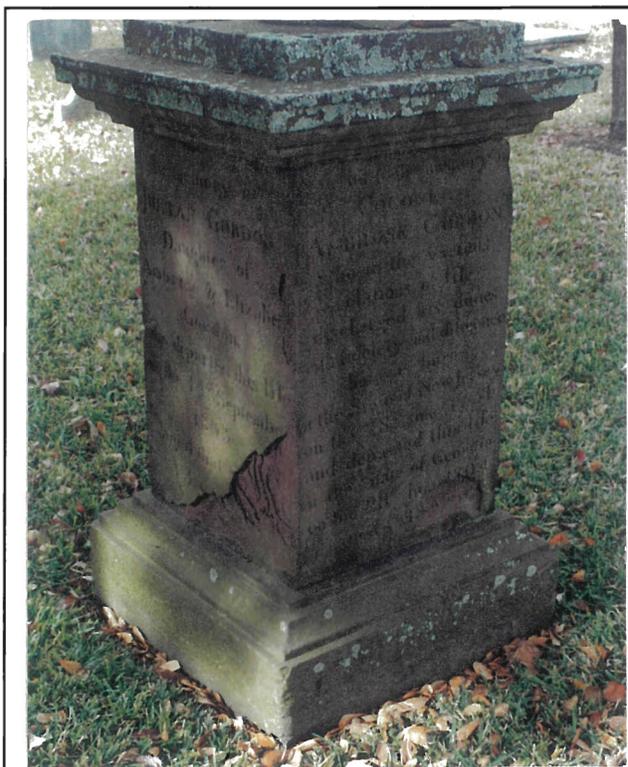


Figure 35. Sandstone monument showing evidence of contour scaling. The probable cause is air pollution.

into the pores of the stone and solidifies, causing the gypsum blocking.

There seems to be no solution for this problem, except of course removal of the object from the offending environment (or, alternatively, improvement of air pollution problems). Consequently, there is no treatment for this damage.

One approach worth consideration, however, is composite repair, whereby a natural composite material — such as Jahn M110 — is used to infill the missing stone. This helps to minimize water intrusion in areas of missing stone and also provides some cosmetic repair.

There are also a number of monuments in the churchyard which appear to be constructed of a local schist (again, I have not taken samples or attempted any more detailed analysis). Schists, because of the ease with which they will part along the laminations, have only been occasionally, and generally regionally, used for

building stone or monuments. I have noted the same situation at Summerville Cemetery and wonder if this stone is a local variety that was used by local stone workers.

Regardless, the stones exhibit extraordinary delamination and even powdering, with the result that the monuments appear to almost be “melting.” Some at St. John’s have had a concrete coating applied to

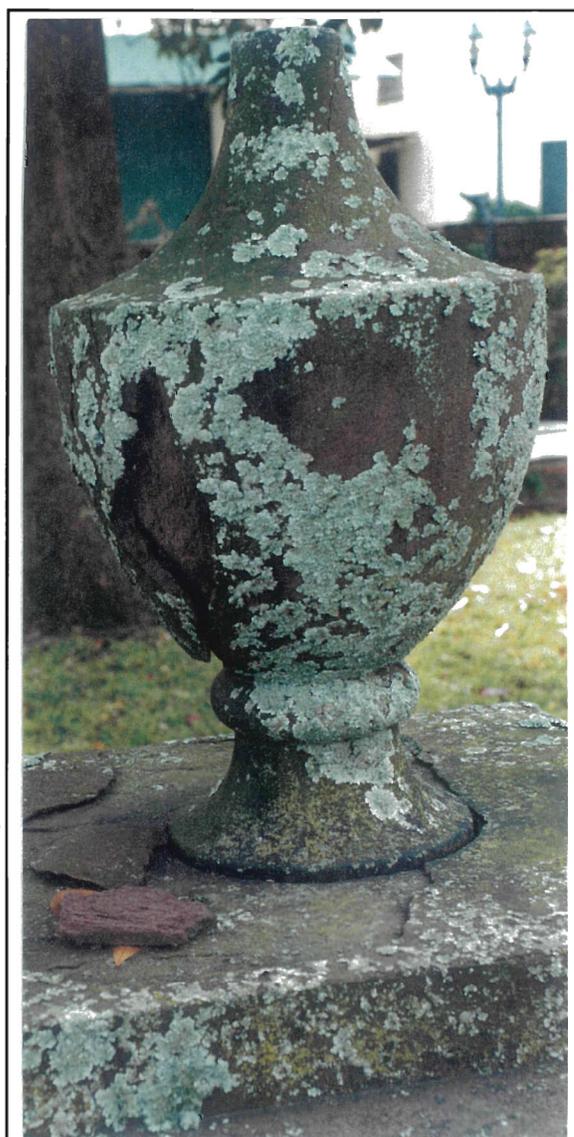


Figure 36. Contour scaling on carved urn topping the monument shown in Figure 35.



Figure 37. Example of severely delaminating schist monument at the entrance to St. John's. A previous effort to retard erosion is evidenced by the concrete patch on the lower half of the base. Most has already spalled off.

exterior coating that protects the stone. Unlike concrete, the material should be as close to the stone's physical strength and permeability as possible. A suitable material may be Jahn M70. I recommend that one stone be selected for a test and, after application, be monitored annually for at least five years to judge whether this approach is useful.

them. Because of the difference in hardness and expansion-contraction, these coatings have generally failed (and may have promoted even more significant erosion).

I am inclined to characterize this problem as one of inherent vice. In other words, the material used was unsuitable and there is no real "cure" for the problem. In some examples where there is still sound stone, it may be possible to prolong the life of the monument through composite repair — applying an

## SUMMARY

This study has provided an overview of critical concerns and issues in the areas of monuments (especially conservation treatment), landscape (notably necessary improvements), appropriate signage for the cemetery (including both regulatory signage and also historical information), use of replacement or additional stones, and care of the churchyard walls.

There are a number of immediate needs, including conservation treatment to anywhere from 10 to 15 monuments, as well as longer term needs, such as installation of better signage. Some of these needs, frankly, will be expensive. Others, however, can be dealt with through modifications of existing activities. For example, improvements can be made in landscaping practices for relatively small sums of money. Sprinklers can be adjusted or relocated and grass cutting can be modified without any major outlays of funds. While it is up to the Church and Oglethorpe Foundation to determine exact priorities, I can make several observations.

### Priority 1

- Among all of the monuments, the most critical need is to reconstruct the Ashton brick obelisk. For over a decade this monument has been in critical condition and it is very close to being too late for intervention. **This work should be scheduled to begin this spring, without delay.**
- I next recommend that broken monuments, both ledgers and tabletstones, be repaired to prevent further damage and deterioration. This represents timely intervention, correcting problems before they become more difficult to treat — and more expensive. **This work should begin this summer, shortly after the completion of the Ashton obelisk. The work might even be scheduled to coincide with the Ashton work.**

- Following that, I recommend that an effort be made to stabilize those monuments facing delamination and failure. I place this third on my list primarily since I am not certain that many of these monuments can be saved. Nevertheless, we would be remiss in our obligation to the past if we didn't try, at least on a sample. **This work can be spread over the Summer and Fall, but should be completed prior to the winter of 2001, allowing time for the effect of the composite infill to be evaluated.**
- Consistent with these projects, the Church and/or Oglethorpe Foundation should enact clear guidelines concerning the use of the cemetery. These should include statements regarding use by outside groups, prohibition of rubbings, clearly defined open hours, authorization of signage as funding allows (beginning with regulatory signage), strict limits on any future ground disturbance in the churchyard cemetery, and strict guidelines for replacement markers. **This should be completed within several months of the receipt of this study.**

### Priority 2

- Work should be scheduled to begin on repair of the brick walls. The Church should investigate if it might be less expensive to have the mason doing the work on the Ashton obelisk also do this work at the same time. While the priority is not that great, the cost savings may make it a wise decision.
- Sufficient investigations should be undertaken to determine if the brick rubble against the parking lot wall is a hogback vault and whether enough remains to allow its repair.

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RECONNAISSANCE PRESERVATION ASSESSMENT OF THE ST. JOHN'S CEMETERY

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- Individual leaning stones should be reset. As previously noted, this is work that could be done by volunteers with only a little training.
- All trees in the Churchyard should be inspected and evaluated by a professional arborist and a care plan should be developed.
- Landscaping should be evaluated for possible changes that would promote the preservation of the cemetery. In particular, the service currently providing mowing and other care should be monitored. In particular, their mowing technique, care, and skill should be carefully observed and evaluated. Any necessary improvements should be requested in writing to the firm and monitoring should confirm improvements. Failure to make necessary improvements should be grounds for their dismissal and a new firm sought.
- Growth on the brick wall should be removed. If its retention is desired, a lattice work should be constructed for it and this should be installed at least an inch from the wall to allow air movement. Once the growth is off the wall, the entrance area should be restuccoed. The Church and/or Oglethorpe Foundation may wish to also move this up to a first priority and have the same mason rebuilding the Ashton obelisk and wall sections also do the stucco work.

**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 m<sup>2</sup> 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 sealed 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 it 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:

This is number 5 in a series of Technical Notes, with which we hope, in drawing upon contributions by APT members, to encourage exchange in a variety of technical areas. Subjects contemplated for this series include extant recording, building inspection, materials conservation, structural repair, building systems conservation, and energy conservation.

Herb Stovel, Publications Chair

Number 5 was prepared by the Heritage Branch of the Ontario Ministry of Citizenship and Culture. Contact Herb Stovel, Heritage Canada (612-237-1066).

Please write to *Communiqué* if you would like to make a Technical Notes contribution.



## 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

#### 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.

APPENDIX 1. APT REPOINTING

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.

.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 : ¼ : 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		vi	v	iv
v	1 : 3 : 10-12	Poorly durable: soft brick, friable stone, etc.			
vi	0 : 2 : 5				

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

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.

- 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

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

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

- .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...

Note:

This is number 5 in a series of Technical Notes, with which we hope, in drawing upon contributions by APT members, to encourage exchange in a variety of technical areas. Subjects contemplated for this series include extant recording, building inspection, materials conservation, structural repair, building systems conservation, and energy conservation.

Number 5 was prepared by the Heritage Branch of the Ontario Ministry of Citizenship and Culture. Contact Herb Stovel, Heritage Canada (612-237-1066).

Please write to *Communiqué* if you would like to make a Technical Notes contribution.

Herb Stovel, Publications Chair



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