St. Louis Cemetery No. 1
Guidelines for Preservation & Restoration

Frank G. Matero, Project Director
Stephen Curtis
John Hinchman
Judy Peters

The Graduate Program in Historic Preservation
Graduate School of Fine Arts
University of Pennsylvania

July 2002
All masonry work including brickwork, stucco and stone should be executed under optimum weather conditions to ensure the success of the repairs. No work should be executed or cured during weather below 40 degrees Fahrenheit. To prevent too rapid drying, particularly of thin finishes, such as stuccoes, washes, and masonry work, require repeated misting and protection from the sun with damp burlap, canvas or plastic sheeting and canopies. In New Orleans, particularly, covering all phases of the work is essential!

**Brickwork**

Brickwork repairs account for the majority of the work required at most tombs. All brick joints should be inspected for missing and deteriorated mortar and loose bricks should be removed and cleaned for resetting. Defective joints should be raked by hand to 1” in depth or down to sound mortar. All dirt and loose debris should be removed before repointing or resetting. Masonry should be well dampened and the joints repointed or bricks set with a compatible mix that matches the original mortar or its properties.

A suitable mortar mix should employ a lime putty or hydraulic lime (not to be confused with “hydrated lime”\(^\text{10}\)). A lime and white Portland cement blend can be used for roofs where harsh conditions prevail. Two such recommended mixes which have been used with good results in Lafayette 1 and St. Louis Cemeteries No. 1 and 2 are as follows: 1 part white Portland cement to 2 parts lime putty (slaked for a minimum of 3 months) or hydrated lime (Type S) to 9 parts clean masons’ sand. Where available, a hydraulic lime mortar made from 1 part Riverton HHL (hydrated hydraulic lime) to 3 parts masons’ sand (all parts by volume) is preferable.
Masonry cracks in the stucco and brickwork often occur at the roof, corners and occasionally in the walls if uneven settlement has occurred. Superficial cracks can be mortar repaired; however large or deep structural cracks will need to be grouted using specialized materials and techniques by a qualified professional.

Missing and broken bricks should be replaced with those of similar size and water absorption to ensure compatibility. Recycled bricks are available from local suppliers. Wherever possible, original construction methods should be duplicated, such as bonding and coursing patterns, unless these have failed due to inadequate support or subsequent modifications to the tomb. Any changes to construction details should be carefully considered before execution, as these can cause serious problems later on. Before relaying, all bricks should be thoroughly soaked in water for at least several hours to reduce suction of moisture from mortar and subsequent shrinkage cracks. Finally, joints should be raked back to provide a key for new stucco.

**Stuccowork**

All stucco should be gently sounded with an acrylic mallet to determine where it is detached. When tapped with the mallet, detached stucco produces a characteristic hollow sound.
Remove non-ornamented detached stucco by hand with a hammer and masonry chisel. Cut the edge of sound stucco at an inward angle to provide a dovetail key for new stucco. Remove all loose dirt and debris from the masonry substrate with soft bristle brushes and dampen well all surrounding stucco and masonry brickwork prior to and after the application of new stucco.

Always apply stucco repair patches to the level of the existing stucco. Do not feather edges of new stucco repairs over adjacent existing stucco. Match existing texture using the appropriate wood or rubber float. If stucco was scored to replicate ashlar block, allow stucco to set until thumbprint hard and strike a shallow joint line in the same dimension and manner as the original. Flush fill all surface cracks and holes to the level of the surrounding stucco layer in order to provide a water tight skin. Finally, make sure all horizontal surfaces allow for proper water disposal.

A highly durable and compatible mix for new stucco and stucco repairs is 1 part Riverton hydrated hydraulic lime (HHL) to 2 parts fine masons’ sand (by volume). A blend of 1 part white Portland cement to 2 parts lime putty to 6 parts fine masons’ sand may be used if the hydraulic lime is not locally available. Sound ornamental stucco, such as cornice moldings and pilasters, should always be preserved. However, missing areas requiring replacement can be duplicated carefully by recording the profile with a molding gauge and cutting a matching sheet metal template, which can then be used by a skilled mason to re-create the molded work in place. Hand rebuilding of molded work should be avoided, unless in small areas where a run-in-place molding is not possible (e.g. a corner of a cornice).

**Tomb #351 - Missing stucco replaced with a compatible hydraulic lime mix, 2001.**

**Left - Tomb #591 - Cracks and losses of original stuccowork are filled with hydraulic lime, 2002.**

*Masonry 48*
**Guidelines - Masonry**

<table>
<thead>
<tr>
<th>Do’s</th>
<th>Do Not’s</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DO</strong> inspect individual tombs on a regular basis for structural</td>
<td><strong>DO NOT</strong> remove or replace original brickwork with dissimilar</td>
</tr>
<tr>
<td>defects. It is important to remember that most deterioration is</td>
<td>materials such as concrete masonry block or poured or pre-cast</td>
</tr>
<tr>
<td>related to moisture penetration. Make sure water drains away from the</td>
<td>concrete. This will preferentially drive ground water up through the</td>
</tr>
<tr>
<td>tomb.</td>
<td>brick walls no matter how well protected the surfaces are and will</td>
</tr>
<tr>
<td><strong>DO</strong> regularly check the tomb for vegetation. Vegetation left</td>
<td>eventually damage the brick and stucco.</td>
</tr>
<tr>
<td>unchecked can invade the masonry, causing eventual displacement and</td>
<td><strong>DO NOT</strong> remove original stucco, leaving exposed brick. Stucco work</td>
</tr>
<tr>
<td>collapse. Mature growth is far more difficult and expensive to remove</td>
<td>is both protective and decorative and was often finished with</td>
</tr>
<tr>
<td>than seedlings. Avoid the use of herbicides as these can introduce</td>
<td>breathable limewashes.</td>
</tr>
<tr>
<td>harmful salts into masonry. In some cases where the root system is</td>
<td><strong>DO NOT</strong> use pre-packaged Portland cement mixes.</td>
</tr>
<tr>
<td>large, the use of herbicides is warranted. Cut the plant at the base,</td>
<td><strong>DO NOT</strong> re-face stucco tombs with stone or re-stucco with Portland</td>
</tr>
<tr>
<td>then apply herbicide carefully to exposed stem.</td>
<td>cement. This completely obliterates the original appearance of the</td>
</tr>
<tr>
<td><strong>DO</strong> repair rather than replace damaged or missing stucco. Avoid</td>
<td>tombs and obscures the details.</td>
</tr>
<tr>
<td>mixes composed of high contents of Portland cement, as they are</td>
<td></td>
</tr>
<tr>
<td>far too hard and dense and will trap moisture within the tomb</td>
<td></td>
</tr>
<tr>
<td>masonry. Stucco and mortar repairs using hydraulic lime or lime and</td>
<td></td>
</tr>
<tr>
<td>cement blends are always preferable.</td>
<td></td>
</tr>
</tbody>
</table>

*Masonry 49*
Technical Guidelines - Surface Finishes

All stucco tombs were finished for decoration and protection with limewashes of various colors. Traditional and acrylic-amended limewashes are still recommended as the most serviceable protective coatings for stucco covered tombs. Evidence of yellow, red, and gray colored and white limewashes has been found on tombs as well as in numerous historical images. Individual tombs can be analyzed to determine their original colors and refinished to match the most significant historical color.

If slaked lime putty is not available, thoroughly mix hydrated lime (Type S) with water to a putty consistency, top with water, and allow it to stand covered for at least 24 hours; two weeks is preferable. Before applying, sieve the lime through a fine screen and thin with water to the consistency of light cream. If a pigmented limewash is used, the correct ratio of pigment to limewash should first be determined (matched to the above samples) by mixing small batches and applying them in test patches on the tomb. Once dry, they can be compared to the original surface finish color.

Pigmented limewashes should be mixed in large enough quantities for each single application coat and no less than 1-2 gallons. It is often advisable to make extra to store for future use. White limewash is best pigmented by first mixing the total amount of pigment required in a small amount of water or limewash and then adding that into the larger quantity to be pigmented. Never add the pigment dry into the limewash as it will not evenly disperse and cause streaking. Mix well by hand or with a mechanical mixer for not less than 15 minutes. If more than 10% of the tinted putty base is pigment, it may be

Stable lightfast alkali-proof cement pigments should be used to recreate these colored washes. For most tombs, a plain unpigmented whitewash is recommended. Contact Save Our Cemeteries for a color chart of traditional limewashes used for the Alley 9L restoration project and for information on limewash recipes and material sources.
necessary to add an acrylic emulsion to the wash to increase adhesion.

Before application of any surface finish, stucco surfaces should be free of dirt, debris, oil, biological growth, and flaking paint; otherwise the limewash will not bond. Heavy accumulations of earlier finishes can be removed by hand scraping aided by low pressure water such as a garden hose. More specialized methods of surface finish removal are possible; however these are best performed by an experienced professional as they can cause great damage to stucco and stonework as well as cause personal injury if misapplied.

Dampen the wall with water and then apply the limewash with traditional distemper or animal hair brushes, brushing it on in short multi-directional stroke applications. Due to the rapid drying, it should be applied in small areas to avoid drying at the overlap. Apply several thin coats (at least three), allowing each coat to dry for at least 24 hours before applying the next coat. Dampen the surface between coats and avoid working in direct sun. Cover the tomb after each application to protect from sunlight and rain. The cover should remain on the tomb for at least 1 week after application of the final coat.

If used properly, limewash finishes are durable, inexpensive, easy to apply and environmentally and user friendly. Their translucent appearance cannot be duplicated by opaque modern synthetic “latex” paints, and their eventual build-up adds to the historic character, unlike the peeling buildup of “latex” and oil-based paints.

Limewashing the Esteve Tomb, #13. Application of a dark grey limewash, matched to the original limewash layer historically intended to imitate the blue-grey limestone closure tablet.
<table>
<thead>
<tr>
<th>Guidelines – Surface Finishes</th>
<th>Do’s</th>
<th>Do Not’s</th>
</tr>
</thead>
<tbody>
<tr>
<td>DO apply limewashes to the masonry every year or other year, if possible.</td>
<td>DO NOT apply surface finish to the stone closure tablet or stone surround, only the stucco.</td>
<td></td>
</tr>
<tr>
<td>DO refinish periodically – every 2 years is best – to protect and keep the tomb clean.</td>
<td>DO NOT try to apply finishes that claim to waterproof the monument, as moisture will be trapped inside, resulting in eventual masonry failure.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DO NOT use oil, alkyd, or other high strength elastomeric coatings, as they will cause masonry decay and fail from entrapped moisture.</td>
<td></td>
</tr>
</tbody>
</table>
St. Louis Cemetery No. 1
Guidelines for Preservation & Restoration

**The Well-Maintained Tomb**

**Original Tomb**
Built of soft hand made brick, covered in stucco and limewashed.

**Regular Care**
Every year or two, a family member applies new limewash.

**Regular Care**
As small cracks develop, repairs are made. Water is kept out of the interior.

**Regular Care**
As needed, the stucco layer is replaced.

**Regular Care**
Fresh lime washing, new colors. Ready for visitation on All Saints’ Day.

**Regular Care**
Well maintained.

*J. Peters, 2002*
A fine-grained, white calcitic marble was used most frequently for closure tablets, tomb slabs, plaques and sculpture. Several other stones were also found in lesser quantities, including a medium to large grained grey veined white marble and a dark gray limestone. By far the most serious problem affecting tomb stonework is the deformation (bowing) and breaking of the closure tablets and their surface erosion (“sugaring”) from atmospheric weathering.

Mechanical Repair

Marble, being highly crystalline, undergoes a volume increase with each thermal cycle, leading to permanent expansion and distortion. If restricted, eventual cracking and breaking of the stone often occurs in order to relieve this built-up stress. This is clearly visible in the many bowed and deformed S- and C-shaped closure tablets. Their poor design as large thin (1”) slabs tightly fitted in the tomb opening and fine-grained structure have contributed significantly to their structural deformation and breakage in New Orleans’ hot damp climate.

Surface erosion and loss of inscription and carved detail on marble and limestone are due to these stones’ chemical sensitivity to acidic conditions caused by atmospheric pollution and micro-flora. Black staining commonly found on horizontal surfaces and joints is the result of black fungal growth.
Frequently, due to the conditions outlined above, inscription tablets and various architectural and sculpted elements become stained, eroded, fragile and fragmented, and often disassociated from their original location. In such instances, if conservation work is not to proceed immediately, stonework should be photographed where found, and a precise record kept which will identify all of the elements. This is useful should elements be stolen and later retrieved. All of the fragments should be marked (on their reverse side) with their location using chalk or a graphite pencil. A copy of the record should be made and stored with the actual element, and the original copy placed with the governing body of the cemetery or preservation society. The fragments should be stored in a dry, cool, safe location that provides ready access to the fragments for restoration and reinstallation. Objects should be placed off of the ground to allow for air circulation and to avoid moisture damage.

Fragmented enclosure tablets and sculpture should be repaired as soon as possible before pieces become lost or damaged from handling. A trained conservator or technician is best qualified to perform this work. For smaller breaks, they may use a structural adhesive, appropriate to the climate. For general stone repairs, they may chose a 2-part epoxy resin, which provides good adhesion and strength with a wider range of environmental tolerances, and is more reliable for such repairs in subtropical climates. In cases where fragments or elements require structural reinforcement, threaded nylon rod, fiberglass or carbon filled polyester, or stainless steel pins can be used in combination with adhesives or as a dry friction fit.

For general adhesive repair, fragments should be cleaned as described for masonry. Adhesive repairs require completely dry, clean surfaces at the interface of the bonding. For surface preparation, the contact edges should be water

An example of a bad marble tablet repair with incompatible materials and poor workmanship.
washed, and swabbed with denatured alcohol, followed by acetone. All joins should be dry tested for fit before the adhesive is applied. Surfaces and edges should be aligned with a straightedge to maintain the original plane of the tablet. Tests based on manufacturer’s recommendations should be executed to determine the working time dependent upon temperature and humidity.

The adhesive should be mixed in quantities readily applied within the setting time. It should be applied as small spot welds very thinly and evenly to both fragment surfaces to be joined, leaving a margin towards the outer surfaces for the spread of the adhesive at contact. The surfaces should be joined immediately and held in position until the initial set has occurred (approximately 15 minutes), preferably under tension with straps or clamps. All surfaces should be protected with padding to prevent abrasion. Any excess adhesive visible at the cracks should be mechanically removed in its gel state before it hardens, as it will discolor and ‘stain’ the stone.

On those stones where areas of loss exist along narrow breaks, a fill of hydrated lime with fine banding sand or marble dust should be applied. The fill may be colored to match the stone by the addition of small quantities of masonry pigments or selecting slightly yellow or grey sand. Larger losses of stone along breaks require more aggregate to control shrinkage, usually 2 parts aggregate to 1 part binder (lime and cement). Resin fills should be avoided, as they will discolor under exposure to the sunlight.

Small dots of adhesive are applied to stone fragments positioned for joining.
For most breaks it is necessary to provide reasonable alignment by working on a horizontal support. Improperly aligned joints are unsightly; growing more noticeable with age as the rough joint attracts dirt and bio-growth. A sheet of exterior grade 1/2” plywood may be placed on sawhorses to provide a suitable worktable on site. For tablets that have become deformed, temporary support of the deformation configuration must be constructed to achieve joint alignment and reduce stress at the join. Mason’s shims of various sizes, foam padding, a sand bed, or small balls of aluminum foil are useful for this localized support. Where continued interment is not anticipated, fragile, deformed tablets can be permanently reinstalled in a full mortar bed of 1 part white Portland cement to 2 parts hydrated lime to 9 parts mason’s sand (by volume) with stainless steel supports. Surface mounted carbon fiber vinyl ester resin straps with adhesive welds are currently being tested to offer lightweight tensile reinforcement to the back of deformed tomb closure tablets.

For large stone losses, “Dutchman” joints provide long-term repair, especially in areas such as tomb thresholds where corrosion of the metal enclosure has cracked the corners. Such repairs require professional experience in the selection, sizing and installation of the stone Dutchman. New or reused stone should match the existing in color and texture and the joint should be as invisible as possible. Epoxy adhesives, with or without non-corrosive pins, should be used and kept well below the surface of the joint. Cosmetic fills are best made with cement, lime and marble powder. Stone dust and resins should be avoided as they will discolor over time.

![Left - A marble Dutchman prepared to repair the Bergamini threshold. Right – the repair in place.](image-url)
Where tablets are missing or need replacement, fine white marble should be selected over other stones. Tablets should be sized to a minimum of 1 1/2” in thickness. Where possible, new and reinstalled tablets should be shaved at the bottom ¼” and placed on lead or polyethylene foam shims to allow for thermal movement.

The original single or double pinning assemblies used to retain the tablet in place should be reused or substituted in kind. If wooden blocks were used to anchor the pin into the vault masonry, these can be replaced if necessary with more durable composite wood to avoid future insect attack. Only non-corrosive stainless steel or bronze pins should be used and are available from the Archdiocesan Cemeteries office.

The recent substitution of gray granite and blue anorthosite for many of the historic white marble tablets is significantly impacting the historic appearance of the site as a whole. These new closure tablet replacements are dramatically different, both in color and reflectivity from their marble precedents. While the closure tablet issue may seem like a minor aesthetic debate, it is indicative of the larger question of the contribution of repetitive architectural elements to the visual integration of the overall site and the impact of such changes. Durable white marble is available from local stone suppliers at comparable costs and should be used in lieu of granite at this site.

A comparison of original marble (left) and inappropriate grey granite replacement (right) closure tablets.
### Guidelines – Stone Tablets & Sculpture

<table>
<thead>
<tr>
<th>Do’s</th>
<th>Do Not’s</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>DO</em> document and protect fragments before they become disassociated from the tomb, vandalized or stolen.</td>
<td><em>DO NOT</em> try to paint, coat, or re-carve the details and inscriptions that have been lost to natural weathering on sculptured marble ornaments.</td>
</tr>
<tr>
<td><em>DO</em> save and remount existing tablets that must be replaced for continued tomb use.</td>
<td><em>DO NOT</em> use dark colored stone for tablet replacements.</td>
</tr>
<tr>
<td><em>DO</em> use white, preferably Carrara, marble, of greater thickness (1½” if possible) for new tablets. (Unfortunately, thicknesses over 1¼” are not readily available.)</td>
<td></td>
</tr>
<tr>
<td><em>DO</em> repair rather than replace broken stone with matched stone Dutchman or mortar fills.</td>
<td></td>
</tr>
<tr>
<td><em>DO</em> use similar pinning methods where possible to mount the closure tablet in place. If the original system has failed, consult a professional to redesign an attachment method.</td>
<td></td>
</tr>
</tbody>
</table>
Cleaning

The decision to clean should be based on a genuine necessity, as all masonry cleaning techniques subject the stone to potential hazards. A monument which is darkened with soiling, biological growth and metallic staining, is not only disfigured but also is susceptible to masonry deterioration and, therefore, requires cleaning. A lightly soiled monument with legible details, however, does not require a major cleaning. All cleaning methods must be tested in a discreet location for each monument before full-scale treatment begins and all but the simplest methods should be left to the professional. The gentlest method should be tested first to avoid unnecessary damage. Fragile, bowed tablets should not be cleaned prior to stabilization.

Water washing is the gentlest, safest, and least expensive method for cleaning masonry and may be performed by the nonprofessional provided the tomb or stonework is sound. Most general surface soiling and some biological growth are easily removed with water. All open joints must be repaired first, to prevent penetration of large quantities of water into the masonry. The water should have a low metals content to avoid staining. Usually, potable water is adequate.

Water can be applied at low pressure with a garden hose spray. Only if necessary, it may be supplemented by gentle scrubbing with nonmetallic soft bristle brushes and water with a small amount of household detergent added (e.g. Ivory).
soft nylon bristle brush. For more tenacious staining, due to biological growth, apply a 2-5% solution of calcium hypochlorite, as found in commercial pool chlorine (2-5 parts dry powder to 100 parts water by volume) to a dry surface with a sprayer. Allow the spray to dwell for 5 minutes and then rinse well with a hose. Proper safety precautions must be taken as this material is a strong oxidizing agent. Eye, respiratory and skin protection is required. It is also necessary to cover all adjacent areas to prevent unwanted bleaching.

Since black gypsum crusts, resulting from the interaction of the marble or limestone with acidic atmospheric pollution, are water soluble, they may be removed with a slow water soak. For this method, it is most important that all joints and seams are watertight to prevent the introduction of water to the tomb interior and the necessary drainage is provided to avoid water collection. As slight staining can sometimes develop on certain stones possessing iron impurities, which can react to form brown or yellow oxide stains, tests should always be done first.

Many commercial chemical products are currently available for cleaning, based on acidic and alkaline compounds and detergents. If used improperly, these can cause etching of stone, insoluble residues, as well as introduce harmful salts which can cause further stone decay. Use of such cleaning systems is best left to experienced professionals.

Abrasive cleaning involving any grit or aggregate applied under pressure should never be used on historic masonry, which includes stucco, brick and stone. The technique is aggressive and can cause irreversible damage to historic fabric. Abrasive cleaning can lead to accelerated weathering by pitting the surface, thus opening the masonry to increased moisture penetration, atmospheric reactivity, and subsequent deterioration.

**Consolidation**

Once stone is deteriorated, the porous structure becomes more open and less resistant to deterioration. A professional conservator may recommend consolidation of the stone surface to improve strength and prevent additional decay. Consolidants generally recommended for marble are silicic ethyl ester based, such as

---

*Stone Tablet & Sculpture 61*
Conservare® OH by Prosoco, Inc. The consolidant penetrates the porous surface and establishes a silicon dioxide matrix to supplement the stone’s natural calcareous binder. The consolidant is a clear, penetrating liquid, which enters the stone’s composition and collects at contact points between individual grains. As the material cures, the liquid consolidant is converted into silicon dioxide, a glass-like material that binds the grains together. One advantage of this particular consolidant is that the treated stone remains water vapor permeable.

Before use, consolidants should be tested in a small, discrete area to ensure that no unintended reactions occur. Consolidation requires a fairly elaborate process of cyclical applications, with periodic testing between applications to determine when sufficient consolidant has been applied. Each cycle may consist of 2-3 applications spaced at 5-15 minute intervals. A more lengthy 30-40 minutes drying time separates each cycle. The consolidant is applied very gently with soft brushes or spray to reach intricate design details.

After the last application, the surface is usually treated with an organic solvent which removes any unabsorbed material from the stone surface. The stone material is then covered to protect it from rain. It should remain protected and undisturbed for 2-3 days of drying time and 2-3 weeks for a full cure.

It should be noted that because of the complicated technique involved in applying and in determining the correct quantities of consolidant, there is great potential for incorrect application. Consolidation is a highly specialized operation involving expensive and toxic materials and should only be executed by an architectural or sculpture conservator.

Conservator applying consolidant.
### Guidelines – Cleaning & Consolidation

<table>
<thead>
<tr>
<th>Do’s</th>
<th>Do Not’s</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>DO</em> clean the monument by the gentlest means possible. Begin with clean water and a soft bristle brush, followed by a solution of household detergent. For the most tenacious stains a weak solution of calcium hypochlorite can be used.</td>
<td><em>DO NOT</em> use household bleach, metallic brushes or any abrasive techniques such as abrasive pads or sandblasting.</td>
</tr>
<tr>
<td><em>DO</em> contact a conservation professional before undertaking chemical or abrasive cleaning techniques.</td>
<td><em>DO NOT</em> attempt to clean an item, such as a broken tablet, that might appear to be fragile or unstable.</td>
</tr>
<tr>
<td><em>DO</em> use consolidants or water repellants without the assistance of a stone conservator.</td>
<td></td>
</tr>
</tbody>
</table>
Common Problems

Years of deferred maintenance and vandalism have left the metalwork in the cemetery in very poor condition. The following conditions are among the most commonly observed.

• **Missing elements**

Theft is the major cause of most missing metalwork in the cemetery. Many of the enclosures are completely or partially missing, the most vulnerable elements being the gates, crosses, and decorative details. Smaller items such as the relief sculpture and cast iron urns have also been lost to theft. The deteriorated condition of the metalwork sends a message that it is expendable and makes it easier for elements to be wrenched loose.

An earlier attempt to remove the cross on Lacoul Tomb, #493, left it bent and damaged, 2001. The cross has since been stolen.

• **Structural failure & corrosion**

Failed joints, broken hinges and loose and corroded anchoring into the tomb masonry are primarily the result of corrosion and racking.

Corrosion is the process whereby metals combine with other elements and compounds to revert to a more stable state, usually resulting in a loss of the desired properties. Corrosion can be caused by intrinsic micro-structural flaws in the production of the metal or by extrinsic environmental attack from oxidation, weathering, and electrochemical action. Despite the relative resistance, wrought iron and high purity cast zinc show to corrosion; these have suffered from a lack of protection.
and the excessive local weather conditions. Poor maintenance and frequent flooding has allowed moisture to penetrate joints causing corrosion of the relatively thin mortises and rivets. Galvanic corrosion has occurred between lead shoes and the wrought iron posts to the extent that the wrought iron posts have corroded away causing collapse. Partial joint and anchoring failure have exerted stresses on the railings causing deformation, wear, and breakage.

Active corrosion of the iron has stained the zinc ornament and the stone thresholds and curbing. Nevertheless, much of the overall surface corrosion appears stable having formed a protective blue-black or red-brown oxide. Other areas, especially joints and basal elements, display severe flaking caused by sulfide and chloride salts in the environment.

Zinc has good resistance to corrosion as long as it is permitted to form its protective dull gray finish of insoluble basic carbonate. Some of the zinc rosettes and hubs at the intersection of bars have split allowing water to collect, which has caused the iron to corrode, expand, and push the zinc connectors further apart. Other zinc details such as the picket spear points are experiencing cracking where the iron was not completely covered by the zinc when cast.
St. Louis Cemetery No. 1
Guidelines for Preservation & Restoration

• **Racking**

Differential settlement of the tombs and their thresholds has caused serious racking of the partial enclosures. Since the top rails of the enclosures are anchored into the tomb walls and thresholds, settlement has put tremendous stress on the structure of the railings causing them to fail at their joints and even to bend bars and pop riveted top rails. Aside from damage to the metalwork, racking contributes to the problem of threshold corner spalling where the ironwork was anchored to the masonry with molten lead.

• **Alterations**

Past and recent repairs to the metalwork consisting of on-site arc welding and metallic fasteners of mild steel have often resulted in failed or unsightly work.

**Treatments**

Treatments include stabilization with temporary measures, surface protection, repairs and replacement.

• **Temporary Repair and Storage**

Temporary measures can do much to stabilize loose and detached metalwork and safeguard its loss to theft and vandalism. Bracing and wiring loose elements and installing locks on gates allow elements to remain in place. If removal is necessary, all elements should be tagged and stored in a safe and dry location until repairs can be undertaken.

• **Surface Protection - Cleaning**

Most, if not all, cemetery metalwork traditionally received some type of coating for protection. The application of paints and
coatings are therefore both historically appropriate and necessary to preserve the decorative metalwork. Prior to applying any finishes, the metalwork must be properly prepared or the finishes will fail prematurely or even cause accelerated corrosion by trapping moisture underneath. Careful cleaning is also useful in revealing structural defects that might require attention prior to refinishing.

Pressurized air-abrasive systems offer the fastest and most effective method of surface preparation and cleaning on- or off-site. Coatings on air-abraded surfaces generally adhere better than on brush-abraded surfaces. Pressure (psi), dwell (or contact) time, and the abrasive type all affect the performance of the air-abrasive system selected for surface cleaning.

Good bonding of any applied finish occurs when all loose material such as peeling paint and corrosion layers as well as harmful corrosive salts are removed. Where paint exists, prior to cleaning and removal, samples should be taken from protected locations on the chance that they might identify the original or historic colors used.

Several different techniques exist for the cleaning of metalwork, each requiring different equipment and skill and each resulting in different degrees of preparation. Cleaning by hand with brass wire brushes, synthetic abrasive pads and with small power-driven synthetic fiber brushes allows easy and reasonably effective removal, especially for localized areas; however, the method is slow and sometimes incomplete.

Walnut shell blasting on the grillwork of the Bergamini Tomb, #12.
Mild air-abrasive materials, such as walnut shell, have been used effectively on metalwork at low pressure (40 psi) at St. Louis Cemetery No. 1 and elsewhere to remove all loose corrosion and paint as well as other contaminants that will interfere with coatings adhesion. The use of sand as an abrasive is not recommended, especially on the site. The risk of damage to the metalwork and surrounding materials is too great. Selection of the optimum parameters for each project depends on testing and the skill and knowledge of the operator. For this reason, air-abrasive cleaning should only be performed by knowledgeable professionals.

Provided no other repair work is required, abrasive cleaning and refinishing should be performed in place, so long as the surrounding masonry is properly protected. Should repair and replacement work be required, removal of the metalwork to a shop or studio affords the best environment in which to clean and refinish under controlled conditions. Cleaning off-site allows the option of chemical and electrolytic solution baths for the complete removal of tenacious coatings and corrosion; however the chemicals used must be thoroughly neutralized. Such methods must be carefully monitored especially for zinc, which is vulnerable to deterioration from the strong alkalis in chemical strippers.

Regardless of the method of cleaning chosen, all bare metalwork should be taken to a dull grey finish (not shiny metal) and wiped down with acetone to remove residual dust and oils. All cleaned ironwork must be immediately treated with a quality inhibitive primer or coating to prevent the formation of rust which will interfere with adhesion of the new coating. This is especially important in the humid environment of New Orleans.

Although little paint has survived on the cemetery’s metalwork, proper precautions must be taken to contain hazardous materials such as lead in the removal of paints. Mechanical cleaning will create harmful airborne dusts, therefore, proper eye and skin protection, respirators, and disposable suits are necessary for personal protection. These are all available from occupational safety equipment suppliers. A thorough means of containing and disposing of contaminated waste from cleaning must also
be devised in compliance with local environmental regulations.

- **Surface Protection - Filling**

All small holes and pitting that might hold water should be filled with a quality patching material designed for metal, such as auto body putty or filled epoxies. Gaps in joints provide places for the entrapment of water and subsequent corrosion. Their repair is best addressed by dismantling the pieces, cleaning, priming, and reassembling them in a bed of non-hardening silicone sealant.

- **Paints and Coatings**

A coating system should be selected that can be easily applied depending on the application context (on- or off-site). Only paints meeting all the current health, safety, and environmental standards should be used. Alkyd vehicle paints have been a standard for years, but with new and evermore stringent legislated controls on volatile organic compounds (VOC) emissions, research and development of high performance water based paints has accelerated. Acrylic paints are building a relatively good track record for protection of metalwork and should be used over other irreversible coatings such as epoxy based paints. However, oil-based primary coats are still recommended for metalwork and may be followed by an acrylic finish coat.

Paints and coatings should only be applied when surfaces are perfectly dry and temperatures are above 50 degrees farenheit. Brush applying paint ensures the best coverage. If railings are removed, they can be spray painted in a controlled environment followed by “back-brushing” to ensure that the paint is worked into the surface and into all joints.

Three-coat work consisting of a primer, intermediate, and finish coats is standard for bare metal. A good quality corrosion inhibitive, “direct-to-metal” (DTM) primer should be used, followed by two compatible finish coats. If the paint is applied in thin coats, there will be better adhesion, build-up will be minimized, and the detail of the metalwork will be less obscured. Maintenance of the finish should involve periodic inspection and spot repainting to prevent rust from spreading.
Ironwork with particularly active corrosion, or corrosion inaccessible to removal, might require the extra protection afforded by the application of a conversion coating. Iron and zinc phosphate coatings can be applied after cleaning to convert the chemical character of the metal surface, neutralizing rust and to provide a better bonding surface for paint.

- **Wax Coatings**

Archival evidence suggests that architectural wrought iron was sometimes wax-and-oil-treated, rather than painted. In these cases, a microcrystalline-based wax formulation can be used to protect and enhance the metalwork. This method has been extensively used with success on outdoor bronze sculpture and was also applied on the Bergamini (#12) Tomb at St. Louis Cemetery No. 1.

On the Bergamini Tomb, the wax mixture was applied hot to a previously cleaned and heated surface. Heating the surface chases off condensed moisture and ensures adequate flow of the wax for complete coverage. Different formulations are possible, including mixtures of microcrystalline and low melting point polyethylene waxes and pigments, such as lampblack and are best prepared and applied by a professional conservator. It should be noted that wax finishes are typically more difficult to remove than paint and therefore regarded as less reversible.

Applying wax finish on the Bergamini Tomb ironwork after cleaning with walnut shell blasting, 2001.

Anthemion finial on the Bergamini Tomb treated with a pigmented wax finish.
• **Repair**

Most repairs to metalwork require a qualified professional. While repair using original techniques is expensive because of the specialized skills needed, there are excellent reasons for making the investment. Repairs often require the replacement of material, which should be done in-kind when at all possible. New products can and should be used when it makes good conservation sense, such as the filling of pits and cracks with synthetic fillers, or the use of sealants to make open joints watertight.

The original methods of assembly are the only ones that will be most visually compatible with the metalwork and offer similar performance. For wrought iron, the disassembly, cleaning and rejoining of joints and elements is the preferred method of repair for weak and broken assemblies. Welding, though easier to perform, cannot work at all junctures, particularly where there is a small difference in section between the two pieces being joined. Modern welds also tend to set up corrosion cells, which can eventually destroy the joints they were intended to repair. For mortise and tenon joints, a compromise solution could involve the use of a round dowel instead of a tenon assemblage, coupled with plug welding to prevent pivoting of the rail in the post.

Riveted connections such as those used to assemble the scroll and cross work on gate tops are highly prone to corrosion and can be easily replaced in-kind. Existing bent and broken elements can be reformed or replaced (see below) and the same attachment methods employed.

Cast iron presents a more difficult problem, as broken elements cannot easily be repaired after casting. The welding or brazing of broken cast iron is extremely difficult to achieve without causing further damage to the metalwork. Only the most experienced expert should be entrusted with the work. The alternative in many cases will be a mechanical repair involving the drilling and tapping of the cast iron and possible reinforcement with ferrous metal backing fastened with electrolytically compatible screws or bolts.
Whenever dismantling of the metalwork is required, this should be taken as an opportunity to thoroughly clean and re-prime all pieces before reassembly. This is especially critical with laminated bars such as top railings, which should have a bed of compatible non-hardening sealant applied before reassembly. In this case, original designs can be “improved” to be more watertight and help prevent future deterioration.

- Replacement

The replacement of single elements or whole sections of metalwork will be required for many of the enclosures in the cemetery. As a general rule, accepted preservation practice advocates the use of similar materials and fabrication techniques wherever possible. There are cases where substitution of materials and techniques can provide a more durable or less expensive alternative; however caution should always be exercised when changes are made, as these can cause unforeseen future problems.

Wrought Iron

Although wrought iron is difficult and expensive to obtain today, it should be used over mild steel for replacement parts in repairs to existing enclosures. Wrought iron offers greater workability and resistance to corrosion than mild steel. Straight forging as a technique was used primarily for the
fabrication of the wrought iron crosses once found on many of the early step tombs and several enclosure gates. Much of the wrought iron shaping that was done hot occurred with the use of jigs using standard bar stock such as the cross and scroll work cresting gracing many of the tomb gates. The scroll ends were forged to provide a mass for fastening the zinc rosettes.

By far, the majority of enclosures were fabricated from round and square iron stock using hand tools and hand-powered machinery. Assemblies were fabricated for each tomb using joinery details similar to those for wood carpentry. Fabricated ironwork has generally performed quite well despite years of neglect. Where necessary, replacements can be made either with hand tools or with the aid of machinery, or by a combination of both techniques.

**Cast Zinc, Iron and Lead**

Casting as an original production method easily lends itself to the replication of missing or broken parts. Given the small scale of most cast iron, zinc and lead ornaments and fasteners, new molds can be taken directly from the surviving originals. The shrinkage factor that results in casting would be negligible at this small scale. Some specialty companies also produce stock designs of cast ornamental elements that may prove suitable replacements for missing metalwork. The larger cast iron panels and posts of the tomb enclosures would require the expensive creation of new patterns to retain the same dimensions of the cast replicas.

While zinc is still a viable material for recasting, zinc-aluminum alloys would provide greater durability and strength and protect against possible future breakage.
from vandalism. Cast iron should be used to replicate missing cast iron elements given its low material cost and strength. Despite its lower shrinkage, cast aluminum should not be used to replace cast iron as it will corrode in contact with cast and wrought iron and painted finishes will adhere poorly to it.

The most obvious case where a substitute material is called for is that of the decorative lead shoe at the base of the railing posts. These have been a problem since their installation due to galvanic action between the two metals causing the iron to corrode preferentially. This results in weakened attachments and eventual collapse of the metalwork.

To address this problem, a more durable zinc aluminum alloy replacement would be justified in this very vulnerable application and would look similar to the lead originals. Whereas the lead bases were cast-on the posts after installation, the higher melting temperatures of the zinc-aluminum alloy...
would require the use of pre-cast shoes at
installation. The simpler shoe designs can
also be obtained from suppliers in cast iron.
In either case, this will require removal of
the railing for fitting; however most post
insets are loose and the stone threshold or
curbing cracked. Removal would allow
repair to the corroded post ends, installation
of the new decorative bases, and
reinstallation in the repaired stone supports
(see Stone Guidelines). This multiple
repair remains among the most urgent and
critical of all preservation activities in the
cemetery.

With all replacement, an economy of scale
could be achieved if a series of elements
could be contracted for replication,
warranting the construction of specialized
tooling and methodologies required for
quick and accurate fabrication.
### Guidelines – Metalwork

<table>
<thead>
<tr>
<th>Do’s</th>
<th>Do Not’s</th>
</tr>
</thead>
<tbody>
<tr>
<td>DO take measures to stabilize the metalwork and prevent needless additional damage. Take temporary measures to secure loose parts and maintain the finishes.</td>
<td>DO NOT jeopardize the integrity of the metalwork by using inappropriate materials and metalworking technologies that might permanently damage the metalwork.</td>
</tr>
<tr>
<td>DO inspect the metalwork periodically for any signs of deterioration and take immediate measures to arrest its progress.</td>
<td>DO NOT ignore the context of the metalwork. This includes such issues as anchoring to shifting masonry, site drainage, visitor wear and tear and collaboration with other stakeholders on the general management of the cemetery.</td>
</tr>
<tr>
<td>DO repair damage and report theft immediately and take measures to forestall repeated aggression.</td>
<td></td>
</tr>
<tr>
<td>DO limit yourself to work for which you are qualified and which you can do safely.</td>
<td></td>
</tr>
<tr>
<td>DO enlist the aid of qualified professionals, especially in the beginning to help devise a conservation plan for the enclosure.</td>
<td></td>
</tr>
</tbody>
</table>
Ground Surface

Many of the tombs repaired in the past 20 years have had the marble or grassy precinct replaced with a concrete slab in the mistaken belief that the impermeable material would keep the problem of rising damp from occurring. The impact on the tombs and on the site as a whole has been dramatic, as the practice has become widespread.

The water table is very close to the surface in the cemetery. Covering the surface with cement serves to reduce the ability of the ground to evaporate moisture, but does not change the fact that the ground water is right below the tomb providing a ready source of moisture for rising damp. The interior structure of highly porous bricks, with numerous capillary sized pores, is a powerful water absorber, and will overcome gravity to pull ground water into the structure.

It is time to re-evaluate this practice. The historical character of the site was one of a permeable grassy space with crushed shell walkways. As time has passed, the tombs have slowly subsided into the damp earth, some have acquired a slight tilt, but most have not. If these individual tomb maintenance practices continue at the current rate, in 30 to 50 years most of the site will be covered in concrete, an impermeable surface. The very character of the site will have been irreparably altered, and the long-term condition of the masonry possibly worsened.

Although crushed shell is no longer available in New Orleans, one alternative ground cover material is crushed limestone. A mixture of powdered stone and pieces of limestone smaller than 1½” was laid on the path of Alley 9L during the 2002 Save America’s Treasures restoration project. The crushed stone provides

Early tomb now surrounded by a concrete pad.
a natural-looking path that packs and drains well; a good substitution for the shell of the past. The material is also inexpensive and readily available.

**Plantings**

As in the case of domestic architecture, a range of garden features, such as planters, accompanies the various types of tomb that have developed in the cemetery. Used for both visual and olfactory decoration of the tomb and cemetery as a whole, gardens played an important role in the design of the tomb, and specialized plant palettes encoded with the language of mourning were used as part of this design.

By the middle of the nineteenth century, the cemetery had become increasingly urban. The loss of the cemetery’s pastoral quality led to an increased allocation of the purchased tomb area to be used to endow the tomb with its own landscape setting, often distilled to the symbolic placement of a few plants, a shrub, or even plant cuttings attached to the tomb itself. The design of these garden spaces accompanying the tombs varied with the design of the tomb and with the precinct area surrounding the tomb. Gardens are present in the form of aboveground containers, below-ground containers, accompanying beds, and associated landscape features.

Family memories and documents may describe the traditional flowers used in the planters and to make the immortelles placed on the tomb for All Saints’ Day and other special occasions. If the precinct has not been paved over, consider re-establishing the grass and plantings and add a crushed limestone ground cover where shell once existed. A variety of evergreen and deciduous trees and shrub species traditionally associated with the cemetery are suggested, including *Quercus agrifolia*, *Magnolia grandiflora*, *Magnolia soulangiana*, *Lagerstroemia indica*, *Phoenix spp.*, *Gardenia jasminoides*, *Rhododendron spp.*, *Azaleas spp.*, as well as various annuals indigenous to New Orleans. Plants and trees with invasive roots should be avoided, as they can damage tomb masonry.

If the precinct has already been paved in concrete, consider removing it during the restoration project.
Further information on planting can be provided by a landscape architect or horticultural specialist.

New palm plantings have been made recently in the Protestant section, 2002.
### Guidelines – Tombscapes

<table>
<thead>
<tr>
<th>Do’s</th>
<th>Do Not’s</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>DO</em> care for landscaping adjacent to the tombs. Caution must be</td>
<td><em>DO NOT</em> use herbicides, as they can cause deterioration of masonry and corrosion of metals, in cases where contact might occur.</td>
</tr>
<tr>
<td>taken with power equipment near masonry or iron work. Grass and</td>
<td><em>DO NOT</em> undertake such interventions that create a discordant appearance in the cemetery landscape.</td>
</tr>
<tr>
<td>ground cover should be cut with nylon filament trimmers only.</td>
<td><em>DO NOT</em> attempt to excavate around the tomb.</td>
</tr>
<tr>
<td><em>DO</em> preserve shell paths where they survive.</td>
<td><em>DO NOT</em> repave with concrete.</td>
</tr>
</tbody>
</table>