

Metalwork in the Historic Cemetery

Some amount of metalwork can be found in most cemeteries. The two most common types of metal encountered are cast iron and wrought iron. For a thorough understanding of metals and their maintenance, we recommend the National Park Service (NPS) Preservation Brief No.27, *The Maintenance and Repair of Architectural Cast Iron*. Preservation Briefs are available at the National Park Service website; or use this link to Brief No.27: <http://www.nps.gov/hps/tps/briefs/brief27.htm>

The Maintenance and Repair of Architectural Cast Iron, on page 4, identifies cast iron as “an alloy with a high carbon content . . . that makes it more resistant to corrosion than either wrought iron or steel. In addition to carbon, cast iron contains varying amounts of silicon, sulfur, manganese and phosphorus.” Molten iron for casting was poured into molds and when cooled became a hard, brittle, but strong metal. It is cast iron's ability to be molded that allowed the production of much of the ornamental fencing, gates, and other decorative items found in a cemetery.

This Preservation Brief also describes wrought iron as “...relatively soft, malleable, tough and readily worked by forging, bending and drawing.” It is much lower in carbon content than cast iron, usually considerably less than one percent.

Cast Iron Characteristics:

- complex in form
- can be very large
- uniform in appearance
- may have mold lines
- may have flashing, casting flaws, and air holes
- frequently repetitive in design (fence sections)
- pieces often bolted or screwed together
- tends to have a sand-like finish

Wrought Iron Characteristics:

- one of a kind, hand-worked items
- shows hammer or rolling marks
- softer and malleable
- simpler in form and detail
- tends to be used for smaller objects

Condition Assessment

A cemetery condition assessment should include the condition of fences, gates and other metal features. Closely inspect and record the condition of all metal items, including the bolts, fasteners and brackets. Keep in mind that metal feature repair should be done by individuals who are trained in proper techniques for each type of metal and trained to handle the hazardous materials found in both the original finishes and the chemicals needed to properly clean iron before repainting.

Corrosion

- Oxidation/Rust:** The most familiar form of corrosion occurs when the metal comes in contact with moisture. Other airborne elements such as carbon dioxide, soot, and sulfur compounds will hasten the deterioration.
- Galvanic:** Electro-chemical or galvanic corrosion occurs when two differing metals come into contact with one another and an electrolyte, such as water containing salts. In this type of corrosion, the carbon present in the cast iron combines with the other metal and the iron is dissolved as rust.
- Graphitization:** Although less common, this type of deterioration can be seen on cast iron. Test for this condition by carefully scraping the surface to reveal the crumbling of the iron beneath.

Cleaning, Paint Removal, and Painting

NPS Preservation Brief No.28, *Painting Historic Interiors*, page 13, recommends: “Before undertaking any project involving paint removal, applicable state and federal laws on lead paint abatement and disposal must be taken into account and carefully followed. State and Federal requirements may affect options available to owners on both paint removal and repainting.” If the condition assessment determines the damage is minimal, then hand brushing with a stiff brush may be all that is necessary. Always remember to start with the gentlest means possible with whatever cleaning is necessary. More deteriorated elements could be cleaned by a professional or a rust stabilizer can be used instead. A rust stabilizer is the preferred alternative to removing all the rust by hand in that it removes the least amount of the original metal surface and is less labor intensive than hand removal. A rust converter is applied like spray-on paint. When cured, it accepts the topcoat of paint well. The use of a rust converter also assures that tiny cracks and pits are sealed.

General Repair Considerations

Volunteers can perform surface cleaning and painting of metal elements; however, most other repairs require professional expertise.

The following description of common repairs and accepted methods should help clarify when a professional conservator is needed:

- **Repairing internal areas of balustrades, statues, and other features.** Never fill cast iron cavities with concrete. As concrete cures, it shrinks, leaving a gap where moisture will collect. Also, it dries slowly, thereby retaining moisture for some time that may lead to corrosion.
- **Repairs requiring welding.** Wrought iron is easy to weld because of its low carbon content. Cast iron is rigid and when one area is heated the surrounding unheated area resists and cracks. Spot welding is not recommended.
- **Brazing.** This is a suitable alternative to welding; however, a professional should evaluate the fixture to determine feasibility of this method.
- **Replacing screws, nut and bolts.** Replacement should always be with a high quality stainless steel. Where new holes are needed, they should be drilled slightly larger in diameter to allow for contraction and expansion. All new hardware should be coated with the coating used on the rest of the feature.
- **Sealing joints.** After cleaning, all joints need to be sealed to prevent moisture penetration. A polyurethane elastomeric sealant is appropriate.

Paint and Coating Systems

Rust is the main cause of deterioration for both cast and wrought iron. Rust cannot be totally prevented but its return can be substantially delayed with the proper techniques.

Below are elements of a good coating treatment:

- Remove as much rust as is reasonably possible.
- Seal the cleaned metal with a rust converter or rust inhibiting primer. Two coats should be applied.
- Apply paint in multiple, thin coats. Historical accuracy is important in choosing both color and finish.
- Flat black paint, applied with a brush, assures appropriate finish and texture.
- Alkyd-based paints and primers are the present recommended choice as latex based products can cause immediate oxidation when they come in contact with bare metal.