Inside-Out
The Inside Scoop on your Outdoor Sculpture

All images by Karen Fix, unless otherwise noted.
TOPICS TO COVER

Identifying Metals
- Zinc
- Cast Iron
- Bronze

Types of Deterioration
- Inherent Vice
- Vandalism
- Failure of Coatings
- Corrosion

Bronze Maintenance/Treatment
- Repatination
- Cleaning
- Hot Wax
- Incralac
- Cold Paste Wax

Plaques

Identifying Stone

Types of Deterioration
- Inherent Vice
- Vandalism
- Corrosion
- Neglect
- Biodeterioration

Stone Maintenance
- Cleaning

• Safety
• Documentation
• Final Thoughts
POLL #1

What type of institution or clientele do you represent?
POLL #2

What are your roles/responsibilities regarding maintenance of outdoor sculpture?
POLL #3

What are your monuments made of?
Identifying Metals
Which Metal Is It?

Zinc

Stainless Steel

Cast Iron

Bronze
Zinc
Cast Iron
Bronze
Typical Historic Bronze Recipe:
85-90% Copper
10% Tin
< 10% Zinc/Lead
BRONZE
Casting in Sections

[Images of bronze casting and sculptures]
BRONZE
Orpheus
Fort McHenry Nat'l Monument, Baltimore, Maryland
Charles H. Niehaus, 1922
Types of Deterioration
INHERENT VICE: Poor Foundry Work
Mississippi Monument
Vicksburg Nat’l Military Park, Mississippi
Frederick E. Triebel, 1912

Front
After Treatment

Back
After Treatment
INHERENT VICE: Poor Foundry Work – Residual Investment Material
Galvanic Series

Least Reactive:
- Platinum
- Gold
- Silver
- 316 Stainless Steel
- Chromium Plating
- Nickel
- Copper
- Cast Iron
- Lead
- Tin
- Iron (Carbon Steel)
- Zinc
- Aluminum

Most Reactive:
- Copper
- Iron (Carbon Steel)
INHERENT VICE: Metal to Metal Corrosion

Abstract
Staten Island, New York
Charles Reina, 1977

Galvanic Series

LEAST REACTIVE
Platinum
Gold
Silver
316 Stainless Steel
Chromium Plating
Nickel
Copper
Cast Iron
Lead
Tin
Iron (Carbon Steel)

MOST REACTIVE
Zinc
Aluminum
INHERENT VICE: Metal to Metal Corrosion
VANDALISM: Theft
Griffin A. Stedman
Hartford, Connecticut
Fred Moynihan, 1900
VANDALISM: Theft

Lots of Research!
VANDALISM: Graffiti

Sharpie Permanent Marker

Spray Paint

Scratching
COATING FAILURE: Incralac
COATING FAILURE: Wax
CORROSION: Environmental Causes - Contamination by Chlorides
CORROSION: Human & Animal Activity: De-Icing Salts, Urine

Agapetime
Lowell, Massachusetts
Dmitri Hadži, 1980s
CORROSION: Human & Animal Activity - Bird Guano

Left: Abstract
San Francisco, California
Jacques Overhoff, 1976

Right: Untitled
Bronx, New York
Inge Hardison, 1972
CORROSION: Natural Patina

Stage 1:
Foundry Patina

Stage 2:
Copper (I) Oxide
Cuprite

Stage 3:
Copper (II) Oxide
Copper Sulfide

Stage 4:
Copper Sulfate
CORROSION: Natural Patina

1999
1946
1920

copper sulfate

copper sulfide
Bronze Maintenance And Treatment
BRONZE TREATMENT: Repatination
Similar techniques then and now... minus the cigarettes and bushy beards...
BRONZE TREATMENT: Repatination

From “Patinas for Silicon Bronze”, Patrick V. Kipper
BRONZE TREATMENT: Repatination
General Fitz John Porter
Portsmouth, New Hampshire
James Edward Kelly, 1904
BRONZE MAINTENANCE: Cleaning
BRONZE MAINTENANCE: Cleaning
Colonel William Prescott
Boston, Massachusetts
William W. Story, 1880
BRONZE MAINTENANCE: Cleaning - Power Washing

POWER WASHING BRONZES
Rules of Thumb:

~2500 psi (hot water is better)

45° fan tip spray wand

Hold wand at least 12” away from object
BRONZE MAINTENANCE: Cleaning - Steam Cleaner
Farragut Monument
Cornish, New Hampshire
Augustus Saint-Gaudens, 18??

STEAM CLEANING BRONZES
Rules of Thumb:
De-ionized Water
LASER CLEANING BRONZES

What you Need:

A reliable power source, ie: a generator when working outside

Safety goggles for operators, barriers (eg: thick black plastic or portable laser screen panels) to protect passersby within 100ft

Good weather: portable lasers don’t like the rain, and some lasers have a max. operating temp. (eg: not to exceed 25° C)
CO2 CLEANING BRONZES

What you Need:

A reliable power source, ie: a generator when working outside
A compressor
A dry ice container and dry ice cleaning machine
PPE (safety goggles, hearing protection, gloves) for operators
Scoops and buckets
BRONZE MAINTENANCE: Hot Waxing

Hot WAX RECIPE
*Mix it up in a Crockpot!*

71% Bareco Victory wax (white or brown) microcrystalline
13% Polywax 500 polyethylene
13% Petronauba-C synthetic carnauba
3% Cosmoloid 80H microcrystalline
BRONZE MAINTENANCE: Hot Waxing
Adams Memorial (copy)
Cornish, New Hampshire
Augustus Saint-Gaudens, 18??
Hot Waxing Videos 1-4
BRONZE MAINTENANCE: Hot Wax in Paste Form
BRONZE MAINTENANCE: Incralac
BRONZE MAINTENANCE: Sacrificial Cold Paste Waxing
Cold Waxing Video
BRONZE MAINTENANCE: Patination, Hot Wax, or Incralac?

Isis, Goddess of Life
Herbert Hoover Nat'l Historic Site, West Branch, Iowa
Auguste Puttemans, 1922

Miguel Hidalgo Y Costilla
San Francisco, California
Juan Fernando Olaguibel, 1962

General Philip Henry Sheridan
Albany, NY
J.Q.A. Ward & Henry Bacon, 1916
Plaques
PLAQUES: What to Aim for...

The Good

The Mediocre

The Fails
Stone
Which Stone Is It?

Concrete

Sandstone

Marble

Granite

Polished Granite
Type of Deterioration
INHERENT VICE: Calcareous Deposits
George Washington (copy)
Kansas City, Missouri
Henry Shrady, Wight & Wight/1935
INHERENT VICE: Gypsum Crusts
Christopher Columbus
White Plains, New York
Peter Celi/1915
INHERENT VICE: Exposed Armature
Florence Nightingale
San Francisco, California
David Edstrom/1937
VANDALISM: Graffiti/Overpainting
Florence Nightingale
San Francisco, California
David Edstrom/1937
VANDALISM: Graffiti
Thomas Starr King
San Francisco, California
Daniel Chester French/1892
VANDALISM: Graffiti Ghosts, Power Washing Abrasion
Bunker Hill Monument
Boston, Massachusetts
CORROSION: Human & Animal Activity: Bird Guano
Con Edison Door Header
NEGLECT: Open Mortar Joints, Inappropriate Mortar Mix
BIODETERIORATION: Biogrowth
Battle Monument
Minuteman Nat’l Historic Site
Concord, Massachusetts
7/1836
BIODETERIORATION: Loss of Stone Binder due to Biogrowth

Orpheus
Vanderbilt Mansion Nat'l Historic Site, New York
Stone Maintenance
STONE MAINTENANCE: Cleaning
Safety
SAFETY: OSHA Training
# SAFETY: Know the Risks

## JOB SAFETY ANALYSIS

<table>
<thead>
<tr>
<th>National Historic Site: Sagamore Hill</th>
<th>Name of Department: doing the work: NPS. NE (HACE)</th>
<th>Project description: Remaining work from the rehabilitation Project</th>
<th>DATE: 1/3/2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syosset Hospital</td>
<td>Oyster Bay Fire Department</td>
<td>Centre Island Police Department</td>
<td>HACE Emergency contact</td>
</tr>
<tr>
<td>221 Jericho Tpke, Syosset, NY 11791</td>
<td>188 South St, Oyster Bay, NY 11771</td>
<td>100 Centre Island Rd, Oyster Bay, NY 11771</td>
<td>Phone: (516) 922-6496</td>
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</table>

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<tr>
<th>SUPERVISOR:</th>
<th>ANALYSIS BY:</th>
<th>REVIEWED BY:</th>
<th>APPROVED BY:</th>
</tr>
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<table>
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<tr>
<th>Job Task</th>
<th>POTENTIAL HAZARDS</th>
<th>RECOMMENDED ACTION OR PROCEDURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working on wood finishes that require the use of paints, solvents, waxes, fillers and cleaners.</td>
<td>Chemical Exposure to vapor, mist, fumes Eyes, skin and respiration irritations Fires</td>
<td>PPE Safety glasses, chemical resistant cloves, Ventilate work areas Store chemicals in fire cabinet Allow used rags to dry out before disposal Dispose used rags in a fire rated container Eye wash and first aid kit MSDS recommendations</td>
</tr>
<tr>
<td>Working on scaffold in the north room and on stair case at heights six feet or greater.</td>
<td>Falls from Elevations Being struck by falling objects Scaffold shifting</td>
<td>Use guard rails at work platform or use Fall Protection (harness and lanyard) Caution tape off work area six feet from scaffold, or hard hats within caution area Scaffold on wheels, wheels need to be locked at all times when not moving.</td>
</tr>
</tbody>
</table>

| Use of tools that require electricity. Buffers, heat guns, lights, fans and more | Electrical Shock. Contact with exposed conductors or a device that is incorrectly or inadvertently grounded. Trip hazard from extension cords Fire from excessive heat from temporary portable | Use GFI receptacle Inspection of tools before each use Pick up all extension cords at the end of each day Do not, lay extension cord across door and stair ways. Use LED portable lights |

| Ergonomics (Strain) continuous/ repetitive motion while waxing, buffing or finish prep | Damage of tissue due to over exertion (strains and sprains) or repetitive | PPE: Knee pads Take 5-minute breaks every 30 minutes |

| Access to each floor including basement | Fall (Slip, Trip) | Inspect and correct any conditions that can result in falls (impacts) from height or traditional walking surfaces (such as slippery floors, poor housekeeping, uneven walking surfaces, exposed ledges, etc.) |
Documentation
Final Thoughts

- A plan for regular maintenance is crucial.
- Give the object the same respect and care given to any sculpture found in a museum.

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