Conservation of American Tinplate: A 19th-Century Chandelier
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ABSTRACT
This poster explores the recent treatment of a 19th-century tinplate chandelier in the Winterthur Museum collection. The object was removed from its permanent display location in one of the Period Rooms in 2011 due to several failed solder joints and ongoing corrosion. Treatment addressed the structural instability and aesthetic condition through the stabilization of loose and detached elements, corrosion inhibition, and preservation of the painted surface. Traditional conservation treatment methodology of plated metal objects was employed along with the additional use of the aminoalcohol class of corrosion inhibitors.

HISTORICAL CONTEXT

What is Tinplate?
The term tinplate refers to sheet iron with a layer of tin or a lead-tin alloy applied to its surface as a sacrificial metal and corrosion inhibitor. The term tinplate object. The three-tiered form surviving example of a commissioned museum. This chandelier, purchased Chandelier on display in the Hall of Statues, Winterthur Museum.

Tinplate at Winterthur
Common American domestic wares were often made from tinplate until the mid-20th century. They ranged from highly decorated to bare-metal surfaces. Henry Francis du Pont, founder of Winterthur Museum, amassed a large collection of tinplate to be displayed in the historic house museum. This chandelier, purchased in 1929 by Mr. du Pont, is a rare surviving example of a commissioned tinplate object. The three-tiered form suggests that it was made to be used as a public-space fixture, possibly in a theater. The chandelier was on display for many years on an open-air porch that was later closed in to become the Room known as the Hall of Statues.

OBJECT CONDITION AND TREATMENT METHODOLOGY

Object Condition
Detailed the chandelier was in tiff condition prior to treatment due to several structural breaks and ongoing corrosion. Specifically, two solder joins on the lower tier as well as several solder joins connecting studs to the central column had failed. Significant corrosion had led to embrittlement of the metal overall and appeared to be ongoing in several areas. The original paint layers, where present, were friable, and a decorative scroll element was missing from the lower tier. There was also a significant layer of surface grime on the object.

Surface Cleaning and Consolidation
A two-part cleaning system incorporating mechanical and solvent methods allowed for the balance of gentle and effective cleaning. A HEPA-filtered vacuum fixed with a rheostat was used in conjunction with soft brushes to remove large-particulate grime. Polyurethane cosmetic sponges dampened with petroleum benzine were used to lift fine, embedded grime.

The cross section samples shown in visible light (left) and UV (right) reveal iron and tin corrosion products (orange and silver/grey), and two distinct paint layers. A ramshackle layer (cream-colored) is visible at the top right under UV.

Table 1. Consolidant Systems Tested

<table>
<thead>
<tr>
<th>Condensate Tested</th>
<th>Surface Result</th>
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</thead>
<tbody>
<tr>
<td>Paraloid® B-48N</td>
<td>Saturated/grey</td>
</tr>
<tr>
<td>Paraloid® B-48N</td>
<td>Saturated/grey, less than 5%</td>
</tr>
<tr>
<td>Paraloid® B-48N (1.75% w/v in ethanol)</td>
<td>Branched white</td>
</tr>
<tr>
<td>Paraloid® B-48N (10% w/v with 1% starch) in 95% Shell-sol A100 and 5% ethranol</td>
<td>Saturated</td>
</tr>
</tbody>
</table>

The friable paint and varnish layers required consolidation—eventually achieved with a 1.75% (w/v) solution of Paraloid® B-48N in acetone. Consolidant mixes were tested on study collection objects to attain the correct sheen, strength and saturation (Table 1).

Structural Repairs
Structural repairs were made using a variety of materials and techniques. Materials chosen possessed the optimal working properties to impart the necessary strength, flexibility, color and sheen for the chandelier and could be manipulated in a variety of ways.

Direct Application (via brush):
- 40% Paraloid® B-48N
- Clamp to dry
- Mends reinforced with toned Japanese paper

Adhesive Injection (via syringe):
- 40% Paraloid® B-48N
- 3M Glass Bubbles
- Dry Pigments
- Adhesive injected into cracks or to bridge small gaps

Aesthetic Loss Compensation
- Single-ply matboard toned with Golden® Fluid Acrylics covered with Japanese paper, also toned with acrylics
- 20% Paraloid® B-48N used to affix the scroll element
- Dried under weight

In addition to the Paraloid®, 2-((2-oxoethyl)amino)ethanol was delivered in a 5% (w/v) solution of the inhibitor in Shell-sol D-38 to all exterior surfaces. It was delivered a 1% (w/v) solution of the inhibitor in Shell-sol D-38 drop-wise via nebulizer to the column, relying on the vapour-phase deposition.

Microcrystalline Wax:
Because the effectiveness of the aminoalcohols has not been extensively tested in open systems, a secondary protective coating was applied to the exterior metal surfaces. Several modes of application were tested, as the gel-based aminoalcohol was soluble in nonpolar solvents, thereby avoiding disruption of the painted surface.

Application methodology:
- Brush-applied a 1% (w/v) solution of the inhibitor in Shell-sol D-38 to all exterior surfaces.
- Delivered a 5% (w/v) solution of the inhibitor in Shell-sol D-38 drop-wise via nebulizer to the column, relying on the vapour-phase deposition.

Corrosion Inhibitors
The passivation of the metal was carried out in a two-part system that included the application of an aminoalcohol-based corrosion inhibitor followed by a microcrystalline wax.

What are aminoalcohol-based corrosion inhibitors?
They are mixed inhibitors that form an adsorptive film to exclude aggressive ions from the surface in low weight percentages. Volatile and non-volatile species exist, allowing for a range of application techniques. The aminoalcohols were developed for and are used extensively in the concrete industry to protect steel embedded in cementitious matrices. However, they have not been extensively researched in a conservation context.

Why an aminoalcohol?
- Little aesthetic change
- Wide range of solvent miscibility
- The selected species, 2-(tertButylamino)ethanol, is soluble in nonpolar solvents, thereby avoiding disruption of the painted surface.

Installation
Candles and Re-hanging
After consultation with curator Ann Wagner, it was decided that candles would be added to the chandelier to provide a historically accurate aesthetic. Careful consideration was given to the height and weight that was appropriate for each candle. candles were modified to 3.5” by cutting and burning the ends. This modification lessened the weight load on the fragile arms. The candles were individually modified to fit loosely into each cup and were wrapped with an insulating layer of Parafilm® M before they were installed. To lessen the appearance of a weight load on the fragile arms, the candles were associated with moving the chandelier with the extra weight of the candles in place. They were installed just prior to the re-hanging of the chandelier in the Hall of Statues.

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Photo Credits: Bartosz Dajnowski and Crista Pack (before treatment), Jessica Ford (corrosion inhibitor), Jim Schneck (studio photography assistant and chandelier installation)