

ACETONE-ROSIN TREATMENT FOR WATERLOGGED WOOD

by Brian R. Howard*

A brief review and assessment of an Acetone-Rosin treatment of a waterlogged nineteenth century coffin from the First African Baptist Church Cemetery excavation; treated in 1985.

Introduction

In November of 1980, workmen involved in Philadelphia's Vine Street Expressway Improvement Project exposed a simple wooden coffin during a tunnel excavation. Archaeologists on site from John Milner Associates, site engineers and city representatives reached a joint decision, halting construction and temporarily securing the area.

Historical research established that this previously unknown burial ground had been associated with the First African Baptist church which occupied the site at Eighth and Vine. The congregation used a portion of this site as a cemetery from approximately 1823 to 1842.(1) Records indicate the Board of health prohibited additional burials due to the crowded state of the graveyard.(2)

The site was determined eligible to the National Register of Historic Places because of its potential yield of information concerning the acculturation, mortality and health among the African-Americans of Philadelphia during this period. Excavation, analysis and documentation of the cemetery were performed during the summer months of 1983 and 1984 by John Milner Associates under the auspices of the Redevelopment Authority of the city of Philadelphia and supplemented by funds from the Pennsylvania Department of Transportation and the Federal Highway Administration.

Burial Conditions

During excavation, it was determined that all undisturbed burials were of a standard type with the individuals in a supine position, placed, typically, in a pinch-toe coffin. These were constructed, *having* either a flat or gabled top, and made from a variety of soft and hardwoods.(3)

Burials ranged in depth from 1.5 feet to 8.0 feet below grade.

Burials were customarily stacked one atop another in grave pits on the urban cemetery due to the scarcity of suitable and undeveloped land. "In London, the public graves in 1842 were...up to thirty feet deep; the first corpse interred was succeeded by another, and up to sixteen or eighteen...when the top most grave was within two feet of the surface, the pit was considered full."(4)

Certainly, the burial ground of the First African Baptist Church, was not nearly as crowded as that previously described; however, the site plan shows that multiple burials in a single grave pit existed. (See figure 1).

The soil conditions were of a clay matrix. The site, during the eighteenth century, had been a clay pit and when closed was subsequently filled with a heavy brown clay from the construction of cellars in the surrounding area.

In spite of the homogeneous nature of the soil, ease of excavation varied extensively. Near the surface, "the clay fill material had the consistency of adobe when dry" and made digging..."a tedious and time consuming activity."(5) Excavation of the deeper burials were considerably less tedious, as a result of the "perpetually moist soil conditions."(6) Organics found in these lower levels were much better preserved because of continued high moisture and near anaerobic conditions found in clay.

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Object Condition

The coffin from burial 98 was in quite good condition considering its 150 years of burial in a northern temperate. Certainly, the one-half inch thick poplar boards exhibited the characteristics of severe degradation. The pieces exhibited excessive surface sculpturing, and were spongy, and fragile.

The cellular structure of the wood had been infiltrated by soil particles and the deposition of mineral substances had considerably altered the color and internal constituents of the cells and tissues of the wood.(7)

Six of the thirteen flat sawn poplar boards were either split in two or had minor losses along ends or edges.

Interior surfaces were covered with a thick layer of fungus.

The iron fasteners, which originally held the coffin boards together, were completely corroded.

Treatment

Several criteria were considered in determining the specific method to be used to treat the waterlogged coffin. First, long term stability, in conditions not under the conservators control; the final appearance of the wood after treatment and the ability to use a variety of adhesives or fillers to present the treated coffin in an acceptable exhibitable form.

The more commonly used Polyethylene Glycol presented concerns in several of those areas. The wood becomes heavy and dark and the surface is waxy to the touch. The waxiness, limits the use of adhesives and filler used in subsequent phases of treatment.

The "Acetone-Rosin Method for the Treatment of Waterlogged Wood" by T. Bryce and H. McKerrell published in the *National Maritime Monograph*, Number 16 - 1975 described a rather straightforward treatment which seemingly met those desired attributes in surface characteristics, visual impact, and left the wood non-hygroscopic. Also, McKerrell's treatment employed the use of dilute acid and solvent baths to reduce cellular blockage in the wood, typically produced by burial conditions. (9)

One preliminary step was added to McKerrell's treatment; that being a water bath containing a fungicide used to reduce the extensive fungal growth found on the wood.

- 1. Water Bath** — The pieces of wood were placed in a water bath containing ortho-Phenyl Phenol at a concentration of 500-700 ppm.
- 2. Water Rinse** — After seven days, the pieces rinsed under running water, using a soft bristle brush to remove soil and remaining mold growth.
- 3. Acid Bath** — The wood was then placed in a dilute acid bath of 3% HCl (w/w), for a period of seven days.
- 4. Water Rinse** — A flow of fresh water was introduced into the tank for six days to remove the HCl.
- 5. Dehydration with acetone** — Three successive baths of one week duration per bath.
- 6. Impregnation with rosin** — The temperature of the acetone and rosin were elevated to 52 degrees C. The process of elevating the temperature increased the solubility from 40% w/w at room temperature to 67% w/w. (The vapor pressure of the acetone above a saturated rosin bath is much lower than for the pure solvent at room temperature). A period of four weeks were required for complete penetration of the rosin into the cellular structure of the wood.

7. **Surface removal of excess rosin** — The pieces were removed one at a time from the heated bath. Acetone was used with a soft bristle brush to remove excess rosin. They were then air dried for one week.
8. **Reduction of surface sheen** — The high gloss which remained on the surface of the wood was reduced using methylene chloride.
9. The pieces were then adhered to an internal support using a reversible adhesive.

Results

The acetone-rosin treatment produced individual pieces which were quite strong and light, both in weight and color. The edges of the individual pieces had been extensively damaged by decay and could not be assembled in the original manner. This condition prevented the use of most adhesives, regardless of their gap filling capabilities.

Treatment continued with the construction of an internal Lexan support, upon which the boards were adhered using a mixture of rosin and beeswax (2:1).

Recently the Historical Society of Pennsylvania has placed the infant's coffin from burial 98 on display, as part of an exhibit entitled "The New Immigrants". Four years after treatment the only visible change was a minor shrinkage crack on one of the four top boards. This crack was approximately 1" long by 1/32" wide running across the grain.

During storage and handling, one of the boards became detached from the Lexan, shearing from the polycarbonate and remaining firmly attached to the rosin-treated wood. Small dots of RTV Silicone Rubber could also be used and produce an adhesive bond somewhat more resistant to shock.

Footnotes

1. Parrington, et al., *The First African Baptist Church Cemetery*, Vol. I., John Milner Associates, Inc. 1987, p. 30.
2. *Ibid.*, p. 31.
3. *Ibid.*, p. 68.
4. *Ibid.*, p. 159.
5. *Ibid.*, p. 72.
6. *Ibid.*, p. 73.
7. Gratten, D.W. "A Practical Comparative Study of Several Treatments for Waterlogged Wood," *Studies in Conservation*, Vol. 27, 1982, p. 124-136.
8. Parrington, et al., *First African Baptist Church Cemetery*, Vol. II., John Milner Associates, Inc., 1987, p. 4.
9. T. Bryce and H. McKerrell., "The Acetone-Rosin Method for the Conservation of Waterlogged Wood and Some Thoughts on the Penetration of PEG into Oak," *National Maritime Museum Monograph*, No. 16, 1975, pp. 35-43.