NBSIR 74-438

# Pilot Demonstration of Lead Based Paint Hazard Elimination Methods

Report on Field Study No. 2

T. H. Boone, T. R. Ray, W. G. Street

Center for Building Technology
Institute for Applied Technology
National Bureau of Standards
Washington, D. C. 20234

December 1973

Final Report

Prepared for
**Office of Policy Development and Research**
**Department of Housing and Urban Development**
**Washington, D. C. 20410**

NBSIR 74-438

# PILOT DEMONSTRATION OF LEAD BASED PAINT HAZARD ELIMINATION METHODS

Report on Field Study No. 2

T. H. Boone, T. R. Ray, W. G. Street

Center for Building Technology
Institute for Applied Technology
National Bureau of Standards
Washington, D. C. 20234

December 1973

Final Report

Prepared for
Office of Policy Development and Research
Department of Housing and Urban Development
Washington, D. C. 20410


U. S. DEPARTMENT OF COMMERCE, Frederick B. Dent, Secretary

NATIONAL BUREAU OF STANDARDS, Richard W. Roberts, Director

Contents

# List of Tables

## ABSTRACT

This report describes the removal of lead based paint from exterior surfaces of a single family attached house using alkaline/solvent thixotropic liquid paint removers followed by a high-pressure/low-volume water spray.

The extent of the reduction of the lead based paint hazard, the cost of the process and the observed problems and merits of this water wash paint removal system are presented.



Key Words: Cost analysis; housing; lead based paint; lead poisoning; surface preparation; surface refinishing; water wash paint removal.

## SI Conversion Units

The conversion factors and units contained in this report are in accordance with the Internation System of Units (abbreviated SI for Systeme International d'Unites). The SI was defined and given official status by the 11th General Conference on Weights and Measures which met in Paris in October 1960. For assistance in converting U.S. customary units to SI units, see ASTM E 380, ASTM Standard Metric Practice Guide, available from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pa. 19103. The conversion factors for the units found in this Standard are as follows:

Length

1 in = 0.0254* meter

1 ft = 0.3048* meter

1 mil = 0.001* in

Area

1 $in^2$ = 6.45.6* x $10^{-4}$ $meter^2$

1 $ft^2$ = 0.9290 $meter^2$

Volume

1 $in^3$ = 1.638 x $10^{-5}$ $meter^3$

1 liter = 1.000* x $10^{-3}$ $meter^3$

Mass

1 grain = 6.479 x $10^{-5}$ kilogram

1 ounce-mass (avoirdupois) = 2.834 x $10^{-2}$ kilogram

1 pound-mass (avoirdupois) = 0.4535 kilogram

Pressure or Stress (Force/Area)

1 inch of mercury (60°F) = 3376 $newton/meter^2$

1 $pound\text{-}force/inch^2$ (psi) = 6894 $newton/meter^2$

Energy

1 inch-pound-force (in-lbf) = 0.1130 joule

Plane Angle

1 degree (angle) = 1.745 x $10^{-2}$ radian

Power

1 watt = 1.000* x $10^7$ erg/second

Temperature

°C = 5/9 (Temperature °F - 32)

---

* Exactly

Pilot Demonstration of Lead Based Paint Hazard Elimination Methods
Report on Field Study No. 2

## 1. INTRODUCTION

Lead poisoning resulting from the ingestion of lead based paint is a serious illness and is recognized as a major pediatric disease [1]*. In January 1971, Congress enacted the "Lead Based Paint Poisoning Prevention Act" (PL 91-695) to provide federal assistance to help eliminate this disease. Title III of this Act gives the Department of Housing and Urban Development (HUD) responsibility for demonstrating methods that can be used to make leaded paint inaccessible to children.

The Center for Building Technology (CBT) of the National Bureau of Standards (NBS) is currently under an interagency agreement with HUD to provide technical support and research on the lead based paint poisoning problem. One of CBT's tasks is to demonstrate methods for the elimination of the lead paint poisoning hazard in existing dwelling units either by removal of the lead based paint or by providing a serviceable nonhazardous barrier to the existing paint.

This second pilot demonstration, under the direction of CBT's Lead Based Paint Poisoning Project, was carried out in Washington, D.C. The first pilot demonstration under this project was also conducted in Washington, D.C. and is reported in reference [2].

A specification was prepared and a contract awarded for the implementation of a exterior paint removal system consisting of the following processes:

a. The spray or brush application of a biodegradable remover solvent.

b. Rinsing with a high-pressure low-volume water spray.

c. Clean-up and disposal of the residue resulting from the above operations.

d. Repainting of deleaded exterior surfaces with a lead free paint (not more than 0.5% lead in the total paint solids).

Operational characteristics of this exterior paint removal system, which are considered of interest to potential users, are described in this report.

## 2. GENERAL DESCRIPTION

### 2.1. DWELLING UNIT

A single family attached unit at 1727 Massachusetts Avenue, S.E., owned and maintained by the National Capital Housing Authority (NCHA), was selected for a field demonstration of the removal of lead base paint from exterior surfaces. The dwelling is a two story brick residence, with basement, which was reportedly erected in the 1930's. The front includes an open wood constructed porch with hand railings and painted concrete steps. The rear exterior consists of an sunken entrance to basement area, screened-in first floor wood porch, wood steps, and a second floor porch enclosed with metal siding. Figures 1 and 2 show the unit's front and rear exteriors respectively. The interior wall and door surfaces of the back screened porch are shown in figure 3.

---

* Figures in brackets indicate the literature references at the end of the paper.

Figure 1. Front porch of pilot demonstration dwelling unit at the start of the paint removal process.

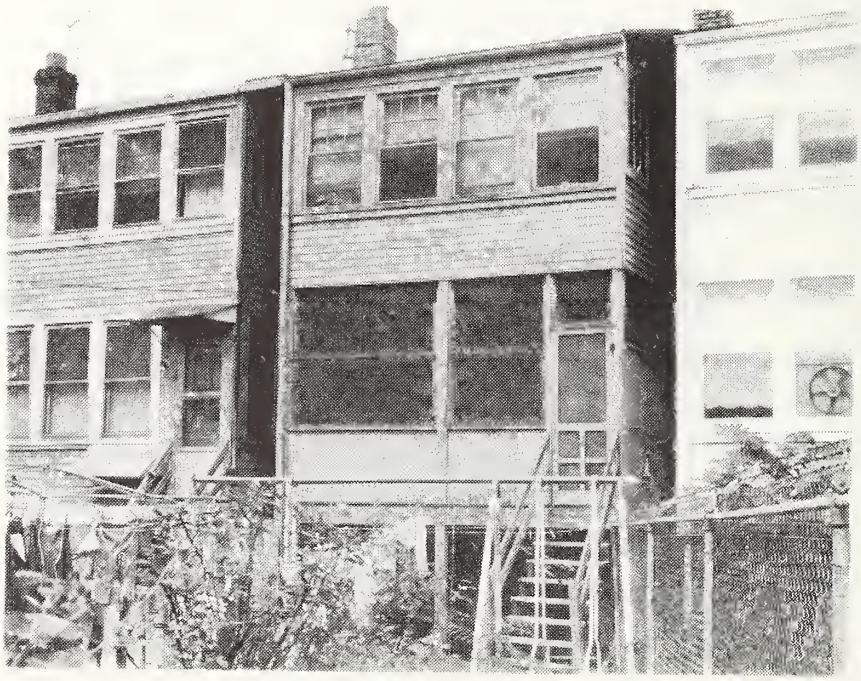

Figure 2. Back screened porch, enclosed second floor porch and basement area way of pilot demonstration dwelling unit before removal of paint.

Figure 3. Interior wall and door of back screened porch before removal of paint.

Figure 4. Application of paint remover on painted wood surfaces with spray equipment.

The specific surface areas that were deleaded are listed in table 1. The lead content present in each original painted surface was recorded in milligrams per square centimeter ($mg/cm^2$) as measured with a portable x-ray fluorescence (XRF) instrument [3,4].

## 2.2. MATERIALS AND APPLICATION

A. Water Wash Paint Removal: Alkaline/solvent thixotropic liquid paint removers were applied to all front and rear exterior painted surfaces listed in table 1. Three removers, which were supplied by one manufacturer, varied in removal strength and consistency. The removers were applied by brush or spray gun depending upon their viscosity and the accessibility of the surfaces. Less consistent materials were applied by spray equipment while removers of paste-like viscosity were applied by brush on some vertical and overhead surfaces. Figures 4, 5 and 6 are photographs taken during the paint remover application phase.

After allowing an appropriate remover dwell time (time remover remained on surface) which varied from about 20 minutes up to 5 hours (figures 7 and 8 show reaction of paint after remover dwell time of about 30 minutes), the coated surface was sprayed with water at high-pressure (1800 psi) and low-volume (5.5 gallons per minute). Figures 9 and 10 show this water spray operation. During the removal of the softened paint, using high pressure water with a 15° spray pattern, it was observed that the bare wood surfaces were being splintered. Increasing the water spray pattern to about 40° reduced this undesirable effect to a minimum. This paint removal procedure was repeated as necessary until all of the paint layers had been removed from the surfaces and the bare substrate was exposed.

All rough surfaces were hand sanded to a smooth texture. At certain points where paint had accumulated in heavy quantities as a result of multiple past repainting (such as at the base of the verticals on the front porch railing), it was necessary to manually remove the remaining softened paint residue. Figures 11 and 12 show the front porch railing on which accumulated softened paint residue can be seen at the bottom of the verticals. After completion of the paint removal process, all surfaces were allowed to dry thoroughly.

B. Paints: Paint coatings containing not more than 0.5% of lead in their nonvolatile solids were chosen to refinish wood surfaces where the old paint was removed. Exterior wood trim and surfaces (listed in table 1) except porch floors were repainted as follows: [The percent lead in the nonvolatile component of the applied paint is presented in parentheses.]

one coat - white alkyd undercoat, (0.006% lead)

one coat - white alkyd exterior finish, (0.014% lead)

Porch floors were repainted as follows:

two coats - 2 component epoxy; clear catalyst (0.000% lead) gray epoxy (0.009% lead)

Both the white alkyd primer and finish paint described above were supplied by the same manufacturer.

Table 1

Comparison of Lead Content on Exterior Surfaces
Before and After Paint Removal

(1727 Massachusetts Avenue, S.E.)

Front Porch Area

| Location | Observed XRF Readings of Lead Content ($mg/cm^2$) Before Paint Removal | After Paint Removal | After Repainting Operations |
|---|---|---|---|
| Ceiling Beam - North | 12.2 | 1.7 | 1.0 |
| Ceiling Beam - East | 13.3 | 0.0 | 0.3 |
| Ceiling Beam - West | 12.2 | 0.4 | 0.4 |
| Railings - North (top) | 8.8 | 0.4 | 1.0 |
| Railings - North (bottom) | 17.3 | 0.2 | 0.6 |
| Railings - East (top) | 13.6 | 0.0 | 0.9 |
| Railings - East (bottom) | 15.5 | 0.0 | 0.5 |
| Railings - West (top) | 16.2 | 0.2 | 0.6 |
| Railings - West (bottom) | 14.5 | 0.0 | 0.6 |
| Wall Rail Post - East | 22.4 | 4.8 | 3.6 |
| Wall Rail Post - West | 18.3 | 2.3 | 2.3 |
| Front Railing Short Post | 11.1 | 0.0 | 0.5 |
| Window - Sill | 3.2 | 0.8 | 0.9 |
| Window - Frame | 5.2 | 0.9 | 0.8 |
| Ceiling | 19.4 | 3.1 | 3.7 |
| Floor | 3.4 | 0.3 | 0.4 |
| Floor Beam - North | 15.1 | 0.3 | 0.9 |
| Floor Beam - East | 11.6 | 0.5 | 0.5 |
| Floor Beam - West | 13.3 | 0.6 | 1.0 |
| Concrete Steps | 3.7 | 0.4 | * |
| Wood Lattice - North | 1.8 | 0.8 | 1.2 |
| Wood Lattice - East | 2.4 | 0.9 | 0.5 |
| Wood Lattice - West | 1.7 | 0.4 | 0.4 |
| Front Door | 4.5 | 1.1 | 0.8 |
| Front Door - Frame | 4.7 | 0.5 | 0.4 |
| Front Door - Step | 2.7 | 0.6 | 0.7 |
| **Back Porch Area (1st Floor Level)** | | | |
| Walls - East | 8.1 | 2.1 | 0.7 |
| Walls - South | 6.2 | 0.3 | 0.6 |
| Walls - West | 8.2 | 1.3 | 0.8 |

* Determination made not to re-paint exposed concrete steps.

Table 1 (continued)

Back Porch Area (1st Floor Level)

| Location | Observed XRF Readings of Lead Content ($mg/cm^2$) Before Paint Removal | After Paint Removal | After Repainting Operations |
|---|---|---|---|
| Window - Frame (Kitchen) | 4.5 | 0.5 | 0.7 |
| Door - Kitchen (Outside) | 9.4 | 0.6 | 0.8 |
| Door - Frame (Kitchen, Outside) | 12.4 | 0.2 | 0.7 |
| Door - Dining Room (Outside) | 10.6 | 0.0 | 0.2 |
| Door - Frame (To Dining Rm., Outside) | 9.8 | 0.5 | 0.6 |
| Wall - Porch, South (Outside) | 17.6 | 1.7 | 0.6 |
| Floor - Porch | 1.6 | 0.6 | 0.7 |
| Floor - Porch Beam (Outside) | 2.9 | 0.5 | 0.6 |
| Walls - North | 2.7 | 0.0 | 0.5 |
| Walls - East | 5.0 | 0.2 | 0.5 |
| Column - Center (Wood) | 12.2 | 0.4 | 0.3 |
| Window - Frame | 3.8 | 0.6 | 0.4 |
| Door - Basement (Outside) | 5.7 | 0.0 | 0.5 |
| Door - Basement Frame (Outside) | 5.2 | 0.9 | 0.5 |
| Down Spout and Gutter | 6.1 | 0.9 | 0.7 |

Figure 5. Application of paint remover on painted concrete stairs with spray equipment.

Figure 6. Application of paint remover on painted wood railing by brush.

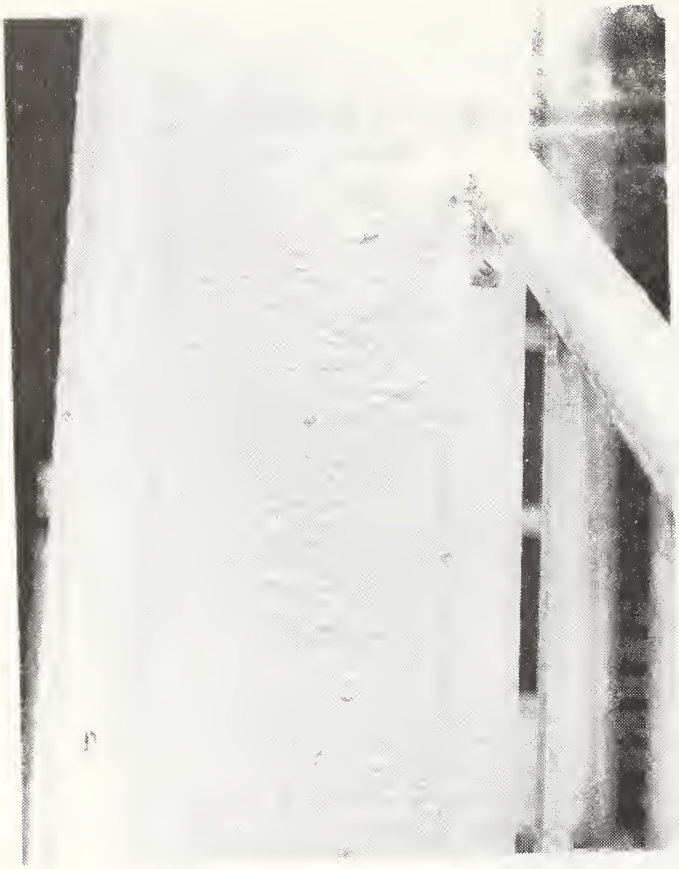

Figure 7. Appearance of paint on wood column after 30 minutes dwell time of paint remover.

Figure 8. Appearance of paint on wood siding and trim on first floor and basement areas and on metal siding below second floor windows after 30 minutes dwell time of paint remover.

Figure 9. Flushing off old paint with high pressure water spray after treatment with paint remover.

Figure 10. Flushing off old paint with high pressure water spray after treatment with paint remover. Note water overspray onto adjoining porch.

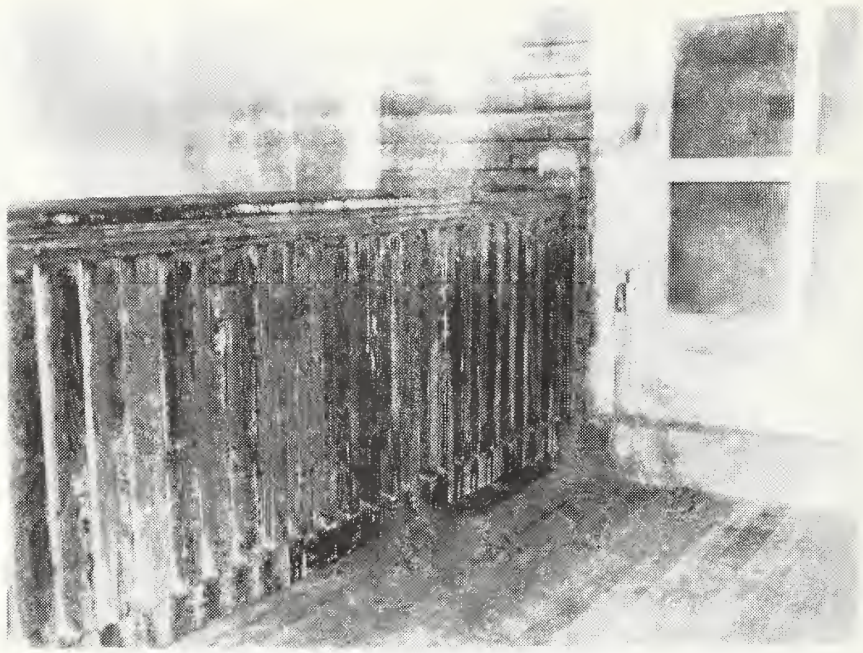

Figure 11. Porch rails after application of three coats of paint remover and water spray flush. Hand scraping was necessary to completely remove paint from the base of railings.

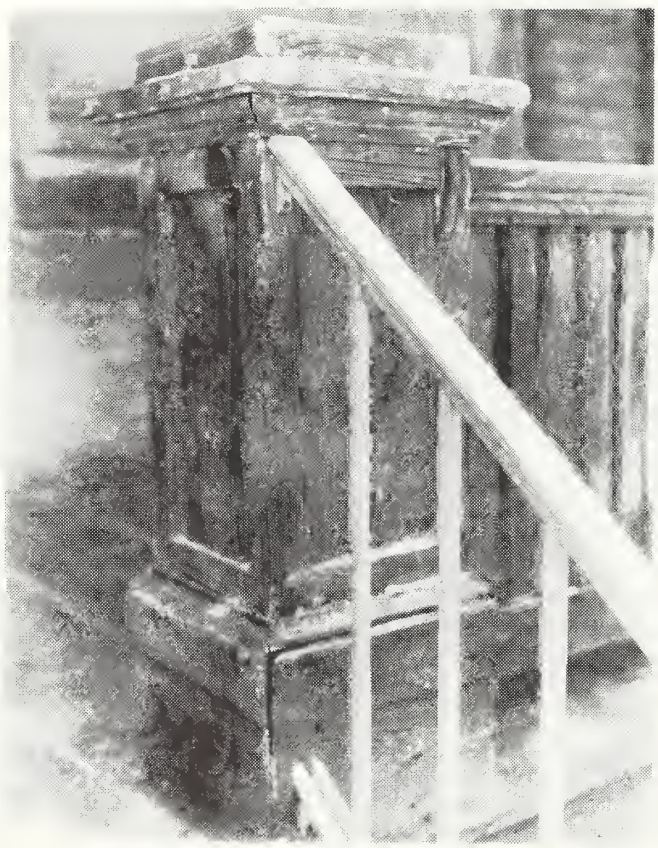

Figure 12. Porch post during water flush operation. Note warpage of post base caused by water soakage during paint removal.

## 2.3. CONTRACTOR

The contractor was experienced in carrying out the process of spray application of biodegradable remover-solvents followed by a high-pressure low-volume water spray rinse. However, all of his previous jobs had involved the removal of paint, coatings and other materials from masonry. This contract was apparently the first opportunity to use this process to remove multiple layers of paint from wood surfaces on residential dwellings.

## 3. REDUCTION OF LEAD BASED PAINT HAZARD

A portable x-ray fluorescence lead detector (XRF) of the type described in reference [3], was used to survey the lead content in the painted surfaces of the exterior front and rear porches of the dwelling unit. All surfaces which showed an average lead content of 1.0 $mg/cm^2$, or more, were deleaded by the water wash removal technique.

A survey of the lead content in the interior painted surfaces of this home had revealed lead content levels too low to warrant consideration for deleading (less than 1.0 $mg/cm^2$). Since high lead content levels were observed on the exterior porch surfaces, it was decided that this dwelling would be appropriate for a field demonstration. It appeared that the water rinse removal technique would apply.

One quantitative measure of the effectiveness of a lead based paint hazard elimination technique is the decrease in lead content resulting from implementation of the particular technique. Table 1 presents a summary of the average XRF lead content measured at various exterior locations before paint removal, after paint removal using the water wash technique, and after repainting with nonleaded paint. When the "before paint removal" lead content readings are compared with the "after removal" readings it is apparent that a significant reduction of the lead content was achieved in virtually every case. Some of the "after paint removal" lead content readings are higher than expected but these cases are attributed to one of the following factors:

1. Although all measurements were made on what appeared as bare, clean wood, some of the original leaded paint has penetrated into the subsurface wood pores and could not be completely removed by the solvent and water rinse.

2. Certain areas (such as the wall rail posts on the front porch) were reported to contain lead shields on their back side to provide separation from the front brick wall. These lead shields were not removed by the water wash technique and could have caused the higher readings noted for such locations.

Another complete lead survey using the XRF instrument was conducted after the repainting operations were completed. The data from that inspection is presented in the third column of table 1. In general, XRF lead content readings tended to approximate those obtained for the "after paint removal" survey. Since chemcial analysis indicated that the new paints used for refinishing were unleaded, differences between readings for the two conditions are probably due to the following:

1. The lead detector head was placed in approximately the same, but not the exact, spot for each survey. Variations in the lead content of the cleaned bare wood could account for some of the differences noted.

2. The basic accuracy of the XRF instrument (approximately $\pm 0.5$ $mg/cm^2$) leads to average readings which can vary over a wider range than most of the differences noted in columns 2 and 3 of table 1.

## 4. COST ANALYSIS

An essential part of the work carried out by the contractor was the collection and reporting of cost/time data, the materials costs and the skills needed. Tables 2, 3, and 4 present the data provided by the contractor.

Table 2 lists the types and quantities of materials used, surface areas involved, labor rates and time used. The listing under operations includes trim work such as windows, window frames, doors, door frames, railings, beams, etc., and flat work such as walls and floors. Tables 3 and 4 contain the accumulated labor and material costs, for the paint removal process and repainting.

A summary of the paint removal and repainting costs based on dollars per square foot are presented in table 5. The information is based on an analysis of tables 2, 3, and 4, verification of material costs by distributors, and spot checks on material usage and man hours by the NBS Lead Based Paint Poisoning Project staff.

## 5. OBSERVATIONS AND COMMENTS

The high-pressure low-volume water wash paint removal system employed by the contractor was satisfactory in that it removed layers of paint on accessible surfaces at a faster rate than would be achieved by hand application of solvents and hand scraping the softened paint.

The contract specification for this water wash paint removal system included precautionary instructions regarding removal and/or containment of residue materials from the process. In spite of these instructions the following problems were observed during the removal operations:

1. Before the contractor used protective plastic coverings, slight breezes caused blow-over of the paint remover spray causing softening and damage to painted surfaces of adjoining property (see figure 10).

2. The contractor failed to pick up water rinse which contained old lead paint particles and paint remover chemicals. This contaminated water was allowed to soak into the back and front yards, run off into the gutter and, under certain circumstances, splash onto adjoining property or yards (see figures 13 and 14).

3. Adjacent unpainted surfaces of brick, glass, and screens became very dirty due to the water flushing operation. The brick and glass was later satisfactorily cleaned, but the screening on the back porch had to be replaced.

4. Because there were multiple layers of old paint on most wood surfaces, it was necessary to repeat the remover application followed by water rinsing 3 or 4 times. This procedure caused warpage, swelling, buckling, and splintering of some wood surfaces. Sanding, recaulking, renailing and in some areas additional coats of paint were required to make the final appearance acceptable as shown in figures 14, 15, 16, and 17.

Additional problems that became apparent during this demonstration were:

1. Although the spray equipment and paint remover chemicals are generally available, only one contractor in the Washington area is apparently equipped to carry out this deleading process.

2. Weather elements, such as temperature and wind, contribute significantly to the effectiveness of the chemical reaction between the solvents and the old lead paint as well as the nature of protection needed for adjoining areas which are not being deleaded.

In general, it is the judgment of the NBS Lead Paint Poisoning Project staff that this water wash paint removal system is appropriate for old paint removal from external masonry, or metal surfaces and marginally effective on wood surfaces. Under no circumstances, however, should this system be used unless satisfactory techniques are devised to collect hazardous runoff materials.

Table 2

Surface Refinishing Data Submitted by the Contractor

| Operation | Materials | | Surface Area Worked Sq. Ft. (Approx.) | Labor | |
|---|---|---|---|---|---|
| | Type | Quantity | | Man-Hours | Rate $/Hr. |
| PAINTING OF: | | | | | |
| 1. Front and Rear of House | White Primer Paint | 5 gal. | 1610 | 10<br>16 | 4.50<br>4.00 |
| 2. Front and Rear of House | White Finish Paint | 7 gal. | 1610 | 11<br>24 | 4.50<br>4.00 |
| 3. Front and Rear Porch Deck | Deck Paint (2 Component Epoxy) | 2 gal. | 260 | 3 | 4.50 |

Note: Time shown includes travel to and from shop, as well as set-up time and touch-up

Table 3

Accumulated Labor Costs Submitted by the Contractor

| Labor Skill | Hourly Wage Rate | | Total Hours on the Job (2) | Total Cost ($) for the Job |
|---|---|---|---|---|
| | Base Rate(1) | Ins. Benefits | | |
| 1. Paint Remover Applicator | 4.50 | .90 | 24 | 129.60 |
| 2. High Pressure Water Sprayer | 4.50 | .90 | 38 | 205.20 |
| 3. Paint Sprayer | 4.50 | .90 | 24 | 129.60 |
| 4. Paint Remover Applicator's Assistant | 4.00 | .80 | 16 | 76.80 |
| 5. High Pressure Sprayer's Assistant | 4.00 | .80 | 47 | 228.00 |
| 6. Paint Sprayer's Assistant | 4.00 | .80 | 40 | 192.00 |
| | | | | |
| Subtotal for Labor | | | 189 | 961.20 |

(1) The contractor did not employ apprentices on this job. It is felt that although regular contractor crews were employed at $4.00 or more per hour, unskilled labor at $3.00 per hour or less could have been used.

(2) Actual payroll hours for the removal and repainting only are reported.

Table 4

Accumulated Materials Costs Submitted by the Contractor

| | Quantity Purchased | Unit Price | Tax | Total Price |
|---|---|---|---|---|
| 1. Polyethylene | 2 rolls | 14.50 | | 29.00 |
| 2. White Primer Paint | 5 gallons | 8.33 | | 41.65 |
| 3. White Finish Paint | 7 gallons | 9.55 | | 66.85 |
| 4. Epoxy Deck Paint | 2 gallons | 15.00 | .70 | 30.70 |
| 5. Remover No. 1* | 5 gallons | 8.73 | | 43.65 |
| 6. Remover No. 2* | 20 gallons | 6.54 | | 130.80 |
| 7. Remover No. 3* | 3 gallons | 8.58 | | 25.74 |
| 8. Painters Caulk | 2 tubes | .84 | | 1.68 |
| 9. Caulking Gun | 1 each | 1.18 | | 1.18 |
| 10. Masking Tape | 2 rolls | 1.80 | | 3.60 |
| 11. Paint Thinner | 1 gallon | .74 | | .89 |
| | | * Subtotal for Materials without Remover Materials -> | | 175.55 |
| Overhead 33% | | Overhead -> | | 58.51 |
| | | Sub Total | | 234.06 |
| Profit 50% | | Profit -> | | 117.03 |
| | | * Other Additions Remover Materials -> | | 200.19 |
| | | Total Material Cost for Job -> | | 551.28 |

*No overhead or profit percentages added to remover products. Totals reflect added percentages only on materials purchased outside.

Table 5

Summary of Paint Removal and Repainting Costs

| | Paint Removal | | | Repainting | | | Total Direct Cost $/Sq. Ft. | Total Cost 1/ $/Sq. Ft. | Summary of Work Performed |
|---|---|---|---|---|---|---|---|---|---|
| | Labor $/Sq. Ft. | Matl. $/Sq. Ft. | Sub Total $/Sq. Ft. | Labor $/Sq. Ft. | Matl. $/Sq. Ft. | Sub Total $/Sq. Ft. | | | |
| Porch Walls (Approx. 1180 Sq. Ft) | 0.34 | 0.11 | 0.45 | 0.05 | 0.07 | 0.12 | 0.57 | 0.99 | Old paint removed. One coat primer paint. One coat finish paint. |
| Porch Floors ( (Approx. 260 Sq. Ft.) | 0.34 | 0.11 | 0.45 | 0.05 | 0.12 | 0.17 | 0.62 | 1.08 | Old paint removed. Two coats epoxy deck paint. |
| | $/Lin. Ft. | $/Lin. Ft. | $/Lin. Ft. | $/Lin. Ft. | $/Lin. Ft. | $/Lin. Ft. | $/Lin. Ft. | $/Lin. Ft. | |
| Porch Beams, Columns, Rails, and Trim (Approx. 535 Lin. Ft.) | 0.42 | 0.14 | 0.56 | 0.06 | 0.09 | 0.15 | 0.71 | 1.22 | Old paint removed. One coat primer paint. One coat finish paint. |

1/ These figures include a 33% overhead and a 50% profit added to labor cost for removal and repainting, and the material cost for repainting only.

Figure 13. Liquid residue which caused damage to grass and bushes.

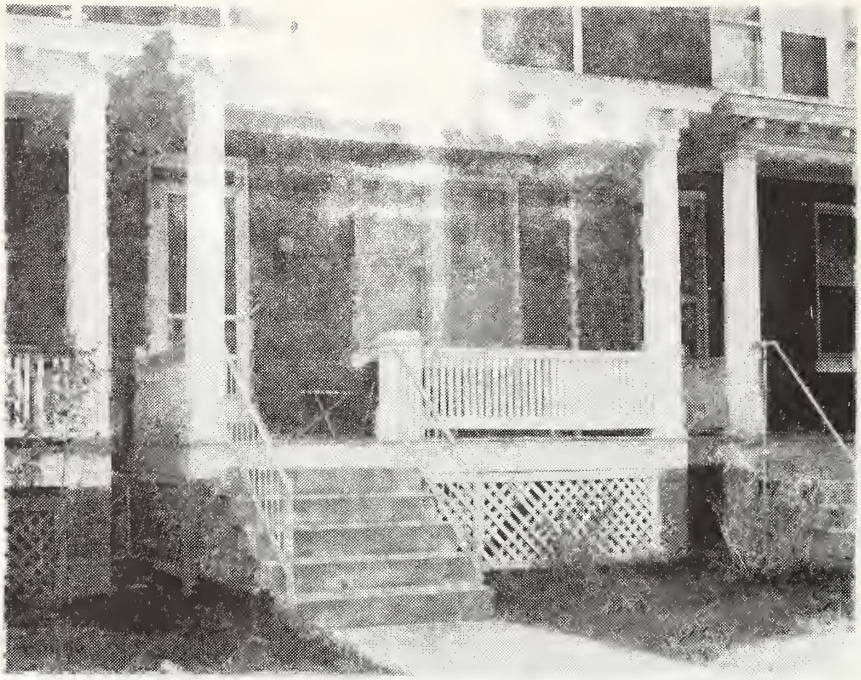

Figure 14. Front porch of pilot demonstration after removal of old paint and repainting. Note loss of foliage on bushes. The damaged grass sod was removed and replaced with new sod.

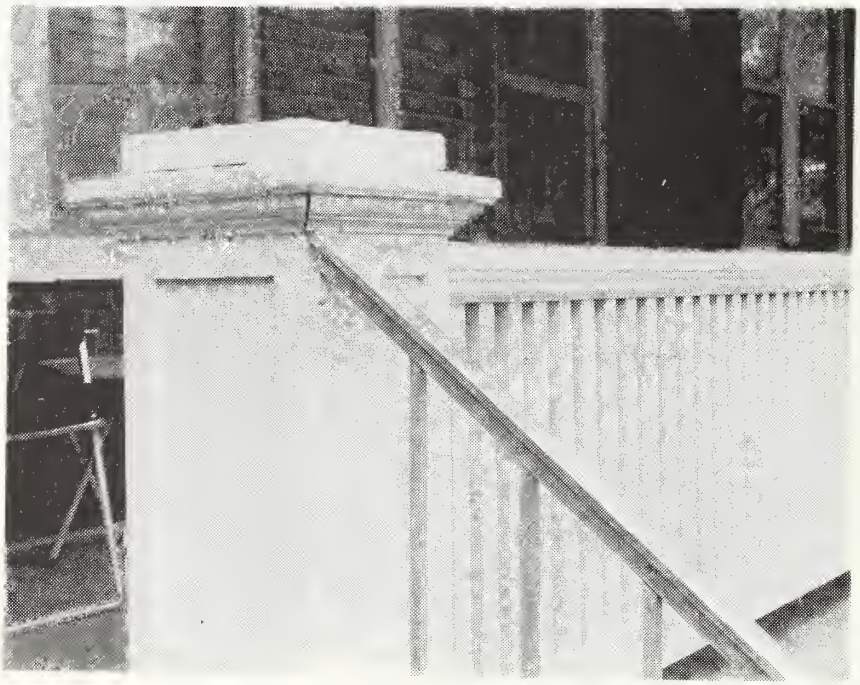

Figure 15. Front porch post and railing after removal of old paint and repainting.

Figure 16. Back screened porch, enclosed second floor porch and basement area way of pilot demonstration after removal of old paint and repainting.

Figure 17. Interior view of wall and door of screened porch after removal of old paint and repainting.

## 6. REFERENCES


1. Gilsinn, J., "Estimates of the Nature and Extent of Lead Paint Poisoning in the United States", National Bureau of Standards Technical Note 746, December, 1972.

2. Boone, T. H., Ray, T. R., and Street, W. G., "Pilot Demonstration of Lead Based Paint Hazard Elimination Methods, Report on Field Study No. 1", National Bureau of Standards Report, NBSIR 73-242, June 1973.

3. Spurgeon, Joe C., "Response Characteristics of a Portable X-Ray Fluorescence Lead Detector: Detection of Lead in Paint", National Bureau of Standards Report, NBSIR 73-231, June 1973.

4. Paabo, Maya, "Analytical Methods for the Detection of Toxic Elements in Dry Paint Matrices -- A Literature Survey", National Bureau of Standards Report, NBSIR 73-251, p. 18, July 1973.

NBS-114A (REV. 7-73)

| U.S. DEPT. OF COMM. BIBLIOGRAPHIC DATA SHEET | 1. PUBLICATION OR REPORT NO. NBSIR 74-438 | 2. Gov't Accession No. | 3. Recipient's Accession No. |
|---|---|---|---|

**4. TITLE AND SUBTITLE**

Pilot Demonstration of Lead Based Paint Hazard Elimination Methods
Report on Field Study No. 2

**5. Publication Date** December 1973

**6. Performing Organization Code**

**7. AUTHOR(S)** Thomas H. Boone, Theodore R. Ray, William G. Street

**8. Performing Organ. Report No.** NBSIR 74-438

**9. PERFORMING ORGANIZATION NAME AND ADDRESS**

NATIONAL BUREAU OF STANDARDS
DEPARTMENT OF COMMERCE
WASHINGTON, D.C. 20234

**10. Project/Task Work Unit No.** 4608400

**11. Contract/Grant No.** IAA-H-34-71

**12. Sponsoring Organization Name and Complete Address (Street, City, State, ZIP)**

Office of Policy Development and Research
Department of Housing and Urban Development
Washington, D.C. 20410

**13. Type of Report & Period Covered** Final

**14. Sponsoring Agency Code**

**15. SUPPLEMENTARY NOTES**

**16. ABSTRACT** *(A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here.)*

This report describes the removal of lead base paint from exterior surfaces of a single family attached house using alkaline/solvent thixotropic liquid paint removers followed by a high-pressure/low-volume water spray.

The extent of the reduction of the lead based paint hazard, the cost of the process and the observed problems and merits of this water wash paint removal system are presented.

**17. KEY WORDS** *(six to twelve entries; alphabetical order; capitalize only the first letter of the first key word unless a proper name; separated by semicolons)*

Cost analysis; housing; lead based paint; lead poisoning; surface preparation; surface refinishing; water wash paint removal.

**18. AVAILABILITY** [X] Unlimited

[ ] For Official Distribution. Do Not Release to NTIS

[ ] Order From Sup. of Doc., U.S. Government Printing Office Washington, D.C. 20402, SD Cat. No. C13

[ ] Order From National Technical Information Service (NTIS) Springfield, Virginia 22151

**19. SECURITY CLASS (THIS REPORT)** UNCLASSIFIED

**21. NO. OF PAGES** 23

**20. SECURITY CLASS (THIS PAGE)** UNCLASSIFIED

**22. Price**

USCOMM-DC 29042-P74


AMERICAN REVOLUTION BICENTENNIAL
1776-1976