

Paint Stripping Trials

Reference to commercial products does not imply any endorsement. The following are actual, factual results.

September 19, 2006 M.O. Hunt (huntm@purdue.edu), D.L. Cassens (dcassens@purdue.edu), Ron Zmyslo (rzmyslo@aol.com), R.L. Leavitt (bjleavit@tctc.com)

On September 19, 2006, Daniel Cassens, Ron Zmyslo, Bob Leavitt and Michael O. Hunt assembled at 1307 Columbia Street, Lafayette, Indiana, to develop production rates for the removal of paint down to bare wood. This exercise is important because of the current effort to stress the long-term paint performance benefits of repainting resulting from first stripping old paint down to the bare wood. Stripping paint when necessary to bare wood before repainting optimizes the new paint film's long-term performance and minimizes loss of historic fabric (term for wood fiber in the context of the Secretary of the Interior's Standards for Rehabilitation of Historic Buildings) due to the elimination of frequent surface disturbances for intermittent repainting over the same period of time. Although the benefit of doing the repainting correctly by creating the appropriate surface for optimal adhesion of paint coating layers is recognized by wood material scientists and paint technologists the onerous task of paint removal is rarely done by "professional painters" in the field. These painters discount the benefit of optimizing the surface to be repainted citing that stripping paint to bare wood is not cost effective. The "professional painters" either intentionally or otherwise inflate the cost to strip paint.

The purpose of our paint stripping trials is to objectively produce rates (time/sq.ft.) to completely remove old paint down to the bare wood which is then ready for pretreatment with water repellent preservative (WRP) and application of new paint coats. Development of production rates for paint stripping by three methods was planned. The stripping methods are hand scrapping with carbide tipped scrappers and Swedish steel scrapers from the Silent Paint Remover company; infra-red heat based Silent Paint Remover[®] (www.silentpaintremover.com) and the Paint Shaver[®] (www.paintshaver.com). To get a more objective estimate of the cost of completely stripping paint our production rates would be multiplied by the professional painter's hourly rate (\$/hr.).

Julie Ginn made her large Queen Anne rental property at 1307 Columbia Street, Lafayette, available for the paint trials. The weather was dry and the temperature was about 60° F during the trials. The south facing wood lapped sided wall of a shed on the back of the house was used for the paint stripping trials. There was a moderate amount of paint accumulation consisting of latex over oil paint layers. The paint condition varied from sound on the top courses to flaky on the bottom courses of siding. The flaky paint was due to excessive moisture: the siding was too close to the ground and water splash and water wicking caused the paint to flake.

Trial #1

Three side-by-side comparisons were laid-out for the three methods of paint removal. Three adjacent strips of siding, one group under the eave (about 10 ft. from the ground), second group about 4-1/2 ft. from the ground, and the third group centered about 1-1/2 ft. above the ground. Each strip of siding was 4-3/4 in. wide by 4 ft. 3/4 in. long and manufactured from yellow poplar lumber. For each group of three strips of siding, the Paint Shaver was used to clean the topmost strip, the hand scraper was applied to the second or middle strip, and the Silent Paint Remover

was used to strip the third and bottom strip of siding. Each stripping method was done separately and time to strip the paint was recorded. A different worker was responsible for each of the stripping techniques. Therefore each worker had time to rest between stripping the designated strip in each group.

The following is a report of the times by tasks for paint removal and description of results by method of removal for the three groups of three strips of siding each from the top group of strips of siding to bottom. An overview of the three groups of siding after stripping is shown.



Overview of the three groups of siding after paint stripping.

Close-up views of each group of stripped siding are included below with the respective report of paint removal times by stripping method.

TOP

Paint Shaver

Set nails	1 min.
Strip paint to bare wood includes moving ladder	3 min. 5 sec.
Sand to remove spots of paint and smooth surface plus move ladder	<u>1 min. 25 sec.</u>
Total	6 min 35 sec.

Scrapper

Hand scrap to bare wood some sanding needed but not included	7 min 30 sec
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Silent Paint Remover (infra-red heat)

Several applications of heat; paint still not removed	6 min 55 sec*
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Appearance of Top Group after paint removal by Paint Shaver, hand scapping, and Silent Paint Remover, in that order from top to bottom.

MIDDLE

Paint Shaver

Set nails and remove paint to bare wood
Sand surface

2 min. 40 sec.
42 sec

Total 3 min 22 sec

Scrapper

Scraping only removed ½ of painted area: new blade gouged wood

10 min*

Silent Paint Remover

Some paint residue left

5 min*



Appearance of Middle Group after paint removal. Paint Shaver, hand scrapping, and Silent Paint Remover, in that order from top to bottom.

BOTTOM

Paint Shaver

Set nails	1 min 30 sec
Remove paint and sand	<u>2 min 50 sec</u>
Total	4 min 20 sec

Scrapper

Some paint remained	6 min 45 sec*
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Silent Paint Remover

Flaking paint was scrapped before application of heat; paint residue left	3 min 30 sec*
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Appearance of Bottom Group after paint removal. Paint Shaver, hand scrapping, and Silent Paint Remover, in that order from top to bottom.

* Surface not completely free of paint. Therefore additional surface preparation would be necessary before the application of water repellent preservative and subsequently paint.

The average time to remove one square foot of paint from the three groups of siding is:

Top:	Paint Shaver	3.92 min/sq. ft.
	Scrapper	4.46 min/sq. ft.*
	Silent Paint Remover	4.12 min/sq. ft.*
Middle:	Paint Shaver	2.00 min/sq. ft.
	Scrapper	5.95 min/sq. ft.*

SPR 2.98 min/sq. ft.*

Bottom: Paint Shaver 2.58 min/sq. ft.
 Scrapper 4.02 min/sq. ft.*
 SPR 2.08 min/sq. ft.*

The grand average (averaged over the top, middle and bottom groups) by stripping method is:

Paint Shaver 2.83 min/sq. ft.
 Scrapper 4.81 min/sq. ft.*
 Silent Paint Remover 3.06 min/sq. ft.*

* = paint not completely removed

Using the Paint Shaver, the time to remove paint from one square foot averaged over the top, middle and bottom groups is $(3.92+2.00+2.83)/3 = \mathbf{2.92 \text{ min./sf}}$

General observations

- If the condition is such that complete paint removal is necessary, it would be ideal if all paint could be economically removed by hand scraping followed by light surface sanding. This would probably cause minimum disturbance of the “historic fabric” in keeping with the philosophy of the Secretary of the Interior’s Standards and Guidelines for Historic Rehabilitation. But very rarely if ever is this minimal treatment effective. Therefore more dramatic paint stripping techniques must be used.
- As to technique in using the Silent Paint Remover (SPR), it was found that heating the surface for 30 – 40 seconds, then allowing it to cool slightly before scraping avoided gumming up the scraper.
- Silent Paint Remover gave mixed results. It cleanly and effectively removed paint that was well over 100 years old from a board that previously proved very difficult for various chemical stripping agents.



Silent Paint Remover in contact with a difficult to chemically strip painted board



Paint softened by Silent Paint Remover is easily and completely scrapped from a painted board

- However, in the side-by-side comparative testing described above the SPR did not produce a bare surface.
- SPR had previously been shown to be effective in stripping paint from window frames and sash. Cracking of window glass is avoided as compared with the use of heat gun or heat plate. A case study of this procedure is included later in this report.
- The four participants in this paint stripping exercise agreed that carbide tipped scrappers purchased at local stores were superior..
- A nail set with a larger contact surface was needed to speed up the nail setting process.
- It was unanimous, that more than one stripping tool was needed. For example, a sander was required for each of the three main stripping techniques tested.
- It was agreed that the Paint Shaver was the most consistent performer.

Trial #2

A second trial using the Paint Shaver only was conducted. This trial was conducted on siding adjacent to that where Trial #1 was conducted. The area stripped totaled 5.62 sq. ft. of yellow poplar lapped siding. One person completed all tasks: nail setting, power shaving, and finish sanding. The total time to complete was 24.5 min. for a production rate of **4.36 min/sq. ft.**

October 25, 2006

M.O. Hunt and R.R. Leavitt

Robert Leavitt and Michael O. Hunt conducted four paint removal trials using the Paint Shaver[®] on October 25, 2006. Lafayette Neighborhood Housing Services made their house at 721 Cincinnati Street, Lafayette available for this purpose. The wood siding was 4-inch wide lap siding. Some of the siding was of the original yellow poplar and replacement boards were of western red cedar. So paint was stripped from a mixture of the two species. The weather at the time of the procedure was dry and overcast and the temperature was approximately 47° F. The west facing wall was somewhat protected by the close spacing of the neighboring house to the west. The paint to be removed was heavy and hard and was oil-based. Four areas of siding were

marked off for four trials; two for each of the two operators the procedure consisted of set nails, shave off paint and sand the surface in preparation for applying water repellent preservative and subsequently paint. The model of Paint Shaver used in these tests has an easy to use depth of cut adjustment. **To maximize removal of paint and minimize removal of wood fiber, the depth of cut was adjusted via trial and error prior to production paint removal.** The procedure is shown in the following:



Setting nails prior to removing paint with the Paint Shaver[®]



Removing paint with the Paint Shaver. The hose is connected to a vacuum, preferably a HEPA Vac, to collect lead paint chips and dust. Note operator is wearing respirator with lead filters to protect against lead dust.



Sanding the surface following the Paint Shaver to remove small residuals of paint and to smooth the surface prior to treatment with water repellent preservative.

The description of the trials including size of area, condition of paint removed and times for each step of removal and preparation are as follows:

Operator A, Trial 1

Area = 11.67 sq. ft.; heavy, hard paint; yellow poplar original siding and western red cedar replacement siding

Set nails	6 min. 8 sec.
Shave off paint	11 min 0 sec.
Power sand	9 min. 20 sec.
Knock off sharp edge of drip edge and scrape out corners	<u>6 min. 0 sec.</u>
Total	32 min. 28 sec. (32.47 min.)

Production rate = $32.47 \text{ min}/11.67 \text{ sf} = 2.78 \text{ min./sf}$

Operator B, Trial 2

Area = 11.67 sf; heavy, hard paint and patches of thin, bubbly paint on replacement siding; all siding western red cedar

Set nails	5 min. 26 sec.
Shave off paint	6 min. 44 sec.
Power sand	4 min. 18 sec.
Knock off sharp edge of drip edge and scrape in corners	<u>8 min. 9 sec.</u>
Total	24 min. 37 sec. (24.62 min.)
Production rate = 24.62 min./11.67 sf = 2.11 min./sf	

Operator A, Trial 3

Area = 7.29 sf; heavy, hard paint; a mix of yellow poplar and western red cedar siding

Set nails	3 min. 9 sec
Shave off paint	5 min. 56 sec.
Power sand	3 min. 2 sec.
Finish sanding and scraping	<u>4 min. 21 sec.</u>
Total	16 min. 23 sec (16.38 min.)
Production rate = 16.38 min./7.29 sf = 2.25 min./sf	

Operator B, Trial 4

Area = 6.25 sf; heavy, hard paint; mix of yellow poplar and western red cedar siding

Set nails	2 min. 59 sec.
Shave off paint	8 min. 45 sec.
Power sand	2 min. 56 sec.
Finish sanding and scraping	<u>5 min. 12 sec.</u>
Total	19 min. 52 sec. (19.87 min.)
Production rate = 19.87 min./6.25 sf = 3.18 min./sf	

The grand average production rate $(2.78+2.11+2.25+3.18)/4 = \mathbf{2.58 \text{ min./sf}}$



Surface ready for water repellent preservative treatment, filling of holes and painting after paint stripping by Paint Shaver followed by light sanding. Note the edge of the area of remaining paint. It indicates heavy, hard paint.

The grand average production rate for stripping with the Paint Shaver (most consistent method of paint removal) = 2.93 min./sf with a Coefficient of Variation = 27%. A large amount of variability in paint stripping times using the Paint Shaver is indicated by the large value of the Coefficient of Variability. Most of the reported experience is for operating at ground level. It is recognized that operating at heights would require scaffolding, and hence set-up time would increase. But all methods of paint removal would have this added cost as well.

Cautionary Notes for use of the Paint Shaver™:

- Before production removal of paint, on siding to be stripped adjust depth of cut to maximize paint removal while minimizing removal of wood fiber.
- In an area out of view, practice with the Paint Shaver to develop handling technique to avoid gouging. It is acknowledged that the Paint Shaver can quickly damage siding if the operator is not careful.
- As with all equipment with moving parts, keep fingers away from proximity of the cutter head.

Chemical Stripping Agents

Preliminary trials with chemical paint strippers convinced us that they were not useful for volume stripping of siding. They are useful for paint removal of detailed architectural elements and possibly door and window frames. A partial list of chemical paint removers and their contact information follows:

Besway Systems Inc. Stripping Chemicals www.besway.com/stripping-chem.html

BIX Manufacturing Co. Bix Overnight Industrial Remover www.bixmfg.com/bix_overnite.htm

Dumond Chemicals Peel Away www.dumondchemicals.com

Napier Environmental Technologies RemovALL www.napiere.com