

**EVALUATION OF EXPOSURES
TO AIRBORNE FIBERS DURING
SOLVENT-ASSISTED REMOVAL OF
ASPHALTIC CUTBACK ADHESIVE
AFTER REMOVAL OF RESILIENT FLOOR TILES
USING PROPOSED WORK PRACTICES**

Prepared for

Resilient Floor Covering Institute
Rockville, MD

Armstrong World Industries, Inc.
Lancaster, PA

Prepared by

ENVIRON Corporation
Arlington, VA

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I. EXECUTIVE SUMMARY

Removal of asbestos-containing floor tiles or floor tiles installed with asbestos-containing asphaltic cutback adhesives in an occupational setting is subject to the standard set by the Occupational Safety and Health Administration (OSHA) for occupational exposure to asbestos in the construction industry (29 CFR 1926.58). This standard requires employers to assure that worker exposures to asbestos do not exceed the permissible exposure limit (PEL) of 0.2 fibers per cubic centimeter (f/cc) of air for an 8-hour time weighted average (TWA) or the excursion limit of 1.0 f/cc averaged over a 30-minute period.¹

The OSHA asbestos standard requires initial monitoring of employee exposure at the start of a job to determine whether employee exposure exceeds either the action level (0.1 f/cc for an 8-hour TWA), or the excursion limit (1.0 f/cc over 30 minutes). The standard also provides that, in lieu of initial monitoring, an employer may rely upon objective or historical data, conducted under substantially similar workplace conditions, to demonstrate that the action level and excursion limit are not exceeded. In a previous study,² ENVIRON had shown that adhesive removal with a method involving wetted sand would meet the OSHA standards and OSHA agreed that such data could be used as historical data in lieu of conducting initial monitoring to satisfy the monitoring requirements of the OSHA standard (29 CFR 1926.58(f)(2)(iii)) for removal of asphaltic cutback adhesive.

To determine whether other removal methods would give similar results, ENVIRON Corporation was retained by the Resilient Floor Covering Institute (RFCI) and Armstrong World Industries, Inc. (Armstrong) to design and carry out a study of worker exposures to airborne asbestos during solvent-assisted removal of asphaltic cutback adhesives ("mastic") pursuant to work practices developed by the sponsors (see Appendix A) for later incorporation into publications that contain Recommended Work Practices (see Appendix B).

¹ OSHA has recently proposed to lower the PEL to 0.1 f/cc (55 FR 140:29720, July 20, 1990).

² ENVIRON Corporation. 1990. Evaluation of worker exposure to airborne fibers during the removal of asphaltic cutback adhesive using Recommended Work Practices. Report prepared for the Resilient Floor Covering Institute and Armstrong World Industries, Inc. Arlington, VA: ENVIRON. March 30.

Removal of the mastic utilized Freedom³ Speed Stripper, a chemical solvent mixture from S. C. Johnson & Son, Inc. (Johnson), which enhanced the mastic removal process, and a low-speed floor machine equipped with a coarse (black) pad. This report presents an analysis of fiber exposures to floor mechanics during the solvent-assisted removal of mastic pursuant to the sponsors' proposed work practices. The highest observed TWA (assuming no background concentration), as determined by phase-contrast microscopy (PCM), was 0.0358 f/cc, which is less than 36% of the OSHA action level. The observed excursion level was less than 0.0322 f/cc, which is less than 4% of the OSHA excursion limit concentration.

Based on the uniformly low occupational exposure levels, no additional solvent-assisted mastic removal studies were deemed necessary at this time. This study shows that the action level and excursion limit for exposure to asbestos fibers are not exceeded when performing mastic removal activities with Freedom Speed Stripper and a rotary floor machine in accordance with the proposed work practices. Consequently, removal of asphaltic cutback floor tile adhesives using Freedom Speed Stripper and a rotary floor machine should enjoy the same exemption from initial monitoring as do other approved methods, when performed in accordance with Recommended Work Practices.

³ "Freedom" is a registered trademark of S. C. Johnson & Son, Inc.

II. INTRODUCTION

A. Background

In the past, many types of resilient tile floors were installed with asbestos-containing asphaltic cutback adhesives. These adhesives or "mastic" were an oleo-resinous material with plastic/flexible properties. Before the use of asbestos in mastic was phased out, these adhesives typically contained 5 to 20% asbestos fibers. Such adhesives, although no longer manufactured, are still found in homes, institutions, and commercial or industrial establishments. According to floor covering manufacturers, the asbestos used in asphaltic cutback adhesives was predominantly short-fiber chrysotile asbestos. Therefore, any asbestos fibers seen during removal would most likely be chrysotile, and observation of amphibole asbestos fibers could suggest that another source of asbestos might be present.

In order to provide a better evaluation of the potential exposure to airborne asbestos and other types of fibers when recommended adhesive removal procedures are followed, the Resilient Floor Covering Institute and Armstrong World Industries, Inc. requested ENVIRON Corporation to design and conduct a scientifically valid study of exposures to fibers during the removal of asbestos-containing asphaltic cutback adhesives. In March 1990, ENVIRON issued an initial report⁴ that showed low worker exposures during adhesive removal with a sand/water mixture and a floor machine equipped with a floor plate attachment. The sponsors have continued work to develop efficient and effective methods for adhesive removal that also result in low fiber exposures, and requested ENVIRON to evaluate a second method involving a floor stripping solution and a low-speed rotary floor machine equipped with a coarse pad. This document reports the results of that evaluation.

When new flooring is installed, removal of an existing resilient floor covering may be necessary. The flooring industry has developed Recommended Work Practices for removing resilient floor tiles, resilient sheet flooring, and flooring adhesives (Appendix B). These Recommended Work Practices, which recognize that these materials may contain asbestos, advise that floor tile removal, followed by the removal of any underlying asphaltic cutback

⁴ ENVIRON Corporation. 1990. Evaluation of worker exposure to airborne fibers during the removal of asphaltic cutback adhesive using Recommended Work Practices. Report prepared for the Resilient Floor Covering Institute and Armstrong World Industries, Inc. Arlington, VA: ENVIRON. March 30.

adhesive, should be conducted only if new flooring cannot be installed directly on top of the existing floor. They also specifically recommend against employing certain aggressive removal techniques, which are no more effective than the recommended techniques, but carry a greater potential for generation of asbestos-containing dust. When removal is necessary, the recommendations regarding the degree of adhesive removal necessary depend on the nature of the new floor to be installed.

The floor mechanics who remove the adhesive are potentially exposed to airborne asbestos fibers during the removal process. Consequently, the removal process in an occupational setting is subject to the regulations of the Occupational Safety and Health Administration (OSHA) that limit employee exposures to airborne asbestos. OSHA has issued two standards regulating occupational exposures to asbestos, one for general industry (29 CFR 1910.1001) and one specifically for the construction industry (29 CFR 1926.58).

B. Sample Collection and Analysis

ENVIRON has designed and conducted experiments on the removal of asbestos-containing asphaltic cutback adhesives according to the proposed work practices with usage guidelines for enhanced adhesive removal. Industrial Health Incorporated (IHI) was engaged by ENVIRON to conduct all air monitoring. Air sampling was performed prior to and during each removal operation to monitor the concentration of airborne asbestos fibers. Five types of air samples were collected during asphaltic cutback adhesive removals:

- overnight baseline samples in the work area prior to removal;
- perimeter samples outside of the work area during removal;
- personal samples on each of two workers during removal;
- personal samples on one individual acting as a supervisor or observer, who spent a significant amount of time in the immediate work area, although she was generally not directly involved in the actual removal; and
- one 30-minute personal sample collected on a worker.

All area samples were collected by setting the sampling apparatus in a stationary location. Filters were held on stands placed at random locations in the room. Personal air sampling monitors were attached to each worker or observer with the filter located within the

individual's breathing zone, as defined by OSHA. In each case, two samples were collected side-by-side for analysis by phase contrast microscopy (PCM) and transmission electron microscopy (TEM).

All air samples intended for PCM analysis were collected in accordance with NIOSH Method 7400. Samples were collected on Millipore 25 mm diameter, 0.8 μm pore size, mixed cellulose ester membrane filters in cassettes with conductive cowls. Samples intended for TEM analysis were collected in accordance with EPA's Interim Transmission Electron Microscopy Analysis Method. These samples were collected on Millipore 25 mm diameter, 0.45 μm pore size, mixed cellulose ester fiber filters with 0.8 μm backup filters in cassettes with conductive cowls. All samples were collected using cassettes in the open-face configuration. Further details concerning the sampling procedures followed by IHI are provided in a companion volume.⁵

Four separate bulk samples of the adhesive material were taken for Polarized Light Microscopy (PLM) analysis. Analysis of the samples was made using a polarizing light microscope and dispersion staining objective in accordance with guidelines set forth in the EPA Interim Method for the Determination of Asbestos in Bulk Insulation Samples (40 CFR, Part 763, Subpart F, Appendix A - 7-1-87 Edition).

All air monitoring samples were shipped by Federal Express to RJ Lee Group, Inc. (RJ Lee) for independent laboratory analysis. Blank filters were submitted to the analytical laboratory for analysis with the samples. For PCM analysis, one hundred fields were counted at a magnification of 400X following the rules outlined in NIOSH Method 7400. The method requires that 100 fields be counted unless fiber counts are sufficiently high to provide adequate reliability with fewer fields. A minimum of 20 fields must be counted under any circumstances. All fibers or fiberlike particles measuring at least 5 μm in length and having a 3-to-1 length-to-width aspect ratio were counted. For TEM analysis, if necessary, samples were analyzed using proposed EPA Level II analysis. The analysis for asbestos fibers consists of fiber morphology, visual selected area electron diffraction (SAED), and elemental chemical analysis by energy dispersive spectroscopy (EDS), supplemented by the measurement and interpretation of micrographs of several SAED patterns. The samples are analyzed at a magnification of 20000X. Particles longer than 5 μm meeting the definition of a fiber length-to-width aspect ratio of greater than 3-to-1 and having substantially parallel

⁵ ENVIRON Corporation. 1990. Supporting data for evaluation of exposures to airborne fibers during solvent-assisted removal of asphaltic cutback adhesive. Arlington, VA: ENVIRON. October 26.

sides are classified as chrysotile or amphibole following definitions developed by Yamate⁶. Structures containing such asbestos fibers are classified in conformance with the definitions in the EPA Interim Method.

⁶ Yamate, G., S.C. Agarwal, and R.D. Gibbons. Methodology for the Measurement of Airborne Asbestos Fibers by Electron Microscopy. EPA Contract No. 68-02-3266.

III. RECOMMENDED WORK PRACTICES FOR ADHESIVE REMOVAL

According to recommendations by the floor manufacturers, existing resilient tile floors should be left in place, whenever possible, and the new floor adhered directly to the tile following the manufacturer's directions. In the event the existing tile must be removed, RFCI and Armstrong have developed work practices for controlling asbestos exposures potentially resulting from the removal of underlying asphaltic cutback adhesives that are designed to assure compliance with the OSHA standards governing exposure to asbestos. These Recommended Work Practices (Appendix B), which continue to evolve from earlier recommendations, prohibit sanding or otherwise abrading the adhesive surface, and call for the use of other, less aggressive techniques to facilitate adhesive removal. The work practice studied in this report (Appendix A) evolved from an earlier recommendation to use wetted sand to remove adhesive. The new work practice uses a floor stripping solution with a rotary floor machine equipped with a coarse pad equivalent to 3M pads color-coded black. Both work practices also include instructions on wet scraping by hand to remove the more loosely adhered residual material.

Additional exposure protection is provided through advice on practices to follow before and after removal of the asphaltic cutback adhesive. The floor must be vacuumed before and after removal with a High Efficiency Particulate Air (HEPA) wet/dry vacuum cleaner. Both the HEPA vacuum bag and any floor sweepings must be disposed of in a labeled, impermeable trash bag. These practices help to minimize air entrainment of any asbestos or other fibers that may be present on the floor during and after mastic removal.

The floor stripping solution used in the adhesive removal was Freedom Speed Stripper. Johnson recommends that safety goggles and appropriate chemical protective gloves should be worn when handling or using this solvent product, because the ingredients of the solvent mixture could cause irritation to the eyes and hands. Users of the solvent should be aware of the potential hazardous nature of this product. The MSDS (Material Safety Data Sheet) for the solvent mixture is provided in the companion volume.⁷

⁷ ENVIRON Corporation. 1990. Supporting data for evaluation of exposures to airborne fibers during solvent-assisted removal of asphaltic cutback adhesive. Arlington, VA: ENVIRON. October 26.

IV. REGULATORY ENVIRONMENT

In 1972, OSHA promulgated a standard dealing with occupational exposures to asbestos for all industries covered by the Act (Occupational Safety and Health Act of 1970). On June 20, 1986 and September 14, 1988, OSHA issued revised standards relating to occupational exposures to asbestos for both general industry (29 CFR 1910.1001) and for the construction industry (29 CFR 1926.58). The 1972 standard established a permissible exposure limit (PEL) of 2 fibers/cc (f/cc) as an 8-hour time-weighted average (TWA). The present standards, among other things, reduced the PEL to 0.2 f/cc as an 8-hour TWA and set an excursion limit of 1.0 f/cc average over a 30 minute sampling period. OSHA has also set an action level of 0.1 f/cc calculated as an 8-hour TWA (29 CFR 1926.58(b)). Although the general industry standard is similar, further references will cite the construction standard only, because removal of asbestos-containing asphaltic cutback adhesives is classified as a construction activity according to OSHA.

The standard for the construction industry requires that each employer who has a workplace or work operation covered by the standard must, with certain exceptions described below, perform initial monitoring to determine the airborne concentrations of asbestos to which employees may be exposed (29 CFR 1926.58(f)(2)(i)). When the action level of 0.1 f/cc or the excursion limit of 1.0 f/cc is exceeded, the employer must continue to perform initial monitoring at the initiation of subsequent new asbestos jobs. Employee training, and under certain circumstances, medical surveillance are also required when exposures exceed the action level. When the PEL of 0.2 f/cc is exceeded, the employer must establish a demarcated, regulated area to which access is limited to authorized persons supplied with respirators (29 CFR 1926.58(e)). Certain additional conditions also apply to a regulated area. When the results of continued periodic monitoring reveal that employee exposures, by statistically reliable measurements, are below the action level and the excursion limit, initial monitoring of continued activities may be discontinued (29 CFR 1926.58(f)(4)).

OSHA provided two exceptions to the requirement for initial monitoring:

- where objective data demonstrate that employee exposures are below the action level and excursion limit (29 CFR 1926.58(f)(2)(ii); or

- where the employer has historical monitoring data to rely upon in lieu of initial monitoring (29 CFR 1926.58(f)(2)(iii)).

The regulation states, in pertinent part (29 CFR 1926.58(f)(2)):

(2) Initial Monitoring:

(i) Each employer who has a workplace or work operation covered by this standard, except as provided for in paragraphs (f)(2)(ii) and (f)(2)(iii) of this section, shall perform initial monitoring at the initiation of each asbestos, tremolite, anthophyllite, or actinolite job to accurately determine the airborne concentrations of asbestos, tremolite, anthophyllite, or actinolite to which employees may be exposed.

(ii) The employer may demonstrate that employee exposures are below that action level and/or excursion limit by means of objective data demonstrating that the product or material containing asbestos, tremolite, anthophyllite, actinolite, or a combination of these minerals cannot release airborne fibers in concentrations exceeding the action level and/or excursion limit under those work conditions having the greatest potential for releasing asbestos, tremolite, anthophyllite, or actinolite.

(iii) Where the employer has monitored each asbestos, tremolite, anthophyllite, or actinolite job for the TWA, and where he has monitored after March 14, 1988, for the excursion limit, and the data were obtained during work operations conducted under workplace conditions closely resembling the processes, type of material, control methods, work practices, and environmental conditions used and prevailing in the employer's current operations, the employer may rely on such earlier monitoring results to satisfy the requirements of paragraph (f)(2)(i) of this section.

OSHA did not provide a specific definition for such exceptions in its 1986 regulations. However, OSHA has recently determined⁸ that a previous ENVIRON study⁹ evaluating exposure to airborne fibers during resilient floor tile removal did provide historical data. Data presented in this study of asphaltic cutback adhesive removal were collected in much the same manner as in the previous study.

⁸ Letter from Thomas J. Shepich, OSHA, to William B. King, Armstrong, dated October 27, 1989; letter from Thomas J. Shepich, OSHA, to Walter D. Anderson, RFCI, dated February 6, 1990.

⁹ ENVIRON Corporation. 1989. Evaluation of Worker Exposure to Airborne Fibers During Removal of Resilient Floor Tiles Using Recommended Work Practices. April 3.

V. STUDY DESIGN

On May 23 and 24, 1990, an asphaltic cutback adhesive removal study was conducted at the Mountville Church of the Brethren in Lancaster County, Pennsylvania. The removal activity occurred in the main floor classroom of the church where floor tile removal had occurred the previous day. The room had contained white and green, 9" square tiles, identified as having been manufactured by Armstrong, that were secured with asphaltic cutback adhesive.

The purpose of this study was to investigate the efficiency and safety of solvent-assisted removal of asbestos-containing asphaltic cutback adhesive. Adhesive removal was to be performed in accordance with the proposed work practices. Freedom Speed Stripper solvent was applied to the adhesive residue and then the adhesive was removed, first with a stiff-bladed floor scraper and then with a low-speed (approximately 220 rpm) floor machine equipped with a coarse black pad.

The work area was initially prepared on May 22nd for a resilient floor tile removal study by removing all materials and furniture within the study area. All work areas were thoroughly cleaned by wet mopping and HEPA vacuuming before the resilient floor tile removal operation. After the completion of the resilient floor tile removal and prior to this asphaltic cutback adhesive removal study the floor was cleaned again, in order to minimize any sources of ambient asbestos; however, the subfloor was not specially prepared and was typical of subflooring prior to adhesive removal. Pre-work baseline samples were set up in the middle of the work area and allowed to run overnight on the night following floor tile removal and prior to the initiation of adhesive removal.

Worker exposures during removal were monitored by placing personal samplers on the two workers. Two companion samplers were placed on each worker, one with a filter designed for PCM analysis and one designed for TEM analysis. An observer was similarly equipped with companion samplers. The sampling protocol for monitoring asphaltic cutback adhesive removal called for analysis of the PCM filter in all cases, but analysis of the TEM filter was not required unless the PCM results exceeded the OSHA criteria (0.1 f/cc for 8-hr TWA; 1.0 f/cc for 30-min excursion sample). Because occupational exposures are regulated by OSHA according to PCM results, the TEM measurements are not directly relevant. However, in adhesive removals of this type, where non-asbestos fiber sources can be present, an elevated PCM reading is not necessarily indicative of elevated exposures to asbestos. The

companion personal TEM samples were reserved only to determine whether any elevated PCM count observed was truly due to asbestos. In order to ascertain whether other sources of fibers were present in the study area, a pair of overnight area samples was collected prior to any removal activities. A pair of perimeter area samples was collected just outside the work area concurrent with the removal activity to assay for potential fiber sources near the study area. Since no outside source of asbestos was suspected (e.g., nearby demolition activity), no outside samples were collected concurrent with the removal activity. Again, the companion TEM area samples were to be analyzed only if the PCM readings were found to be elevated.

VI. RESULTS

Fibers of asbestos and many other natural and man-made materials are found in virtually every type of environment, including structures where asphaltic cutback adhesives might be removed. Many of these fibers would qualify for inclusion under the geometric counting rules of the OSHA standard, independent of their composition or origin. These fibers are not attributable to adhesive removal activities and should not be counted against compliance with the action level. Therefore, acquisition of background concentration data on qualifying fibers is necessary for interpreting the exposure results in adhesive removal operations. In this study, one background concentration available was obtained from the pre-work baseline sample, which was taken prior to the adhesive removal operation and analyzed via PCM. The fiber levels observed in this baseline sample exceeded the PCM analytical sensitivity (limit of detection) and may have been influenced by the fact that tile removal activities had occurred in the same room the previous day.

Given that adhesive removals would typically follow tile removals, adjustment of observed fiber levels by subtracting baseline measurements may not be appropriate. A more conservative calculation of net concentration in exposure samples can be obtained by assuming that the baseline concentration is 0.0 f/cc rather than the observed value. This provides a calculated net concentration that will be a maximum value. Results under both assumptions are included in this report.

Some of the filters used in the personal monitors are made of materials that can be contaminated with asbestos fibers as well as other fibrous material prior to use. Such contamination should also not be attributable to adhesive removal activities and should not be counted against the action level. Therefore, a blank filter, which was not exposed to the work environment, was analyzed for fiber counts. No contamination of this filter was observed.

To assure the relevance of the tests, the asbestos content of the adhesive was also determined by polarized light microscopy (PLM) analysis of bulk samples. Because this determination is very sensitive to the method of sample preparation, two laboratories, RJ Lee and Dixon Information, Inc. (Dixon), were asked to analyze mastic samples. RJ Lee also provided both ENVIRON and IHI with PCM fiber counting results. For PCM analysis, concentrations reported in fibers per square millimeter (f/mm²) detected on the sample filters were converted to airborne fibers per cubic centimeter (f/cc) using the following relationship:

$$C_{air} (f/cc) = C_{filter} (f/mm^2) \cdot \text{Filter Area (mm}^2) / \text{Air Volume Sampled (cc)} \quad (1)$$

C_{air} is the concentration of airborne fibers and C_{filter} is the concentration of fibers analyzed on the sample filter. The total surface area of the sample filters is 491 mm²; however, 106 mm² of this area is shielded by the sampling cassette and cowl. Thus, 385 mm² of surface area were available for analysis. Sample volumes were reported by IHI in liters and were converted to cubic centimeters. The net PCM concentration is then obtained by subtracting the baseline concentration. For PLM analysis, results were reported as the percentage of asbestos and non-asbestos fibers (RJ Lee and Dixon data are in the companion volume¹⁰).

An air sampling report prepared by IHI, covering the site description and a detailed presentation of the sampling procedures and findings, and analytical results of the fiber analyses conducted by R. J. Lee and results for bulk tile sample analysis by Dixon are provided in the companion report.

Floor mechanics typically do not spend a full 8-hour shift at a job site but instead spend some of their time enroute from and back to their home shop. Therefore, a final time-weighted averaging adjustment is necessary to account for the fact that the adhesive removal activities and the corresponding monitoring do not always extend over a full 8-hour workday. The TWA was calculated by assuming that all unsampled time, including lunch breaks away from the work area and transit time, would involve no work-related exposure to asbestos. Consequently, the TWA concentrations in this study are lower than the net concentrations by a factor of T/480, where T is the actual sampling time in minutes and 480 is the number of minutes in an 8-hour workday. If the mechanics should remain on-site to do additional work, such as installing a new floor in a small area, some residual fibers could remain in the air and exposure would be higher than the TWA as calculated but lower than the level measured over the actual removal period.

Without exception, all of the concentrations of airborne fibers experienced by the workers and observer, whether or not adjusted for TWA, are far below the OSHA criteria (0.1 f/cc as an 8-hr TWA; 1.0 f/cc as a 30-min Excursion Limit) by PCM analysis, even when assuming that the background concentration was 0.0 f/cc. Although the monitoring protocol did not require TEM analyses under such conditions, one companion sample was analyzed by TEM.

¹⁰ ENVIRON Corporation. 1990. Supporting data for evaluation of exposures to airborne fibers during solvent-assisted removal of asphaltic cutback adhesive. Arlington, VA: ENVIRON. October 26.

Some structures containing short chrysotile fibers were observed (see companion volume¹¹), but no structures containing chrysotile fibers longer than 5 μm were observed. This finding implies that some of the fibers counted by PCM were not asbestos. The highest observed TWA by PCM analysis was 0.0358 f/cc, less than 36% of the OSHA action level, when assuming zero baseline concentration. The results for worker exposures in this study are summarized in Table 1. Due to the small number of samples, no statistical analysis was performed on these results.

A sample was taken specifically to examine short-term worker and observer exposures. The observed excursion level was less than the detection limit of 0.0322 f/cc, which is less than 4% of the excursion limit of 1.0 f/cc averaged over a 30-minute period. It should be noted that the sample concentration reported by RJ Lee for the excursion sample was below the analytical sensitivity of 7 f/mm². Sample data are presented in Table 1.

¹¹ ENVIRON Corporation. 1990. Supporting data for evaluation of exposures to airborne fibers during solvent-assisted removal of asphaltic cutback adhesive. Arlington VA: ENVIRON. October 26.

TABLE 1
Adjusted Personal Monitoring Results for Worker and Observer
Exposure During Solvent-Assisted Removal of Asphalt Cutback Adhesive
Pursuant to Industry Recommended Work Practices

Sample Type	Net PCM Concentration (f/cc)	8-Hour TWA (f/cc)
<u>Results modified for ambient asbestos in baseline sample</u>		
Baseline	0.0162	N/A ^a
Perimeter	0.0209	N/A ^a
Worker #1	0.0219	0.0179
Worker #2	0.0261	0.0221
Observer	0.0235	0.0200
Excursion	<0.0159 ^a	N/A ^a
<u>Results assume that the baseline concentration is 0.0 f/cc</u>		
Baseline	0.0	N/A ^a
Perimeter	0.0371	N/A ^a
Worker #1	0.0381	0.0312
Worker #2	0.0423	0.0358
Observer	0.0397	0.0338
Excursion	<0.0322 ^a	N/A ^a

Notes: Bulk samples taken of the asphalt cutback adhesive were assayed at 10-15 % chrysotile asbestos. PCM measures both asbestos and non-asbestos fibers greater than 5 μm in length, 0.25 μm in width, and with a 3-to-1 aspect ratio. Baseline samples were taken overnight, prior to the removal activity. Perimeter samples were taken in an area adjacent to the study area. Activities performed by workers #1 and #2 are similar in scope and airborne exposures should be comparable. The observer was generally in the room throughout the removal activity and may have participated in some removal activities, although to a lesser degree than the workers.

Excursion level was determined for a 30-minute exposure period during the removal activity. The sample concentration reported by RJ Lee was below the analytical sensitivity of 7 f/mm².

These data are not applicable for these samples.

VII. CONCLUSIONS

Based on this analysis of results for exposures to asbestos and other fibers during removal of asphalt cutback adhesive using a solvent-assisted wet removal technique, ENVIRON concludes that exposures to fibers experienced by workers conducting asphalt cutback adhesive removal according to the proposed work practices did not exceed the OSHA action level or excursion limit for the asbestos construction standard for protection of workers (29 CFR 1926.58).

The 8-hour TWA concentration was less than 36% of the OSHA action level when conservatively assuming that no ambient background fiber levels were present. Accounting for the observed baseline concentration gives a maximum TWA concentration that is less than 22% of the OSHA action limit. An analysis of one worker TEM sample detected no qualifying asbestos fibers (i.e., greater than 5 μm long). The observed excursion level was found to be less than 4% of the OSHA excursion limit.

This study shows that the action level and excursion limit for exposure to asbestos fibers were not exceeded when performing solvent-assisted adhesive removal in accordance with the Recommended Work Practices. Consequently, removal of asphaltic cutback floor tile adhesive with Freedom Speed Stripper and a floor machine should enjoy the same exemption from initial monitoring as do other approved methods, when performed in accordance with Recommended Work Practices.

As noted by Johnson, the ingredients in Freedom Speed Stripper have the potential to cause minor eye and hand irritation in the absence of proper protective equipment.

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APPENDICES

APPENDIX A

Proposed Work Practice for Removal of Residual Asphaltic Adhesive

Exhibit 1
Training Outline

PROPOSED WORK PRACTICE FOR
REMOVAL OF RESIDUAL ASPHALTIC ADHESIVE

MATERIALS:

Broad stiff-bladed wall or floor scrapers, a 4 inch wide blade with handle is recommended

Floor machine fitted with a 3M black floor pad (or equivalent)

Removal Solution: S. C. Johnson & Son, Inc. (Johnson) Freedom^{*} Speed Stripper mixed 1:1 with water

Wet-dry tank type vacuum cleaner equipped with a High Efficiency Particulate Air (HEPA) filter and disposable dust bag

Heavy-duty polyethylene bags at least 6 mils thick, tape or ties and labels ("Caution--contains asbestos. Avoid creating dust. Breathing asbestos may cause bodily harm. Dispose in an approved landfill only.")

Slip-resistant shoes or rubber boots

Rubber gloves

Safety glasses or goggles

Ground fault circuit interrupter for electrical connection of the HEPA vacuum and any other electrical connections required

Armstrong or RFCI "Recommended Work Practices for Resilient Floor Coverings"

Garden sprayer, sprinkling can or mop

* Freedom is a trademark of Johnson Wax.

WET SCRAPING ADHESIVE: (with the tile flooring completely removed)

1. Start in the corner of the room farthest from the entrance door and moisten an area of the adhesive approximately 3' x 10' with equal parts of water mixed with Freedom Speed Stripper (to aid in wetting the adhesive.) Place the removal solution on the residual adhesive and allow to soak 5-10 minutes. Wet scrape with a stiff-blade wall or floor scraper removing ridges and any loose adhesive.

2. Place loosened adhesive residues into a heavy duty impermeable trash bag, or other impermeable container and seal with ties, tape or string and label "Caution - contains asbestos. Avoid creating dust. Breathing asbestos may cause bodily harm. Dispose in an approved landfill only".
3. Wet vacuum standing water with HEPA wet/dry vacuum.
4. Continue steps 1 through 3 until entire area is wet scraped.

FLOOR MACHINE REMOVAL OF ADHESIVE:

1. Start in the corner of the room farthest from the entrance door. Put the removal solution onto the residual adhesive with a garden sprayer or mop over a 6' x 6' area. Put enough solution on to insure that the area is thoroughly wet. Allow the area to soak for 5-10 minutes. Remove the adhesive using a floor machine equipped with a 3M black floor pad (or equivalent.) The subfloor must be continuously kept wet.
2. Occasionally push away the adhesive slurry from the subfloor with a wall or floor scraper to check for complete removal. Continue to use the floor machine in the same area until the concrete subfloor is cleaned to the desired degree. (This depends on what material will be reinstalled, and therefore based on the flooring manufacturers recommendations.)
3. Adhesive around the edge of the room and areas that were missed or difficult to reach with the machine can be removed with a hand held piece of the black floor pad.
4. Wet HEPA vacuum the adhesive slurry. When the HEPA vacuum is full place a commercially suitable water absorbent into the HEPA container until the adhesive slurry is absorbed. Place adhesive waste from the HEPA vacuum into heavy duty impermeable bags and seal with ties or tape, and label "Caution - contains asbestos. Avoid creating dust. Breathing asbestos may cause bodily harm. Dispose in an approved landfill only".
5. Rinse area with clear, clean water using a garden sprayer, sprinkling can or mop.
6. Wet vacuum standing water with HEPA wet/dry vacuum.
7. Continue steps 1 through 7 until the entire room is complete.
8. Allow subfloor to dry and vacuum with a HEPA vacuum.

Appendix B

LIST OF SUNDRY ITEMS FOR ADHESIVE REMOVAL PROJECT PLAN

Adhesive Removal Equipment

Broad stiff-bladed wall or floor scrapers
Floor machine fitted with a 3M black floor pad (or equivalent)
Removal Solution: S. C. Johnson & Son, Inc. (Johnson) Freedom* Speed
Stripper mixed 1:1 with water
Wet-dry tank type vacuum cleaner with HEPA filter and disposable dust bag
Ground-fault circuit interrupter
50' Extension cord
Garden sprayer, sprinkling can or mop

* Freedom is a trademark of Johnson Wax.

Personal Protective Equipment

Safety glasses or goggles
Rubber gloves
Slip-resistant shoes or boots

Monitoring Equipment

Personnel and environmental pumps
Cartridges and sample tubes
Chain of custody forms
Data sheets
Bulk collection containers

Miscellaneous

Duct tape
Heavy polyethylene bags
Asbestos warning labels
Camera
Videotaping equipment

APPENDIX B

Recommended Work Practices for Removal of Resilient Floor Coverings

B-1	Resilient Floor Covering Institute (July 1990)	B-2
B-2	Armstrong World Industries, Inc. (March 1990)	B-22

APPENDIX B-1

Recommended Work Practices for Removal of Floor Tiles
Resilient Floor Covering Institute (February 1990)

(FRONT COVER)

RECOMMENDED WORK PRACTICES
FOR THE REMOVAL OF
RESILIENT FLOOR COVERINGS

WARNING

Do Not Sand, Dry Scrape, Beadblast or Mechanically Pulverize Existing Resilient Flooring, Backing, Or Lining Felt. These Products May Contain Asbestos Fibers That Are Not Readily Identifiable. Using The Above Non-recommended Procedures On Asbestos-Containing Material Can Create Asbestos Dust. The Inhalation Of Asbestos Dust May Cause Asbestosis Or Other Serious Bodily Harm. Smoking Greatly Increases The Risk Of Serious Bodily Harm.

NOTICE

Various federal, state and local government agencies have regulations covering the removal of asbestos-containing material. If you are considering the removal of resilient floor covering that contains, or is assumed to contain, asbestos, you should determine if these regulations apply. The RFCI recommended work practices are designed to comply with the federal occupational asbestos permissible exposure limits.

This publication replaces prior editions of these work practices. Future editions of these work practices may be issued to replace this publication.

Issued by
Resilient Floor Covering Institute
966 Hungerford Drive
Suite 12-B
Rockville, MD 20850
(301) 340-8580

RECOMMENDED WORK PRACTICES FOR RESILIENT FLOOR COVERINGS

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**IMPORTANT
INFORMATION FOR
INSTALLERS OF RESILIENT
FLOOR COVERINGS**

Introduction

The member companies of the Resilient Floor Covering Institute are manufacturers of the following forms of Resilient Floor Coverings:

1. Sheet Vinyl
2. Vinyl Floor Tile

While today these products do not contain asbestos, it is possible that in the past some of these products including asphalt tile, may have contained firmly-encapsulated asbestos fibers. In the past decade much attention has been focused on the relationship between exposure to asbestos fibers and respirator ailments. It has been determined that inhalation of free airborne asbestos fibers may be injurious to health. However, the asbestos fibers contained in the above types of resilient floor coverings are not free but firmly encapsulated or locked in the product during the manufacturing process. Asbestos contained therein will not become airborne during the lifetime of the product when these products are used and maintained as recommended by the manufacturer.

The Resilient Floor Covering Institute is providing this booklet of recommended work practices for installing or removing resilient floor so that you may proceed with this work in a prudent and protected manner.

There are several general rules to follow:

1. Unless absolutely positive beyond any doubt that the floor is a non-asbestos product, assume it contains asbestos and treat it in the manner prescribed in this pamphlet for a floor containing asbestos.
2. It is preferred to install a new floor over a floor which contains asbestos rather than to remove that floor. This can be done by several methods—directly over the existing floor; installing new underlayment; or use of leveling compounds following installation procedures recommended by the floor covering manufacturer.
3. Removal should be considered the last alternative.
4. Never sand any resilient floor or its backing to remove them from the floor (See Warning).
5. Use a vacuum equipped with a HEPA filter, disposable dust bag, and metal floor tool (no brush).
6. All sheet removal must be done using detergent solution.
7. All felt scraping must be done wet.
8. Do not dry sweep.
9. Material removed must be placed in heavy-duty polyethylene bags at least 6 mils thick, properly labeled and disposed of in an authorized landfill.

RECOMMENDED WORK PRACTICES

PREPARATION OF FLOORS WITH EXISTING RESILIENT FLOOR COVERINGS TO RECEIVE NEW RESILIENT FLOOR COVERINGS

Follow the installation instructions published by the manufacturer of the new floor covering when a new resilient sheet or tile floor covering is to be installed on a surface presently covered with a resilient floor covering. These instructions will tell you what must be done to the existing surface before a new resilient floor covering can be installed.

Of the four general procedures listed below, Items 1a, b, and c are covered by manufacturers' instructions. Item 2 is covered specifically in this Work Practices Manual.*

1. Resilient Floor Covering Installation Over . . .
 - (a) The Existing Surface. Follow the manufacturer's instructions for removing wax, filling in spots, etc. Use wet scrubbing. Never sand an existing resilient floor covering.
 - (b) New Underlayment. Install panels on top of the existing surface (wood subfloors only) and apply new floor covering directly over this. Follow manufacturer's instructions.
 - (c) Leveling Compounds. Follow manufacturer's instructions.

* In case of minor variations, manufacturer's instructions should be followed.

2. **Completely Removed Existing Resilient Floor Covering**

(a) **Sheet Vinyl**--See instructions below:

- (1) "Complete Removal of Peripherally Adhered Sheet Vinyl Floor Coverings," page 6.
- (2) "Complete Removal of Fully Adhered Sheet Vinyl Floor Covering," page 11.

(b) **Tile**--See instructions under heading "Complete Removal of an Existing Resilient Tile Floor Covering," page 20.

SHEET VINYL FLOOR COVERING

Preparation of Floors With Existing Sheet Vinyl Floor Covering to Receive a New Resilient Floor Covering

Sheet vinyl floor covering can be installed over existing resilient sheet vinyl floor covering under certain conditions. Be sure to follow the floor covering manufacturer's instructions regarding the conditions and floor preparation required.

If complete removal of the existing sheet vinyl floor covering is required, the following instructions are to be followed:

Supplies and Tools
(refer Sketch 1.)

1. Broad stiff-bladed wall scraper or floor scraper.

-5-

2. Utility or hook knife.
3. Tank type wet/dry HEPA (High Efficiency Particulate Air) filter vacuum cleaner with disposable dust bag and metal floor tool (no brush).
4. Large size heavy-duty impermeable trash bags (at least 6 mils thick) or closed impermeable containers, with ties, tapes, or string to tie shut and tags for labeling.
5. Garden sprayer.
6. A liquid dishwashing detergent which is stated to contain anionic, nonionic, and amphoteric surfactants. The detergent should be mixed with water to make a dilute solution (15 oz. of detergent in one gallon of warm water).*
7. Pressure sensitive labels.
8. Ground fault circuit interrupter for connection of HEPA vacuum and any other electrical equipment.

WARNING

Sketch 1. Tools and supplies for sheet removal

***PRECAUTION:** Resilient flooring becomes slippery when wet with a detergent solution. Use caution to contain the solution in the immediate work area. Standing on a new sheet of plywood non-slip surface while working recommended.

WARNING

Sketch 2. Never dry scrape adhered areas of floor covering

WARNING

Sketch 3. Never sand in existing floor covering and never sand or dry scrape residual felt

WARNING

Sketch 4. Wash hands before eating and at the end of the work day

COMPLETE REMOVAL OF PERIPHERALLY ADHERED SHEET VINYL FLOOR COVERING

A. Preparation

1. Move all appliances and furniture from the work area.
2. Remove all binding strips or other restrictive molding from doorways, walls, etc.
3. Mix a detergent solution (16 ounces of the specified liquid detergent [See page 5, #6] to 1 gallon of warm water) and pour into a garden sprayer.
4. Clean the entire floor using a wet/dry vacuum cleaner equipped with a HEPA Filtration System and metal floor attachment (no brush). Do Not Sweep.

WARNING

ELECTRICAL SHOCK HAZARD EXISTS. USE A

GROUND FAULT CIRCUIT INTERRUPTER FOR ANY ELECTRICAL CONNECTIONS IN A WORK ENVIRONMENT.

- B. Make a cut in the adhered floor covering 4 to 8 inches wide parallel with the walls, around the perimeter of the room.
- C. Starting on either side of the entrance door, pry up the corner of the first strip, separating the backing layer. As the strip is being removed, a constant mist of the detergent solution must be sprayed into the delamination point to minimize any airborne dust particles.* When done properly, the felt remaining on the floor and the back of the strip will be thoroughly wet. The strip is peeled by pulling upward at an angle that permits the best separation or rolling around a core.
- D. Roll the strip tightly as it is removed. Tie or tape securely and place in a heavy-duty impermeable trash bag or closed impermeable container for disposal.
- E. It may be necessary to remove a second strip following steps (B, C) if the unadhered subfloor area has not been exposed.

***PRECAUTION:** Resilient flooring becomes slippery when wet with a detergent solution. Use caution to contain the solution in the immediate work area. Standing on a new sheet of plywood non-slip surface while working is recommended.

- F. Remove all of the exposed residual felt by wet scraping before proceeding.

RESIDUAL FELT MUST BE REMOVED BY WET SCRAPING; DO NOT SAND OR DRY SCRAPE IN ANY WAY; DO NOT DRY SWEEP; AVOID CREATING DUST. SEE WARNING STATEMENT.

Wet Scraping Residual Felt

1. Thoroughly wet the residual felt with the detergent solution and allow a few minutes to soak.
2. Stand on the remaining floor covering (not the felt) and use the stiff-bladed scraper or a floor scraper with a replaceable blade to remove the wet felt.

WARNING

Never sand or dry scrape residual felt. See Warning Statement.

3. Re-wet the felt if the solution has not completely penetrated, if drying occurs or if dry felt is exposed during scraping. Scrape all felt from this floor area before proceeding further. Pick up the scrapings as they are removed from the floor and place in a heavy-duty impermeable trash bag or closed impermeable container.

PRECAUTION: Wet residual felt as above but do not excessively soak or flood wood floors with detergent solution. Excessive water can damage wood floors to the extent that new underlayment

could be required. A floor that has been wet scraped must be allowed dry thoroughly before new resilient flooring is installed.

7. Continue around the room completely removing the adhered flooring along the perimeter, one strip at a time following steps D through F. Do not remove the flooring in the entrance doorway until all other flooring has been completely removed.
8. Place all flooring strips and fee scrapings immediately while wet in the recommended trash bags. Close full bags tightly and seal secure for disposal. Identify with a label stating, "Caution--Contain Asbestos. Avoid opening or breaking bag or container. Breathing asbestos may cause serious bodily harm. Dispose of in an approved landfill only."
9. Vacuum up any residue of wet fee scrapings immediately with a wet/dry vacuum equipped with a HEPA filter.

NOTICE

Various federal, state, or local governmental agencies have regulations covering the disposal of asbestos containing material. If you are considering the removal and disposal of resilient floor covering that contains or is assumed to contain asbestos, you should determine if these regulations apply. The RFCI recommended work practices are designed to comply with the federal occupational asbestos permissible exposure limits.

and metal floor attachment (no brush).

- J. Remove the unadhered flooring as detailed in the following steps.

**COMPLETE REMOVAL OF SHEET VINYL FLOORING
IN UNADHERED AREAS AND FLOORING INSTALLED
LOOSE LAID (WITHOUT ADHESIVE)**

A. Preparation

- o Move all appliances and furniture from the work area.
- o Remove all binding strips or other restrictive holding from doorways, walls, etc.
- o Prepare a detergent solution (16 ounces of the specified liquid detergent [See page 5] to 1 gallon of warm water) and pour into a garden sprayer.
- o Clean the entire floor with a wet/dry vacuum equipped with a HEPA Filtration System and metal floor attachment (no brush). Do Not Sweep.

- B. Start at the end of the room farthest from the entrance doorway and cut a strip 4 to 8 inches wide in the unadhered flooring.

- C. Remove the cut strips while spraying the detergent solution directly into the separation rip point.* Do not

***PRECAUTION:** Resilient flooring becomes slippery when wet with a detergent solution. Use caution to contain the solution in the immediate work area. Standing on a new sheet of plywood or non-slip surface while working is recommended.

stand or kneel on the exposed subfloor during the removal process.

- D. Roll the wet strip tightly and secure with tape to secure. Continue working toward the doorway, cutting each strip and removing it while spraying the separation rip point with the detergent solution. Place the strips immediately into a heavy-duty impermeable trash bag or close impermeable container. Close full bags tightly and seal securely for disposal. Identify with a label stating, "Caution--Contains Asbestos. Avoid opening or breaking bag or container. Breathing asbestos may cause serious bodily harm. Dispose of in approved landfill only. (See NOTICE page 9).

- E. After removing three strips of flooring, vacuum the exposed floor using a wet/dry vacuum equipped with a HEPA filter and metal floor attachment (no brush).

- F. Seams and other adhered areas should be removed as they are encountered by stripping the wear surface and spraying the detergent solution in the delamination rip point and scraping the residual felt as previously described in complete removal of peripherally adhered flooring.

- G. Continue removing flooring doing only one three-strip area at a time until the entire floor has been completely removed.

- H. When the whole floor has been completely removed, let it dry and

vacuum up any dust using a vacuum with a HEPA Filtration System and a metal floor tool (no brush). Stand only in vacuumed areas as you proceed across the floor. Position the vacuum cleaner so that discharge air does not blow on the floor being cleaned.

WARNING

Do not dry sweep; avoid creating dust. SEE WARNING STATEMENT.

- I. Take the vacuum cleaner outside and carefully remove the dust bag and place it in a heavy-duty impermeable trash bag or closed impermeable container, which is labeled as above, for disposal. (See page 11 paragraph D.)
- J. When the floor is dry, install the new resilient floor covering following manufacturers' installation recommendations.

COMPLETE REMOVAL OF AN EXISTING ADHERED SHEET VINYL FLOOR COVERING

If complete removal is required, follow these instructions:

WARNING

Never Sand an Existing Floor Covering

- A. Preparation
 1. Move all appliances and furniture from the work area.
 2. Remove all binding strips or other restrictive molding from doorways, walls, etc.
 3. Prepare a detergent solution (16 ounces of the specified detergent

(See page 5) to 1 gallon of warm water) and pour into a garden sprayer.

4. Clean the entire floor with a wet/dry vacuum equipped with a HEPA Filtration System and metal floor attachment (no brush). Do Not Sweep.
5. Make a series of parallel cuts 4 to 8 inches apart, parallel to a wall.
6. Start at the end of the room farthest from the entrance door; pry up the corner of the first strip separating the backing layer. As the strip is being removed, a constant mist of the detergent solution must be sprayed into the delamination nip point to minimize any airborne dust particles. When done properly, the felt remaining on the floor and on the back of the strip will be thoroughly wet. The strip is peeled by pulling upward at an angle that permits the best separation or by rolling around a core.

WARNING

ELECTRICAL SHOCK HAZARD EXISTS. USE A GROUND FAULT CIRCUIT INTERRUPTER FOR ANY ELECTRICAL CONNECTIONS IN WET ENVIRONMENT.

- D. Roll the strip tightly as it is removed. Tie or tape securely and place in a heavy duty impermeable trash bag or closed impermeable container for disposal.
- E. Occasionally, parts of the foam inner-layer will remain stuck to the backing. This condition can

sometimes be eliminated by pulling the strips loose from the opposite end. Peel the foam inner-layer from the floor while spraying the detergent solution into the delamination nip point.

Some resilient flooring is not readily stripable by hand. When these conditions are encountered, it may be necessary to employ a sharp, stiff blade scraper to assist cleavage of the wearlayer from felt (distance between cuts in wearlayer should be narrower, 3" to 5" wide).

NOTE: Regardless of which one of the previously mentioned methods is used for stripping the wear surface, the detergent solution must be sprayed into the delamination nip point to minimize any airborne dust particles.

- F. Repeat the wetting and removal process on the next two strips, placing them immediately into the recommended trash bags or containers for disposal.

NOTE: During the stripping process, do not stand or walk on the exposed felt.

- G. After removing three strips of the wear surface, the remaining residual felt must be removed by wet scraping before proceeding.

WARNING

RESIDUAL FELT MUST BE REMOVED BY WET SCRAPING; DO NOT SAND OR DRY SCRAPE IN ANY WAY; DO NOT DRY SWEEP; AVOID CREATING DUST. SEE WARNING STATEMENT.

H. Wet Scraping Residual Felt

1. Thoroughly wet the residual felt with the detergent solution. Avoid excessive wetting or standing water. Wait a few minutes to allow the solution to soak into the felt.
2. Stand on the remaining floor covering (not the felt) and use the stiff-bladed scraper or floor scraper with a replaceable blade to remove the wet felt.

WARNING

Never sand or dry scrape residual felt. See Warning Statement.

3. Re-wet the felt if the solution has not completely penetrated if drying occurs or if dry felt is exposed during scraping. Scrape all felt from this floor area before proceeding further. Pick up the scrapings as they are removed from the floor and place in a heavy-duty impermeable trash bag or close impermeable container.

PRECAUTION: Wet residual felt as above but do not excessively soak or flood wood floors with detergent solution. Excess water can damage wood floors to the extent that an underlayment could be required. A floor that has been wet scraped must be allowed to dry thoroughly before new resilient flooring is installed.

4. After removing the three strips of flooring vacuum the exposed

floor using a wet/dry vacuum equipped with a HEPA filter and metal floor attachment (no brush).

- i. Repeat the operation (wetting the delamination nip point while removing the next three strips, then wet scrape the residual felt then vacuum the exposed floor). Do only one three-strip area at a time until the entire floor has been completely removed.

WARNING

ELECTRICAL SHOCK HAZARD EXISTS. USE A GROUND FAULT CIRCUIT INTERRUPTER FOR ANY ELECTRICAL CONNECTIONS IN A WET ENVIRONMENT.

- J. Place all flooring strips and felt scrapings immediately while wet into the recommended trash bags. Close full bags tightly and seal securely for disposal.

Identify with a label stating, "Caution—Contains Asbestos. Avoid opening or breaking bag or container. Breathing asbestos may cause serious bodily harm. Dispose in an approved landfill only." (See NOTICE page 9.)

WARNING

Do Not Dry Sweep; Avoid Creating Dust. See Warning Statement.

- K. When the whole floor has been completely removed, let it dry and vacuum up any dirt using a vacuum with a HEPA Filtration System and a metal floor attachment (no brush). Stand only in vacuumed area as you proceed across the floor. Position the vacuum cleaner so the discharge

air does not blow on the floor being cleaned.

- L. Take the vacuum cleaner outside and carefully remove the dust bag and place it in a heavy-duty impermeable trash bag or closed impermeable container for disposal, which is labeled as above.
- M. When the floor is dry, it is ready to have a new resilient floor covering installed. Follow the floor covering manufacturer's instructions.

COMPLETE REMOVAL OF THIN WOOD UNDERLAYMENT COVERED WITH EXISTING SHEET VINYL RESILIENT FLOORING

The removal of resilient flooring over wood subfloors using the wet stripping/wet scraping method may not be practical in cases where multiple layer of floor covering are present, where non-recommended underlayments were used or where the flooring was made with heavy foam backing. As an alternative the wood underlayment can be removed with the flooring adhered to it. Following are the details.

A. Preparation

- o Move all appliances and furniture from the work area.
- o Remove all binding strips and other restrictive molding from doorways, walls, etc.
- o Prepare a detergent solution (1 ounce of the specified liquid detergent [See page 5] to gallon of warm water) and put into a garden sprayer.
- o Clean the entire floor with a

wet/dry vacuum equipped with a HEPA Filtration System and metal floor tool (no brush).

- B. Locate the joints of the underlayment panel farthest from the entrance door.
- C. Cut a strip of the flooring 4 to 6 inches wide centered over the underlayment joint in the panel being removed.
- D. Pry up the corner of the strip separating the backing layer. As the strip is being removed, a constant mist of the detergent solution must be sprayed into the delamination nip point to minimize any airborne dust particles. When done properly, any felt remaining on the floor and on the back of the strip will be thoroughly wet. The strip is peeled by pulling upward at an angle that permits the best separation or by rolling around a core.

PRECAUTION: Resilient flooring becomes slippery when wet with a detergent solution. Use caution to contain the solution in the immediate work area. Standing on a new sheet of plywood or non-slip surface while working is recommended.

- E. Roll the strip tightly as it is removed. Tie or tape securely and place in a heavy-duty impermeable trash bag or closed impermeable container for disposal, which is labeled "Caution—Contains Asbestos. Avoid opening or breaking bag or container. Breathing asbestos may cause serious bodily harm. Dispose

of in an approved landfill only."

WARNING

RESIDUAL FELT MUST BE REMOVED BY WET SCRAPING; DO NOT SAND OR DRY SCRAPE ANY WAY; DO NOT DRY SWEEP; AVOID CREATING DUST. SEE WARNING STATEMENT.

- F. Remove all of the exposed residual felt by wet scraping before proceeding.

Wet Scraping Residual Felt

1. Thoroughly wet the residual felt with the detergent solution and allow a few minutes to soak.
2. Stand on the remaining floor covering (not the felt) and use the stiff-bladed scraper or a floor scraper with a replaceable blade to remove the wet felt.

WARNING

Never sand or dry scrape residual felt. See Warning Statement

3. Re-wet the felt if the solution has not completely penetrated if drying occurs or if dry felt is exposed during scraping. Scrape all felt from this floor area before proceeding further. Pick up the scrapings as they are removed from the floor and place in a heavy-duty impermeable trash bag or closed impermeable container.
4. Continue around the underlayment panel completely removing all adhered flooring over the joints.

5. Place all flooring strips and felt scrapings immediately while wet into the recommended trash bags. Close full bags tightly and seal securely for disposal. Identify with a label stating, "Caution--Contains Asbestos. Avoid opening or breaking bag or container. Breathing asbestos may cause serious bodily harm. Dispose in an approved landfill only." (See NOTICE page 9.)
6. Vacuum the exposed floor area using a wet/dry vacuum equipped with a HEPA filter and metal floor attachment (no brush).
7. Drive a cold chisel using a hammer or mallet into the joint at a corner of the panel. Now use the chisel to pry the panel up far enough to insert a pry bar. Continue working around the panel, lifting all edges slowly. Use one or two pry bars to pry up the underlayment panel a little at a time until the panel is completely loose and can be removed. Every attempt should be made to remove the panel in one piece.
8. If the underlayment panel breaks, cut the resilient flooring at the break and spray the detergent solution onto the exposed felt. Allow the solution to penetrate for a few minutes, then continue lifting the broken underlayment.

WARNING

ELECTRICAL SHOCK HAZARD EXISTS. USE A GROUND FAULT CIRCUIT INTERRUPTER FOR ANY ELECTRICAL CONNECTIONS IN A WET ENVIRONMENT.

- I. Remove each underlayment panel or piece from the work area as it is lifted to avoid injury. Wear heavy gloves when handling removed panels. Be very careful of wood splinters and protruding fasteners. Flatten the fasteners with a hammer and stack the panels back to back on pallets or place in dumpster. Identify panels with a label stating, "Caution--Contains asbestos. Avoid breaking panels. Breathing asbestos may cause serious bodily harm. Dispose of in an approved landfill only." Place any small wood or flooring scraps in a heavy-duty impermeable trash bag or closed impermeable container for disposal. Identify all of the containers and bags with a label stating, "Caution--Contains Asbestos. Avoid opening or breaking bag or container. Breathing asbestos may cause serious bodily harm. Dispose of in an approved landfill only."
- J. If the underlayment extends under cabinets or wall partitions, it will be necessary to cut through the flooring with a knife as close to the vertical surface as possible, deeply scoring the panel. This should allow removal.
- K. After each panel has been lifted and removed from the work area, pull out any remaining nails or fasteners in the subfloor.
- L. Continue removing each underlayment panel following steps G through K.
- M. When the underlayment/resilient flooring removal is completed, prepare the subfloor following

manufacturer's installation recommendations.

RESILIENT TILE FLOOR COVERING

Preparation of Floors With Existing Resilient Tiles to Receive New Resilient Floor Covering

Some resilient floor coverings can be installed over existing resilient tile installations. Follow the installation instructions published by the manufacturer of the new floor covering when a new resilient floor covering is to be installed on a surface presently covered with a resilient floor covering.

These instructions will tell you what must be done to the existing surface before the new resilient floor covering can be installed.

WARNING

Never Sand an Existing Tile Installation
(see Sketch 4)

Complete Removal of Existing Resilient Tile Floor Covering

Supplies and Tools (refer Sketch 14)

1. Sharp stiff blade floor scraper.
2. Weighted scraper with long handle.
3. Safety glasses.
4. Hammer
5. Hot air gun.
6. Wet/dry vacuum with a HEPA Filtration System and metal floor attachment (no brush).
7. Heavy-duty, impermeable, plastic

trash bags with minimum 6 mil wall thickness.

8. Garden sprayer.
9. A liquid dishwashing detergent which is stated to contain anionic, nonionic, and amphoteric surfactants. The detergent should be mixed with water to make dilute solution (1 oz. of detergent to one gallon of water).
10. Pressure-sensitive labels 3" x or larger.
11. Ground fault circuit interrupter for connection of HEPA vacuum at any other electrical equipment.

Whenever possible, existing tile floor should be left in place and the new floor adhered directly to the tile following manufacturer's directions.

Occasionally, there is no alternative except to remove the tile; curling, peeling, bond and breakage are common reasons. If removal is unavoidable, consideration must also be given to subfloors coated with asphalt tile adhesive. The following procedures address the recommended work practice for removal of floor tile and preparation of adhesive-coated floors.

Removal Procedure

A. Preparation

1. Move all appliances and furniture from the work area.
2. Remove all binding strips or other restrictive molding from doorways, walls, etc.
3. It is also suggested that entire floor be cleaned with wet/dry vacuum equipped with HEPA Filtration System and metal floor attachment (no

brush). Do Not Sweep.

- B. Those areas normally exposed to heavy foot traffic patterns usually have tiles adhered the tightest. As a matter of good practice in starting the tile removal, those sections which receive the least traffic should be the locations selected for starting the removal of the tile. Since tiles are normally in a 9" x 9" or 12" x 12" dimension, it should be the goal to remove individual tiles as a complete unit although breakage of some tiles is unavoidable.
- C. Start the removal by carefully wedging the wall scraper in the seam of two adjoining tiles and gradually forcing the edge of one of the tiles up and away from the floor. Continue to force the balance of the tile up by working the scraper beneath the tile and exerting both a forward pressure and a twisting action on the blade to promote release of the tile from the adhesive and the floor.
- D. When the first tile is removed, place it, without breaking it further into smaller pieces, in a heavy-duty impermeable trash bag or closed impermeable container which will be used for disposal.
- E. With the removal of the first tile accessibility of the other tile is improved. Force the wall scraper under the exposed edge of another tile and continue to exert a prying twisting force to the scraper as it is moved under the tile until the tile releases from the floor. Again, dispose of the tile, and succeeding

tiles, by placing in the heavy-duty bag or closed container without additional breaking.

- F. Some tiles will release quite easily while others require varying degrees of force. Where the adhesive is spread heavily or is quite hard, it may prove easier to force the scraper through the tightly adhered areas by striking the scraper handle with a hammer using blows of moderate force while maintaining the scraper at a 25° to 30° angle to the floor.
Caution: Use safety goggles.
- G. If some areas are encountered where even the technique detailed in the previous paragraph proves to be inadequate, the removal procedure can be simplified by thorough heating the tile(s) with a hot air blower until the heat penetrates through the tile and softens the adhesive.
NOTE: Handle the hot air blown tiles and adhesive carefully to avoid personal burns.
NOTE: Do not handle the heated tiles and adhesive without suitable glove protection for the hands.
- H. As small areas of subfloor are cleared of tile, the adhesive remaining on the floor must be treated. The degree of treatment for residual "cut-back" adhesive is dependant upon the type of resilient floor covering material

to be installed and the type of subfloor. See page 32 Preparation of Adhesive Coated Subfloor for special recommendations.

If new resilient floor tile is to be installed over a concrete subfloor using an asphaltic adhesive, the residual asphaltic "cut-back" adhesive must be left so that no ridges or puddles are evident and what remains is a thin, smooth film.

Wet Scraping Residual Adhesive

- (1) Start in the corner of the room farthest from the entrance door and moisten an area approximately 3' x 10' with water mixed with the specified liquid dishwashing detergent (1 oz. specified liquid dishwashing detergent to one gallon of water) to aid in wetting the adhesive. Wet scrape with a stiff-bladed wall or floor scraper removing ridges and any loose adhesive.
- (2) Place loosened adhesive residues into a heavy-duty impermeable trash bag or other impermeable container and seal with ties, tape or string and label "Caution--Contains Asbestos. Avoid opening or breaking container. Breathing asbestos is hazardous to your health. Dispose in an approved landfill only."
- (3) Wet vacuum standing water with HEPA wet/dry vacuum.

(4) Continue steps (1) through (3) until what remains of the residual asphaltic "cut-back" adhesive is a thin, smooth film.

- I. As indicated in previous paragraphs, tiles should be placed immediately in a heavy-duty impermeable trash bag or closed impermeable container. Do not attempt to break tiles further after they are in the bag.
- J. When all tiles and adhesive residue have been removed from the floor and placed in heavy-duty polyethylene bags at least 6 mil thick or closed containers, seal the bags securely for disposal and label: "Caution--Contains Asbestos. Avoid opening or breaking bag or container. Breathing asbestos may cause serious bodily harm. Dispose in approved landfill only."
- K. Vacuum up any dirt in the area using a vacuum equipped with a HEPA filter and metal floor attachment (no brush).
- L. After vacuuming, used HEPA filter and cleaner bags should be removed according to manufacturer's instructions and placed in a heavy-duty impermeable trash bag with label stating "Caution--Contains Asbestos. Avoid opening or breaking container. Breathing asbestos is hazardous to your health. Dispose in an approved landfill only." Close and seal trash bags securely for disposal.

**Complete Removal of Thin Wood
Underlayment Covered with Existing Tile**

Supplies and Tools

1. Chisel.
2. Hammer or mallet.
3. Short- and long-handled pry bars.
4. Heavy gloves.
5. Sharp stiff-blade floor scraper.
6. Weighted scraper with long handle.
7. Safety glasses.
8. Hammer.
9. Hot air gun.
10. Wet/dry vacuum with a HEPA Filtration System and metal floor attachment (no brush).
11. Heavy-duty, impermeable, plastic trash bags with minimum 6 mil wall thickness.
12. Pressure-sensitive labels 3" x 5" or larger.
13. Ground fault circuit interrupter for connection of HEPA vacuum and any other electrical equipment.

Removal Procedure

- A. Preparation
 1. Move all appliances and furniture from the work area.
 2. Remove any binding strips or other restrictive molding from doorways, walls, etc.
 3. It is also suggested that the entire floor be cleaned with a wet/dry vacuum equipped with a HEPA Filtration System and a metal floor attachment (no brush). Do Not Sweep.
- B. Starting at the doorway or a floor ventilation vent, locate a joint in an underlayment board.

- C. Start the removal by carefully wedging the wall scraper in the seam of two adjoining tiles and gradually forcing the edge of one of the tiles up and away from the floor. Continue to force the balance of the tile up by working the scraper beneath the tile and exerting both a forward pressure and a twisting action on the blade to promote release of the tile from the adhesive and the floor. Continue to remove tile in this manner, at all joints, until all board joints are exposed.
- D. When the first tile is removed place it, without breaking it further into smaller pieces, in a heavy-duty impermeable trash bag or closed impermeable container which will be used for disposal.
- E. With the removal of the first tile accessibility of the other tile is improved. Force the wall scraper under the exposed edge of another tile and continue to exert a prying twisting force to the scraper as it is moved under the tile until the tile releases from the floor. Again, dispose of the tile, as succeeding tiles, by placing in the heavy-duty bag or closed container without additional breaking.
- F. Some tiles will release quite easily while others require varying degrees of force. Where the adhesive is spread heavily or is quite hard, it may prove easier to force the scraper through the tightly adhered areas by striking the scraper handle with a hammer.

using blows of moderate force while maintaining the scraper at a 25° to 30° angle to the floor.

Caution: Use safety goggles.

- G. If some areas are encountered where even the technique detailed in the previous paragraph proves to be inadequate, the removal procedure can be simplified by thoroughly heating the tile(s) with a hot air blower until the heat penetrates through the tile and softens the adhesive.
- NOTE: Handle the hot air blower, tiles and adhesive carefully to avoid personal burns.
- NOTE: Do not handle the heated tiles and adhesive without suitable glove protection for the hands.
- H. After all the tiles have been removed from the underlayment joints, drive a chisel, using a hammer or a mallet, between the underlayment board and the subfloor. Use the chisel to pry up the underlayment enough to insert a pry bar and remove the chisel. Slowly and carefully use pry bars to pry up the underlayment board a little at a time until the board is completely loose and can be removed.
- I. Caution must be used to avoid breaking the underlayment board. The underlayment board should be removed in one piece. If the underlayment board breaks, heat and cut the tile at the break, then continue to remove broken underlayment.
- J. Wear heavy gloves and be very careful of wood splinters and fasteners sticking out of the back of the underlayment. Each underlayment

board (or piece of board) should be removed from the work area as soon as it has been pried up to avoid injuries (such as stepping on a nail). Fasteners protruding from removed board should be flattened with a hammer. Place removed underlayment boards on skids with the nails pointing downward. Wrap skid with 6 mil polyethylene plastic sheeting and secure with duct tape. Identify with a label stating "Caution--Contains Asbestos. Avoid opening breaking container. Breathing asbestos may cause serious bodily harm. Dispose in an approved landfill only."

- K. After each board has been removed, pull out any nails or fasteners still in the subfloor. Dispose these and any other nails and fasteners which have been removed but are still lying in the work areas.
- L. A chisel is not needed to start removal of boards after the first board has been removed. Simply work the pry bar under the exposed edge of the next board.
- M. When removal of the underlayment existing tile floor is complete, thoroughly check the exposed subfloor. Rerail loose areas and reset any "popped" nails and fasteners.
- N. Vacuum up any dirt in the work area using the vacuum cleaner equipped with the HEPA filter and the floor attachment (no brush).

0. After the underlayment is completely removed, install the new underlayment and/or floor covering according to the manufacturer's installation instructions.

PREPARATION OF ADHESIVE COATED SUBFLOORS

The degree to which residual asphalt adhesive has to be removed depends on the new flooring material which is being installed. Generally installation of Vinyl Composition Tile requires only the wet removal of adhesive ridges, excess adhesive, and loose adhesive residues. (See page 25, paragraph H.)

Installation of sheet flooring and specialty tiles requiring latex, resin, or epoxy adhesives will require that the residual asphaltic adhesive be essentially completely removed.

Warning Regarding Complete Adhesive Removal: Some Solvent Based "Out-Back" Asphaltic Adhesives May Contain Asbestos Fibers That Are Not Readily Identifiable. Do Not Use Power Devices Which Create Asbestos Dust in Removing These Adhesives. The Inhalation Of Asbestos Dust May Cause Asbestosis Or Other Serious Bodily Harm. Smoking Greatly Increases The Risk Of Serious Bodily Harm.

I. Recommended Method for Preparing Concrete Subfloors Coated with Out-Back or Emulsion Tile Adhesive

Unless absolutely positive beyond any doubt that the adhesive is a non-asbestos product, assume it contains

asbestos and treat it in the manner prescribed in this pamphlet for cut-back or emulsion tile adhesive containing asbestos.

A. Trowelable Underlayment

Cover the adhesive residue with trowelable underlayment following the manufacturer's recommended application procedures. (Recommended for residential use only.)

B. Self-Leveling Cementitious Underlayment

Follow manufacturer's recommendations for use of these types of underlayments as a covering for adhesive coated concrete.

NOTE: All warranties and recommendations as to suitability and performance of these products are the responsibility of the manufacturer of the underlayment.

C. Adhesive Removers

The Resilient Floor Covering Institute does not recommend approve the use of the products. There are a number of commercial adhesive removers on the market that will properly remove cut-back emulsion adhesive residue from a subfloor; however, there are concerns that these products may adversely affect the new adhesive and new floor covering.

D. Wet Removal

Supplies and Tools

1. Broad stiff-bladed wall or floor scrapers, a 4-inch wide blade with handle is recommended.
2. No. 1 sandblasting sand (clean, sharp, coarse cutting sand).
3. Terrazzo or low-speed floor machine fitted with a floor plate attachment (Clark Assy. 500212-6).
4. Hand-held rubbing stones.
5. Wet/dry tank-type vacuum cleaner equipped with a High Efficiency Particulate Air (HEPA) filter and metal floor attachment (no brush).
6. Heavy-duty polyethylene bags at least 6 mils thick, tape or ties, and labels.
7. Slip-resistant shoes or rubber heels.
8. Ground fault circuit interrupter for electrical connection of the HEPA vacuum and any other electrical connections required.
9. Garden sprayer.
10. A liquid dishwashing detergent which is stated to contain anionic, nonionic, and amphoteric surfactants. The detergent should be mixed with water to make a dilute solution (1 oz. of liquid in one gallon of water).

Procedure

1. Start in the corner of the room farthest from the entrance door and moisten an area of the adhesive approximately 3' x 10' with water mixed with liquid dishwashing detergent (to aid in wetting the adhesive). Wet scrape with a stiff-bladed wall or floor scraper removing ridges and any loose adhesives, until only thin smooth film remains.
2. Place loosened adhesive residues into a heavy-duty impermeable trash bag or other impermeable container and seal with ties, tape, string and label "Caution: Contains Asbestos. Avoid opening or breaking bag container. Breathing asbestos may cause bodily harm. Dispose in approved landfill only."
3. Wet vacuum standing water with HEPA wet/dry vacuum.
4. Continue steps 1 through until entire area is scraped.
5. Place cutting sand into container (enough to cover an approximate 6' x area), add water mixed with liquid detergent (1 oz. of the specified detergent [See page 33] to one gallon of water) to the sand dampen (20 lbs. of sand 1/2 gallon of solution).
6. Place sand over a 6' x area and wet remove the

existing adhesive residue using a terrazzo floor machine. Keep sand under rubbing stones when operating the machine. The sand and the subfloor must be continuously kept wet.

7. Occasionally push away cutting sand from the subfloor with a wall or floor scraper to check for complete removal.
8. Adhesive around the edge of the room and areas that were missed can be removed with dampened, clean, sharp cutting sand and a hand-held rubbing stone.
9. Wet scrape sand into a pile using a stiff-bladed floor or wall scraper and place sand and adhesive residue in a heavy-duty impermeable container, seal with ties or tape and label "Caution-Contains Asbestos. Avoid opening or breaking bag or container. Breathing asbestos may cause bodily harm. Dispose in an approved landfill only."
10. Rinse area with clear, clean water using the hand sprayer.
11. Wet vacuum standing water with a wet/dry vacuum equipped with a HEPA filter and metal floor attachment (no brush).
12. Continue steps 1 through 8 until the entire room is complete.
13. Allow subfloor to dry and vacuum up any remaining

dirt or sand using a vacuum equipped with a HEPA filter and metal floor tool (no brush).

WARNING

Electrical ~~Shock~~ Hazard Exists
Use A Ground Fault Circuit Interrupter For Any Electrical Connections In A Wet Environment.

II. Recommended Methods for Preparing Wood Subfloors Coated with Out-Bac or Emulsion Tile Adhesive

- A. Trowelable Underlayment
Cover the adhesive residue with trowelable underlayment following manufacturer recommended application procedures. (Recommended for residential use only).
- B. Wood Panel Underlayment*
Normally it will not be necessary to remove the tile when installing a new underlayment over a single layer of tile. However, if the tile must be removed, the tackiness of the adhesive must be "dried-up" before installing new underlayment. This can be done by spreading a layer of powder from latex patching compound (either type) and vacuuming up the excess. Another method is to place a layer of asphalt saturated pattern scribing felt or two layers of newspaper over the tacky adhesive residue.

* See manufacturers' recommendations for approved underlayment types.

before the underlayment is installed. If the old adhesive is not "dried-up" before the underlayment is installed, there is the possibility that a "cracking" sound will be heard when the new floor is walked on, creating an unsatisfactory condition. This occurs because the underlayment is pressed into the tacky adhesive by foot traffic. When the pressure is released, the underlayment sticks momentarily and then springs from the tacky adhesive, creating a "cracking" noise.

- C. Removal of Adhesive Coated Underlayment Panels
If removal of the existing underlayment panels is necessary follow the procedure outlined under "Complete Removal of Thin Wood Underlayment Covered with Existing Resilient Flooring" steps G - M (pages 19 - 21).

WARNING

Do Not Sand, Dry Scrape, Sandblast Mechanically Pulverize Existing Resilient Flooring, Backing Or Liner Felt. These Products May Contain Asbestos Fibers That Are Not Readily Identifiable. Using the Above Recommended Procedures On Asbestos Containing Material Can Create Asbestos Dust. The Inhalation Of Asbestos Dust May Cause Asbestosis Or Other Serious Bodily Harm. Smoking Greatly Increases The Risk Of Serious Bodily Harm.

(BACK COVER)

Issued By

Resilient Floor Covering Institute
966 Hungerford Drive, Suite 12B
Rockville, MD 20850
(301) 340-8580

February 1990

This publication replaces prior editions of these work practices. Future editions of these work practices may be issued to replace this publication.

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Revised 1987
Revised 1990

APPENDIX B-2

Recommended Work Practices for Removal of Floor Tiles

Armstrong World Industries, Inc. (March 1990)

Armstrong

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Printed in United States of America

Armstrong



The illustration shows a worker in a plaid shirt and safety glasses using a hand tool to pry up a square tile from a grid-patterned floor. A black bag with a 'CAUTION' label is nearby. The floor is composed of many square tiles, and the worker is focused on the task.

**Recommended
Work Practices for
Removal of
Resilient
Floor
Coverings**

Effective MARCH 1990
Through DECEMBER 1990

**⚠ WARNING ASBESTOS-
CONTAINING RESILIENT
FLOOR COVERING MATERIALS**

DO NOT SAND EXISTING RESILIENT FLOOR TILE AND SHEET FLOORING, BACKING, OR LINING FELT. THESE PRODUCTS MAY CONTAIN ASBESTOS FIBERS THAT ARE NOT READILY IDENTIFIABLE. AVOID CREATING DUST. INHALATION OF ASBESTOS DUST MAY CAUSE ASBESTOSIS OR OTHER SERIOUS BODILY HARM. SMOKING GREATLY INCREASES THE RISK OF SERIOUS BODILY HARM.

**⚠ WARNING ASBESTOS-
CONTAINING ASPHALTIC
"CUTBACK" ADHESIVE**

SOME IN-PLACE ASPHALTIC ADHESIVES MAY CONTAIN ASBESTOS FIBERS THAT ARE NOT READILY IDENTIFIABLE. IN THE REMOVAL OF ASPHALTIC "CUTBACK" ADHESIVES, DO NOT USE POWER DEVICES WHICH CAN CREATE DUST. THE INHALATION OF ASBESTOS DUST MAY CAUSE ASBESTOSIS OR OTHER SERIOUS BODILY HARM. SMOKING GREATLY INCREASES THE RISK OF SERIOUS BODILY HARM. ASSUME THAT ALL IN-PLACE ASPHALTIC "CUTBACK" ADHESIVES CONTAIN ASBESTOS.

**NOTICE: Regulations Affecting
the Removal of Existing
Resilient Floor Covering
Structures**

Various government agencies have regulations governing the removal of in-place asbestos-containing material. If you contemplate the removal of a resilient floor covering structure that contains (or is assumed to contain) asbestos, you should determine whether such regulations apply.

**THIS EDITION OF THE RECOM-
MENDED WORK PRACTICES,
F-2622-390J SUPERCEDES ALL
OTHERS. ALL PREVIOUS EDITIONS
ARE NOW OBSOLETE.**

**Important information
for installers of
resilient floor coverings**

**What You Should Know About
Existing Resilient Floor
Covering Structures**

Vinyl-asbestos tile and asphalt tile contain asbestos fibers, as did some asphaltic "cut-back" adhesives and the backings of many sheet vinyl floorings and lining felts. The presence of the asbestos in these products is not readily identifiable.

Unless absolutely positive beyond any doubt that the product is a nonasbestos-containing material, always assume it does contain asbestos.

Armstrong's Recommended Work Practices are a defined set of instructions addressed to the task of removing all resilient floor covering structures whether or not they contain asbestos. When Armstrong's Recommended Work Practices are followed, resilient floor covering structures that contain (or are assumed to contain) asbestos can be removed in a manner that will comply with the current OSHA Occupational Exposure to Asbestos Standard's Permissible Exposure Limits (PEL).

Numerous products, devices and techniques have been recently introduced and/or recommended for the removal of resilient floor covering structures. Armstrong is only able to endorse its own Recommended Work Practices. Before you use any other practice for the removal of an in-place resilient floor covering product that contains (or is assumed to contain) asbestos, you should determine if the practice meets all applicable regulations or standards including those of the Occupational Safety and Health Administration (OSHA) for Occupational Exposure to Asbestos and that the material will be compatible with the new floor covering to be installed.

Recommended Work Practices for Removal of Resilient Floor Coverings

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1. ALTERNATIVES TO REMOVAL OF EXISTING RESILIENT FLOOR COVERINGS

Removal of the existing resilient floor is the final alternative (see note below). Armstrong recommends that whenever possible you leave the existing resilient floor covering in place and go over the top with your new floor.

Note: Alternatives to the removal of an existing resilient floor over approved subfloors are:

- (1) Installing directly over a single layer of approved existing resilient flooring.
- (2) Filling the embossing of the existing resilient flooring with S-188 Embossing Leveler before installation (residential products only).
- (3) Covering existing resilient flooring on an approved suspended wood subfloor with a recommended wood underlayment.

Contact your local Armstrong dealer for our recommendations or consult Armstrong's brochure F-5061, "Armstrong Engineered Installation System."

• Installing resilient floor covering over existing resilient floor covering

When you plan to install a new resilient sheet or tile floor covering over an existing resilient floor covering, follow the installation instructions published by the manufacturer. Those instructions will tell you what must be done to the existing surface before the new resilient floor covering can be installed. Remove wax by wet stripping only.

⚠ WARNING

NEVER SAND AN EXISTING RESILIENT FLOOR COVERING. SEE WARNINGS ON PAGE ONE.

- **Use of embossing leveler**

When you use Armstrong's S-188 Embossing Leveler to fill the embossing of the existing resilient flooring, follow the Armstrong recommendations found in brochure F-5061, "Armstrong Engineered Installation System."

- **Installing resilient floor covering over new underlayment**

When you install a new floor covering over new underlayment, follow the Armstrong recommendations found in brochure F-5061, "Armstrong Engineered Installation System."

2. REMOVAL OF RESILIENT SHEET FLOORING

⚠ WARNING

DO NOT SAND EXISTING RESILIENT TILE AND SHEET FLOORING, BACKING, OR LINING FELT. SEE WARNINGS ON PAGE ONE.

- **Supplies and tools**

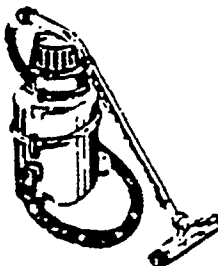
1. Stiff-bladed wall or floor scraper.



2. Utility or hook knife.



3. Tank-type High Efficiency Particulate Air (HEPA) wet/dry vacuum cleaner with disposable dust bag and metal floor tool (no brush).



- 4. Hand sprayer or sprinkling can. 
- 5. Large-size heavy-duty impermeable trash bags (or closed impermeable containers) with ties, tape, or string to tie the bags shut, and tags for labeling. 
- 6. A liquid dishwashing detergent which is stated to contain anionic, nonionic, and amphoteric surfactant. Mix this specified liquid dishwashing detergent with water to make a dilute solution (16 oz. specified liquid dishwashing detergent in one gallon of water).
- 7. Ground fault circuit interrupter for electrical connection of the HEPA vacuum and any other electrical connections required.

- **Removal procedure, fully adhered resilient sheet flooring**

⚠ WARNING

NEVER SAND AN EXISTING FLOOR COVERING OR FELT BACKING. SEE WARNINGS ON PAGE ONE.

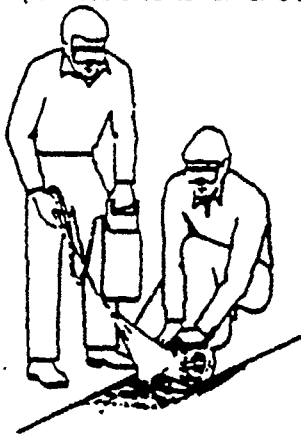
- a. Remove any binding strips or other restrictive moldings from doorways, walls, etc.
- b. Prepare the specified liquid dishwashing detergent solution (16 oz. of specified liquid dishwashing detergent to one gallon of water) and pour into a hand sprayer or sprinkling can.
- c. Clean the entire floor with the HEPA vacuum cleaner using the metal floor tool.
- d. Make a series of parallel cuts 4" to 8" apart through the top layer of the flooring and about halfway through the backing, parallel to the wall, for the entire floor.

⚠ CAUTION

RESILIENT FLOORING BECOMES SLIPPERY WHEN WET WITH THE SPECIFIED LIQUID DISHWASHING DETERGENT SOLUTION. USE CAUTION TO CONTAIN THE SOLUTION IN THE IMMEDIATE WORK AREA. STANDING ON A NEW SHEET OF PLYWOOD OR NONSLIP SURFACE WHILE WORKING IS RECOMMENDED.

e. Wear layer removal:

One worker starts at the end of the room farthest from the entrance door and pries up the corner of the strip, separating the backing from the wear layer. As the strip is being removed, another worker sprays a constant mist of the specified liquid dishwashing detergent solution into the delamination nip point to minimize any airborne dust particles. When done properly, the felt remaining on the floor and on the back of the strip will be thoroughly wet. Do only one three-strip area at a time. Stand on the remaining floor covering or clean floor (do not stand on the felt). The cut strips should be peeled from the backing by pulling or rolling around a core which will control the stripping angle to create a uniform tension (some resilient flooring wear layers may not be readily strippable and may require wet-scraping). Tie or tape the removed material securely and place in the heavy-duty impermeable trash bag or closed impermeable container for disposal.



f. Remove and dispose of each succeeding strip in the above manner. Avoid walking on the exposed felt as much as possible. Close full bags tightly, and seal securely for disposal. Identify with a label stating — "Caution — contains asbestos. Avoid Opening or Breaking Container. Breathing Asbestos is Hazardous to Your Health. Dispose in an approved landfill only."

g. Occasionally, parts of the top layer will stick to the backing. This can often be eliminated by peeling in the opposite direction. The stiff-bladed scraper may aid in the removal or peeling of the wear layer.

⚠ WARNING

NEVER SAND OR DRY-SCRAPE RESIDUAL FELT BACKING. SEE WARNINGS ON PAGE ONE.

h. Wet-scraping residual felt:

(1) Thoroughly wet the residual felt with the specified liquid dishwashing detergent solution. Wait a few minutes to allow the specified liquid dishwashing detergent solution to soak into the felt.

(2) Stand on the remaining floor covering (not the felt) and use the stiff-bladed scraper to scrape up the wet felt.

(3) Rewet the felt if the specified liquid dishwashing detergent solution has not completely penetrated, if drying occurs, or if dry felt is exposed during scraping. Pick up the scrapings as they are removed from the floor and place in a heavy-duty impermeable trash bag or closed impermeable container. Wet-scrape all felt from this floor area before proceeding further.

PRECAUTIONS: EXCESSIVE MOISTURE CAN CAUSE PERMANENT DAMAGE TO WOOD UNDERLAYMENTS. IT IS THE INSTALLER'S RESPONSIBILITY TO USE THE CORRECT AMOUNT OF SPECIFIED LIQUID DISHWASHING DETERGENT SOLUTION TO PRE-

VENT UNDERLAYMENT DAMAGE. A FLOOR THAT HAS BEEN WET-SCRAPED MUST BE ALLOWED TO DRY BEFORE INSTALLING ANY NEW RESILIENT FLOORING.

(4) When this floor area has been cleaned free of felt, vacuum up any dirt using the HEPA vacuum cleaner with the metal floor tool. Position the vacuum cleaner so that the discharge air does not blow on the area being cleaned.

(5) Repeat the above on the next series of strips.

(6) Repeat this operation until the felt has been removed from the whole floor. Close full bags tightly and seal securely for disposal. Identify with a label stating — "Caution — contains asbestos. Avoid Opening or Breaking Container. Breathing Asbestos is Hazardous to Your Health. Dispose in an approved landfill only."

(7) When the whole floor has been cleaned free of felt, vacuum up any dirt using the HEPA vacuum cleaner with the metal floor tool and let it dry. Position the vacuum cleaner so that the discharge air does not blow on the area being cleaned.

⚠ WARNING

DO NOT DRY-SWEEP. AVOID CREATING DUST. SEE WARNINGS ON PAGE ONE.

(8) After vacuuming, used HEPA filters and cleaner bags should be removed according to the manufacturer's instructions and placed in a heavy-duty impermeable trash bag with a label stating "Caution — contains asbestos. Avoid Opening or Breaking Container. Breathing Asbestos is Hazardous to Your Health. Dispose in an approved landfill only." Close and seal the trash bag securely for disposal.

(9) When the floor is dry, it is ready to have a new resilient floor covering installed. Follow the manufacturer's installation instructions.

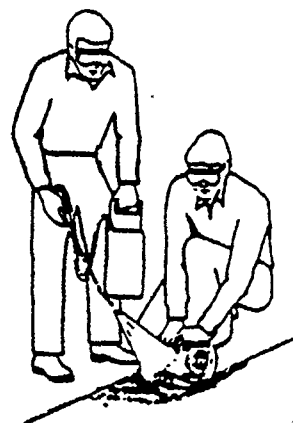
• Removal procedure, unadhered (loose-lay) or peripherally adhered resilient sheet flooring

a. Remove any binding strips or other restrictive moldings from doorways, walls, etc.

b. Prepare the specified liquid dishwashing detergent solution (16 oz. of the specified liquid dishwashing detergent to one gallon of water) and pour into a hand sprayer or sprinkling can.

c. Clean the entire floor with the HEPA vacuum cleaner using the metal floor tool.

d. If flooring is unadhered, start at the end of the room farthest from the entrance doorway and cut flooring into strips about 18" wide for the entire room. One worker removes the cut strips while another worker sprays the specified liquid dishwashing detergent solution directly into the separation nip point. Do not stand on the exposed subfloor during the removal process.



⚠ CAUTION

RESILIENT FLOORING BECOMES SLIPPERY WHEN WET WITH SPECIFIED LIQUID DISHWASHING DETERGENT SOLUTION. USE CAUTION TO CONTAIN THE SOLUTION IN THE IMMEDIATE WORK AREA. STANDING ON A NEW SHEET OF PLYWOOD OR NONSLIP SURFACE WHILE WORKING IS RECOMMENDED.

e. Roll the wet strip tightly and tie or tape securely so it will not unroll. Place it in a heavy-duty impermeable trash bag or closed impermeable container big enough to accommodate several rolls for disposal.

Use this method for nonbonded areas of peripherally adhered floors. To remove bonded areas, follow instructions under "Removal procedure, fully adhered resilient sheet flooring."

f. Clean the exposed floor with a HEPA vacuum cleaner with the metal floor tool positioned so that the discharge air does not blow on the area being cleaned.

⚠ WARNING

DO NOT DRY-SWEEP. AVOID CREATING DUST. SEE WARNINGS ON PAGE ONE.

g. Repeat the above, cutting, rolling and disposing of one strip at a time and cleaning the newly exposed area immediately until the entire floor covering has been removed and the entire floor is vacuumed clean.

h. If any residual felt remains stuck to the floor, it should be removed by the wet-scraping method described in Section (h) of the "Removal procedure, fully adhered resilient sheet flooring."

⚠ WARNING

DO NOT DRY-SCRAPE OR SAND. SEE WARNINGS ON PAGE ONE. PLACE THE REMOVED FLOOR COVERING IN THE HEAVY-DUTY IMPERMEABLE TRASH BAG OR CLOSED IMPERMEABLE CONTAINER.

i. After vacuuming, used HEPA filters and cleaner bags should be removed according to manufacturer's instructions and placed in a heavy-duty impermeable trash bag with a label stating — "Caution — contains asbestos. Avoid Opening or Breaking Container. Breathing Asbestos is Hazardous to Your Health. Dispose in an approved landfill only." Close and seal the trash bags securely for disposal.

j. After the underlayment is dry, install the new resilient floor covering according to the manufacturer's installation instructions.

3. REMOVAL OF RESILIENT TILE

⚠ WARNING

NEVER SAND AN EXISTING RESILIENT FLOOR TILE INSTALLATION. SEE WARNINGS ON PAGE ONE.

• Supplies and tools

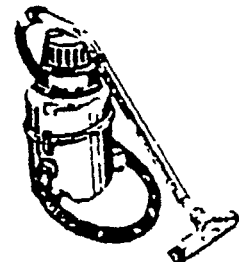
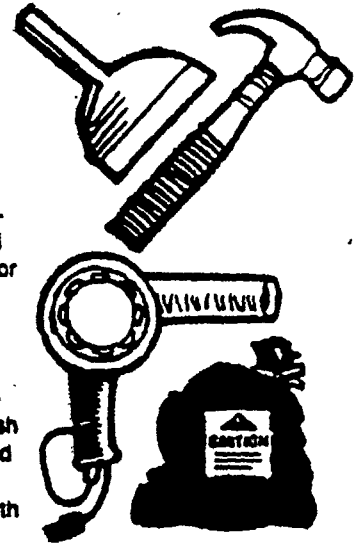
1. Heavy-duty scraper with approximately 4" blade and 6" to 8" handle.

2. Hammer.

3. Commercial-type hand-held hot-air blower or a radiant heat source.

4. Large size heavy-duty impermeable trash bags (or closed impermeable containers), with ties, tape or string to tie the bag shut, and tags for labeling.

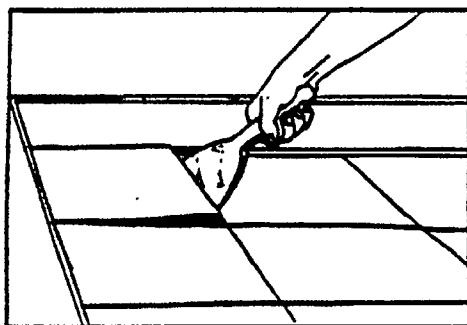
5. Tank-type High Efficiency Particulate Air (HEPA) wet/dry vacuum cleaner with disposable dust bag and metal floor tool (no brush).



• Removal procedure

a. Those areas normally exposed to heavy foot-traffic patterns usually have tiles adhered the tightest. As a matter of good practice in starting the tile removal, select those sections which receive the least traffic. Since tiles are normally in a 9"x9" or 12"x12" dimension, try to remove individual tiles as a complete unit.

b. Start the removal by carefully wedging the scraper in the seam of two adjoining tiles and gradually forcing the edge of one of the tiles up and away from the floor. Do not break off pieces of the tile, but continue to force the balance of the tile up by working the scraper beneath the tile and exerting both a forward pressure and a twisting action on the blade to promote release of the tile from the adhesive and the floor.



c. When the first tile is removed, place it, without breaking it into smaller pieces, in the heavy-duty impermeable trash bag or closed impermeable container which will be used for disposal. Removed tiles can be placed in empty tile cartons first and then placed in the heavy-duty impermeable trash bags. To prevent tearing of the heavy-duty impermeable trash bag, place only one full carton of removed tile in a bag.

d. With the removal of the first tile, accessibility of other tiles is improved. Force the scraper under the exposed edge of another tile, and continue to exert a prying, twisting force to the scraper as it is moved under the tile until the tile releases from the floor.

Remove and dispose of each tile in the manner above. Avoid walking on the exposed adhesive as much as possible. Close full bags tightly and seal securely for disposal. Identify with a label stating "Caution — contains asbestos. Avoid Opening or Breaking Container. Breathing Asbestos is Hazardous to Your Health. Dispose in an approved land-fill only."

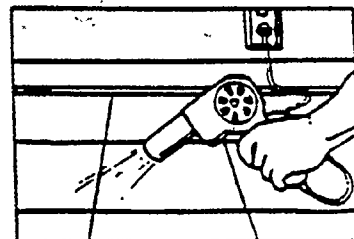
e. Some tiles will release quite easily while others require varying degrees of force. Where the adhesive is spread heavily or the tile is bonded tightly, it may prove easier to force the scraper through the tightly adhered areas by striking the scraper handle with a hammer, using blows of moderate force while maintaining the scraper at a 25° to 30° angle to the floor.

▲ CAUTION

WEAR SAFETY GLASSES WHEN USING THIS PROCEDURE.



f. If you encounter areas where even the above methods will not remove the tiles, the removal procedure can be simplified by thoroughly heating the tiles with a hot-air blower or a radiant heat source until the heat penetrates through the tile and softens the adhesive.



NOTE: Handle the hot-air blower carefully to avoid injury. Do not use a blowtorch or open flame. Use caution not to burn or char tile. Use adequate ventilation.

NOTE: The treatment of residual asphaltic "cutback" adhesive is dependent upon the type of new resilient floor covering material to be installed and the type of subfloor. See Section 4, Removal of Residual Adhesive for Armstrong's recommendations for the treatment of residual asphaltic "cutback" adhesive.

g. If new resilient floor tile is to be installed over a concrete subfloor using an asphaltic adhesive, the residual asphaltic "cutback" adhesive must be left so that no ridges or puddles are evident and what remains is a thin, smooth film. This can be accomplished by wet-scraping the residual adhesive. **NOTE:** See Section 4, Removal of Residual Adhesive, for Warning and Supplies and Tools.

Wet-scraping residual adhesive:

(1) Start in the corner of the room farthest from the entrance door and moisten an area approximately 3' x 10' with water mixed with the specified liquid dishwashing detergent (1 oz. specified liquid dishwashing detergent to one gallon of water) to aid in wetting the adhesive. Wet-scrape with a stiff-bladed wall or floor scraper removing ridges and any loose adhesive.

(2) Place loosened adhesive residues into a heavy-duty impermeable trash bag or other impermeable container and seal with ties, tape or string and label "Caution—contains asbestos. Avoid Opening or Breaking Container. Breathing Asbestos is Hazardous to Your Health. Dispose in an approved landfill only."

(3) Wet vacuum standing water with the HEPA vacuum cleaner.

(4) Continue steps (1) through (3) until what remains of the residual asphaltic "cutback" adhesive is a thin, smooth film.

h. Clean the entire floor with the HEPA vacuum cleaner using the metal floor tool to remove debris before applying new asphaltic adhesive or installing new resilient floor tile.

i. After vacuuming, used HEPA filters and cleaner bags should be removed according to manufacturer's instructions and placed in a heavy-duty impermeable trash bag with a label stating—"Caution—contains asbestos. Avoid Opening or Breaking Container. Breathing Asbestos is Hazardous to Your Health. Dispose in an approved landfill only." Close and seal the trash bags securely for disposal.

4. REMOVAL OF RESIDUAL ADHESIVE

⚠ WARNING

ASBESTOS CONTAINING ASPHALTIC "CUTBACK" ADHESIVE.

SOME IN-PLACE ASPHALTIC ADHESIVES MAY CONTAIN ASBESTOS FIBERS THAT ARE NOT READILY IDENTIFIABLE. IN THE REMOVAL OF ASPHALTIC "CUTBACK" ADHESIVES, DO NOT USE POWER DEVICES WHICH CAN CREATE DUST. THE INHALATION OF ASBESTOS DUST MAY CAUSE ASBESTOSIS OR OTHER SERIOUS BODILY HARM. SMOKING GREATLY INCREASES THE RISK OF SERIOUS BODILY HARM. ASSUME THAT ALL IN-PLACE ASPHALTIC "CUTBACK" ADHESIVES CONTAIN ASBESTOS.

• Recommendations for the treatment of residual asphaltic "cutback" adhesive

The treatment of residual asphaltic "cutback" adhesive is dependent upon the type of new resilient floor covering material to be installed and the type of subfloor. Armstrong's recommendations for the treatment of residual asphaltic "cutback" adhesive are shown in the following chart.

Residual Asphaltic			"Cutback" Adhesive	
New Material To Be Installed	Concrete Subfloor		Wood Underlayment Subfloor	
	Removal of Residual Adhesive	Alternative to Removal	Removal of Residual Adhesive	Alternative to Removal
Resilient floor tile to be installed using S-88 or S-80 cutback adhesive.	Residual adhesive must be wet-scraped so that no ridges or puddles are evident and what remains is a thin, smooth film. See wet-scraping of residual adhesive.	Application of a cementitious underlayment that is approved by the underlayment manufacturer for use over residual asphaltic "cutback" adhesive.*	Armstrong does not recommend the use of a cutback adhesive over wood underlayment subfloor.	Armstrong does not recommend the use of a cutback adhesive over wood underlayment subfloor.
Armstrong Step Master Tile or Armstrong Rubber Tile to be installed using S-215 Adhesive or Armstrong SOT to be installed using S-202 Adhesive.	Enough of the residual adhesive must be removed so that 80% of the original substrate of the overall area is exposed. Subfloor must be porous when using S-202 Adhesive. See removal of residual adhesive.	Application of a cementitious underlayment that is approved by the underlayment manufacturer for use over residual asphaltic "cutback" adhesive.*	Complete removal of Wood Underlayment. See Complete Removal of Wood Underlayment Under Existing Tile.	Covering residual asphaltic "cutback" adhesive on an approved wood subfloor with a recommended wood underlayment. When installing this new wood underlayment, felt or polyethylene sheering may be placed over the residual adhesive to prevent a cracking or tacky sound when walking on the floor.
Resilient floor tile to be installed using an adhesive other than S-88 or S-80 cutback adhesive, S-202 Adhesive or S-215 Adhesive.	Residual adhesive must be wet-scraped so that no ridges or puddles are evident and what remains is a thin, smooth film. See wet-scraping of residual adhesive.	Application of a cementitious underlayment that is approved by the manufacturer for use over residual asphaltic "cutback" adhesive.*	Complete removal of Wood Underlayment. See Complete Removal of Wood Underlayment Under Existing Tile.	Covering residual asphaltic "cutback" adhesive on an approved wood subfloor with a recommended wood underlayment. When installing this new wood underlayment, felt or polyethylene sheering may be placed over the residual adhesive to prevent a cracking or tacky sound when walking on the floor.
Interlax or other vinyl-backed sheet flooring.	100% of the residual adhesive must be removed from the area to be covered. See removal of residual adhesive.	Application of a cementitious underlayment that is approved by the underlayment manufacturer for use over residual asphaltic "cutback" adhesive.*	Complete removal of Wood Underlayment. See Complete Removal of Wood Underlayment Under Existing Tile.	Covering residual asphaltic "cutback" adhesive on an approved wood subfloor with a recommended wood underlayment. When installing this new wood underlayment, felt or polyethylene sheering may be placed over the residual adhesive to prevent a cracking or tacky sound when walking on the floor.
Felt-backed sheet flooring.	Enough of the residual adhesive must be removed so that 80% of the original substrate of the overall area is exposed. See removal of residual adhesive.	Application of a cementitious underlayment that is approved by the underlayment manufacturer for use over residual asphaltic "cutback" adhesive.*	Complete Removal of Wood Underlayment. See Complete Removal of Wood Underlayment Under Existing Tile.	Covering residual asphaltic "cutback" adhesive on an approved wood subfloor with a recommended wood underlayment. When installing this new wood underlayment, felt or polyethylene sheering may be placed over the residual adhesive to prevent a cracking or tacky sound when walking on the floor.

* All warranties and/or performance guarantees concerning underlayment's failure rest with the underlayment manufacturer and not with the resilient floor covering's manufacturer.

NOTE: For further installation recommendations consult Armstrong's brochure F-5061, "Armstrong Engineered Installation System."

NOTE: Many liquid adhesive removal products usually employ solvents which leave a residue within the subfloor that can adversely affect the new adhesive or floor covering. The warranties provided by the manufacturers of the new floor covering materials will not cover instances where existing subfloor conditions damage their products or affect its installation.

The use of asbestos encapsulants or bridging materials over asphaltic adhesive is not recommended as those products may affect the bonding properties of the new adhesive. The application of asphaltic adhesives, as an installation medium, has been demonstrated to be an effective cover for the existing residual adhesive. The encapsulant use of the new adhesive must, however, be consistent with other installation recommendations.

• Supplies and tools

1. Stiff-bladed wall or floor scraper.
2. No. 1 sandblasting sand (clean, sharp, coarse cutting sand)
3. Terrazzo or a low speed floor machine fitted with a floor plate. (Clark Assembly No. 500212-6)
4. Hand held rubbing stones.
5. Tank-type High Efficiency Particulate Air (HEPA) wet/dry vacuum cleaner with disposable dust bag and metal floor tool (no brush).
6. Large-size heavy-duty impermeable trash bags (or closed impermeable containers) with ties, tape, or string to tie the bags shut, and tags for labeling.
7. Slip-resistant shoes or rubber boots.
8. Ground fault circuit interrupter for electrical connection of the HEPA vacuum and any other electrical connections required.
9. Hand sprayer or sprinkling can.
10. A liquid dishwashing detergent which is stated to contain anionic, nonionic, and amphoteric surfactant. Mix this specified liquid dishwashing detergent with water to make a

dilute solution (1 oz. of the specified liquid dishwashing detergent to one gallon of water).

• Wet-scraping residual adhesive

- a. Start in the corner of the room farthest from the entrance door and moisten an area of the adhesive approximately 3' x 10' with water mixed with the specified liquid dishwashing detergent (to aid in wetting the adhesive). Wet-scrape with a stiff-bladed wall or floor scraper removing ridges and any loose adhesive.
- b. Place loosened adhesive residues into a heavy-duty impermeable trash bag or other impermeable container and seal with ties, tape or string and label "Caution — contains asbestos. Avoid Opening or Breaking Container. Breathing Asbestos is Hazardous to Your Health. Dispose in an approved landfill only."
- c. Wet vacuum standing water with the HEPA vacuum cleaner.
- d. Continue steps a through c until entire area is wet-scraped.

• Removal of residual adhesive

- a. Place cutting sand into a container, add water mixed with the specified liquid dishwashing detergent (1 oz. specified liquid dishwashing detergent to one gallon of water) to the sand to dampen. Approximately 20 lbs. of sand to 1/2 gallon of water should provide a workable slurry for a 6' x 6' area.
- b. Start in corner of the room farthest from the entrance door. Place sand slurry on the residual adhesive over a 6' x 6' area and remove the existing adhesive using a terrazzo floor machine. Keep sand under rubbing stones when operating the machine. The sand and the subfloor must be continuously kept wet.

▲ WARNING

ELECTRICAL SHOCK HAZARD EXISTS. USE A GROUND FAULT CIRCUIT INTERRUPTER FOR ANY ELECTRICAL CONNECTIONS IN A WET ENVIRONMENT.

- c. Occasionally push away cutting sand from the subfloor with a wall or floor scraper to check for complete removal.
- d. Adhesive around the edge of the room and area that were missed can be removed with dampened, clean, sharp, cutting sand and ground off with a rubbing stone.
- e. Wet-scrape sand into a pile using a stiff-bladed floor or wall scraper and place sand and adhesive residue in a heavy-duty impermeable container and seal with ties or tape, and label "Caution — contains asbestos. Avoid Opening or Breaking Container. Breathing Asbestos is Hazardous to Your Health. Dispose in an approved landfill only."
- f. Rinse area with clean water using a hand sprayer or sprinkling can.
- g. Wet vacuum standing water with the HEPA vacuum cleaner.
- h. Continue steps a through g until the entire room is complete.
- i. Allow subfloor to dry and vacuum with a HEPA vacuum cleaner.
- j. After vacuuming, used HEPA filters and cleaner bags should be removed according to manufacturer's instructions and placed in a heavy-duty impermeable trash bag with a label stating — "Caution—contains asbestos. Avoid Opening or Breaking Container. Breathing Asbestos is Hazardous to Your Health. Dispose in an approved landfill only." Close and seal the trash bags securely for disposal.

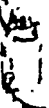
5. COMPLETE REMOVAL OF WOOD UNDERLAYMENT

Complete Removal of Wood Underlayment Under Existing Sheet Flooring

• Definitions

- a. Wood Subfloor - A subfloor is selected for structural purposes and is the substrate for the underlayment.
- b. Wood Underlayment - This is the smooth surface that is selected to receive the resilient floor covering.
- c. Wood Subfloor Underlayment Combination - This is the type of construction that must meet the structural requirements as well as have a suitable surface to receive the resilient floor covering.

• Supplies & tools

1. Chisel 
2. Hammer or mallet 
3. Short and long handled pry bars 
4. Heavy gloves 
5. Utility or hook knife 
6. Stiff-bladed wall or floor scraper 
7. Large-size heavy-duty impermeable trash bags (or closed impermeable container) with ties, tape, or string to tie the bag shut and tags for labeling 
8. Tank-type High Efficiency Particulate Air (HEPA) wet/dry vacuum cleaner with disposable dust bags and metal floor tool (no brush) 
9. Hand sprayer or sprinkling can 
10. A liquid dishwashing detergent which is stated to contain anionic, nonionic, and amphoteric surfactant. Mix this specified liquid dishwashing detergent with water to make a dilute solution (16 oz. specified liquid dishwashing detergent to one gallon of water)

11. 6-mil polyethylene sheeting

12. Duct tape 



13. Ground fault circuit interrupter for electrical connection of the HEPA vacuum and any other electrical connections required.

• **Removal of sheet flooring at underlayment joints**

- a. Remove any binding strips or other restrictive moldings from doorways, walls, etc.
- b. Prepare the specified liquid dishwashing detergent solution (16 oz. of specified liquid dishwashing detergent to one gallon of water) and pour into a hand sprayer or sprinkling can.
- c. Clean the entire floor with the HEPA vacuum cleaner using the metal floor tool.
- d. Starting at the doorway or a floor ventilation vent, locate a joint in an underlayment board.
- e. Make a series of parallel cuts 4" to 8" wide centered over the underlayment joint, through the top layer of the flooring and about halfway through the backing. Continue this procedure for all underlayment joints over the entire floor.

▲ CAUTION

RESILIENT FLOORING BECOMES SLIPPERY WHEN WET WITH SPECIFIED LIQUID DISHWASHING DETERGENT SOLUTION. USE CAUTION TO CONTAIN THE SOLUTION, IN THE IMMEDIATE WORK AREA. STANDING ON A NEW SHEET OF PLYWOOD OR NONSLIP SURFACE WHILE WORKING IS RECOMMENDED.

f. One worker starts at the end of the room farthest from the entrance and pries up the corner of a strip, separating the backing from the wear layer. As the strip is being removed, another worker sprays a constant mist of the specified liquid dishwashing detergent solution into the delamination nip point to minimize any airborne dust particles. When done properly, the felt remaining on the floor

and on the back of the strip will be thoroughly wet. Stand on the remaining floor covering or clean floor (do not stand on the felt). The cut strips should be peeled from the backing by pulling or rolling around a core which will control the stripping angle to create a uniform tension (some resilient flooring wear layers may not be readily strippable and may require wet-scraping). Tie or tape the removed material securely and place in the heavy-duty impermeable trash bag or closed impermeable container for disposal.

g. Remove and dispose of each succeeding strip in the above manner. Avoid walking on the exposed felt as much as possible. Close full bags tightly, and seal securely for disposal. Identify with a label stating: "Caution — contains asbestos. Avoid Opening or Breaking Container. Breathing Asbestos is Hazardous to Your Health. Dispose in an approved landfill only."

h. Occasionally, parts of the top layer will stick to the backing. This can often be eliminated by peeling in the opposite direction. The stiff-bladed scraper may aid in the removal or peeling of the wear layer.

i. Wet-scraping residual felt:

(1) Thoroughly wet the residual felt with the specified liquid dishwashing detergent solution. Wait a few minutes to allow the specified liquid dishwashing detergent solution to soak into the felt.

(2) Stand on the remaining floor covering (not the felt) and use the stiff-bladed scraper to scrape up the wet felt.

(3) Rewet the felt if the specified liquid dishwashing detergent solution has not completely penetrated, if drying occurs, or if dry felt is exposed during scraping. Pick up the scrapings as they are removed from the floor and place in a heavy-duty impermeable trash bag or closed impermeable container. Wet-scrape all the felt from this 4" to 8" strip before proceeding to remove the next strip.

(4) When this 4" to 8" strip has been cleaned free of felt, vacuum up any dirt using the HEPA vacuum cleaner with the metal

meet the structural requirements as well as have a suitable surface to receive the resilient floor covering.

• Supplies & tools

1. Chisel
2. Hammer or mallet
3. Short and long handled pry bars
4. Heavy gloves
5. Utility or hook knife
6. Large-size heavy-duty impermeable trash bags (or closed impermeable container) with ties, tape, or string to tie the bag shut and tags for labeling
7. Tank-type High Efficiency Particulate Air (HEPA) wet/dry vacuum cleaner with disposable dust bags and metal floor tool (no brush)
8. 6-mil polyethylene sheeting
9. Commercial-type hand-held hot air blower or a radiant heat source
10. Duct tape

• Removal of tile at underlayment joints

- a. Remove any binding strips or other restrictive moldings from doorways, walls, etc.
- b. Starting at the doorway or a floor ventilation vent, locate a joint in an underlayment board.
- c. Start the removal of the tile at the underlayment joint by carefully wedging the scraper in the seam of two adjoining tiles and gradually forcing the edge of one of the tiles up and away from the floor. Do not break off pieces of the tile, but continue to force the balance of the tile up by working the scraper beneath the tile and exerting both a forward pressure and a twisting action of the blade to promote release of the tile from the adhesive and the floor. Continue to remove tile in this manner at all underlayment joints until all board joints are exposed.

d. When the first tile is removed, place it, without breaking it into smaller pieces, in the heavy-duty impermeable trash bag or closed impermeable container which will be used for disposal. Removed tiles can be placed in empty tile cans first and then placed in the heavy-duty impermeable trash bags. To prevent tearing of the heavy-duty impermeable trash bag, place only one full can of removed tile in a bag.

e. With the removal of the first tile, accessibility of the other tiles is improved. Force the scraper under the exposed edge of another tile, and continue to exert a prying, twisting force to the scraper as it is moved under the tile until the tile releases from the underlayment. Remove and dispose of each tile in the manner above. Avoid walking on the exposed adhesive as much as possible. Close full bags tightly and seal securely for disposal. Identify with a label stating: "Caution — contains asbestos. Avoid Opening or Breaking Container. Breathing Asbestos is Hazardous to Your Health. Dispose in an approved landfill only."

f. Some tiles will release quite easily while others require varying degrees of force. Where the adhesive is spread heavily or the tile is bonded tightly, it may prove easier to force the scraper through the tightly adhered areas by striking the scraper handle with a hammer, using blows of moderate force while maintaining the scraper at a 25° to 30° angle to the floor.

g. If you encounter areas where even the above methods will not remove the tiles, the removal procedure can be simplified by thoroughly heating the tiles with a hot-air blower or a radiant heat source until the heat penetrates through the tile and softens the adhesive.

NOTE: Handle the hot-air blower carefully to avoid injury. Do not use a blowtorch or open flame. Use caution not to burn or char the tile. Use adequate ventilation.

floor tool. Position the vacuum cleaner so that the discharge air does not blow on the area being cleaned.

(5) Repeat steps (1) - (4) on the next strip.

(6) Repeat this operation until the felt has been removed from the 4" to 8" strips over all the underlayment joints. Close full bags tightly and seal securely for disposal. Identify with a label stating: "Caution — contains asbestos. Avoid Opening or Breaking Container. Breathing Asbestos is hazardous to Your Health. Dispose in an approved landfill only."

• Removal of wood underlayment boards

a. After all felt has been wet-scraped from the underlayment joints, drive a chisel, using a hammer or mallet, between the underlayment board and the subfloor. Use the chisel to pry up the underlayment enough to insert a pry bar and remove the chisel. Slowly and carefully use pry bars to pry up the underlayment board a little at a time until the board is completely loose and can be removed.

b. Caution must be used to avoid breaking the underlayment board. The underlayment board should be removed in one piece. If the underlayment board breaks, cut through the resilient flooring at the break and spray any exposed felt with the specified liquid dishwashing detergent solution. Allow the specified liquid dishwashing detergent solution to penetrate for a few minutes, then continue lifting the broken underlayment.

c. Wear heavy gloves and be careful of wood splinters and fasteners sticking out of the back of the underlayment. Each underlayment board (or piece of board) should be removed from the work area as soon as it has been pried up to avoid injuries (such as stepping on a nail). Fasteners protruding from removed board should be flattened with a hammer. Place removed underlayment boards on skids with the nails pointing downward. Wrap skid with 6-mil polyethylene plastic sheeting and secure with duct tape. Identify with a label stating: "Caution — contains

asbestos. Avoid Opening or Breaking Container. Breathing Asbestos is Hazardous to Your Health. Dispose in an approved landfill only."

d. After each panel has been removed, pry out any nails or fasteners still in the subfloor. Dispose of these and any other nails or fasteners which have been removed but are still laying in the work area.

e. A chisel is not needed to start the removal of boards after the first board has been removed. Simply work the pry bar under the exposed edge of the next board.

f. When removal of the underlayment under the existing floor is complete, thoroughly check the exposed subfloor. Renail loose areas and reset any "popped" nails or fasteners.

g. Vacuum up any dirt using the HEPA vacuum cleaner with the metal floor tool.

h. After vacuuming, used HEPA filters and cleaner bags should be removed according to the manufacturer's instructions and place in a heavy-duty impermeable trash bag with a label stating "Caution—contains asbestos. Avoid Opening or Breaking Container. Breathing Asbestos is Hazardous to Your Health. Dispose in an approved landfill only." Close and seal the trash bag securely for disposal.

i. After the wood subfloor is completely dry, install the new underlayment and/or floor covering according to the manufacturer's installation instructions.

Complete Removal of Wood Underlayment Under Existing Tile

• Definitions

a. Wood Subfloor - A subfloor is selected for structural purposes and is the substrate for the underlayment.

b. Wood Underlayment - This is the smooth surface that is selected to receive the resilient floor covering.

c. Wood Subfloor Underlayment Combination - This is the type of construction that must

• Removal of wood underlayment boards

a. After all the tiles have been removed from the underlayment joints, drive a chisel, using a hammer or a mallet, between the underlayment board and the subfloor. Use the chisel to pry up the underlayment enough to insert a pry bar and remove the chisel. Slowly and carefully use pry bars to pry up the underlayment board a little at a time until the board is completely loose and can be removed.

b. Caution must be used to avoid breaking the underlayment board. The underlayment board should be removed in one piece. If the underlayment board breaks, heat and cut the tile at the break, then continue to remove broken underlayment.

c. Wear heavy gloves and be careful of wood splinters and fasteners sticking out of the back of the underlayment. Each underlayment board (or piece of board) should be removed from the work area as soon as it has been pried up to avoid injuries (such as stepping on a nail). Fasteners protruding from removed board should be flattened with a hammer. Place removed underlayment boards on skids with the nails pointing downward. Wrap skid with 6-mil polyethylene plastic sheeting and secure with duct tape. Identify with a label stating: "Caution — contains asbestos. Avoid Opening or Breaking Container. Breathing Asbestos is Hazardous to Your Health. Dispose in an approved landfill only."

d. After each board has been removed, pull out any nails or fasteners still in the subfloor. Dispose of these and any other nails or fasteners which have been removed but are still laying in the work area.

e. A chisel is not needed to start the removal of boards after the first board has been removed. Simply work the pry bar under the exposed edge of the next board.

f. When removal of the underlayment under the existing floor is complete, thoroughly check the exposed subfloor. Renail loose

areas and reset any "popped" nails or fasteners.

g. Vacuum up any dirt in the area using the HEPA vacuum cleaner with the metal floor tool.

h. After vacuuming, used HEPA filters and cleaner bags should be removed according to manufacturer's instructions and placed in a heavy-duty impermeable trash bag with a label stating — "Caution"—contains asbestos. Avoid Opening or Breaking Container. Breathing Asbestos is Hazardous to Your Health. Dispose in an approved landfill only." Close and seal the trash bags securely for disposal.

i. After the floor is completely dry, install the new underlayment and/or floor covering according to the manufacturer's installation instructions.