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AIR MONITORING STUDY
SHEET VINYL FLOORING REMOVAL
OCTOBER 1988

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References²⁷

**AIR MONITORING STUDY
DURING SHEET VINYL FLOORING REMOVAL**

A. Background

Work practices have been developed by the Resilient Floor Covering Institute (RFCI) and manufacturers of resilient floor covering to provide guidance to the flooring mechanic in the removal of sheet vinyl flooring products. Specific guidance is provided for removal procedures when asbestos-backed flooring is being removed. Recommendations, however, do state that floor removal should be a last resort. New floor covering can be installed directly over the old, and there are a variety of products such as liquid levelers, underlayments, and the like to assist in providing a smooth subsurface for the installation of new flooring.

Government regulations have imposed requirements upon workers and contractors for specific situations when asbestos is in use, removed or involved in demolition. The Occupational Safety and Health Administration (OSHA) has set a Permissible Exposure Limit (PEL) of 0.2 fibers/cubic centimeter over an eight-hour Time Weighted Average (TWA) and an action level of 0.1 fibers/cubic centimeter. OSHA has established an excursion limit of 1 fiber/cubic centimeter averaged over a 30-minute period.

B. Objective

To conduct a sheet vinyl flooring removal with asbestos-containing product using recommended work practices to confirm compliance with the OSHA asbestos standards.

C. Protocol

o Site Selection

1. An isolated office 12 feet x 12 feet within the Congoleum factory site in Trenton, N.J., was selected. This particular office was unoccupied and had a concrete subfloor. The asbestos-containing sheet vinyl flooring removed was Congoleum Corporation's Pavillion #52020, installed in 1983.

o Workers

1. Congoleum employees performed the removal. These employees were trained Installation Department personnel and were qualified to handle asbestos-containing material.

o Tools/Material Used for Removal of Flooring

1. Sharp stiff blade floor scraper
2. Floor scraper with sharp, replaceable blade
3. Garden sprayer or hand sprayer
4. Detergent solution (1 gallon warm water to 16 ounces Ivory Liquid detergent)
5. Vacuum with a HEPA Filtration System and metal floor attachment
6. Heavy-duty, impermeable plastic trash bags with minimum 6 mil wall thickness
7. Pressure sensitive labels 3" x 5" or larger.

o Preparation

1. All furniture was removed from the work area.
2. The HVAC ducts were sealed with polyethylene sheeting and duct tape.
3. All binding strips and moldings were removed.
4. The floor was vacuum cleaned with a vacuum equipped with a HEPA Filtration System.
5. A detergent solution was mixed in the portable garden sprayer consisting of 5 ounces of a nonionic surfactant per gallon of water.

o Procedure

1. A series of parallel cuts 4 to 8 inches apart were made in the flooring, parallel to one wall.
2. Starting at the end of the room farthest from the entrance door, the corner of the first strip was pried up by mechanics #1, separating the backing layer. As the strip was being removed, a constant mist of detergent solution was sprayed into the delamination nip point to minimize airborne dust by mechanic #2. The strip was observed to verify that the back of the strip as well as the residual felt left on the floor was thoroughly wet. The strip was peeled by pulling upwards at an angle.
3. The strip was rolled up tightly and placed in a heavy-duty impermeable trash bag for disposal.
4. The procedure for steps 2 and 3 was repeated on the next two strips.
5. After removing three strips of the wear surface, the remaining residual felt was removed by mechanics #1 and #2 by wet scraping.
6. The residual felt was thoroughly wetted by an additional spray of detergent solution.
7. After waiting 10 - 20 minutes, both mechanics kneeled down on the remaining floor covering still in place and scraped the residual wet felt off the floor with stiff-bladed scrapers and replaceable blade floor scrapers.
8. The residual felt scrapings were placed in the heavy-duty impermeable trash bag for disposal.
9. The removal procedure steps 2 through 8 were then repeated until the flooring was completely removed, one three-strip area at a time.
10. The floor was then allowed to dry and the residual dirt was removed using a vacuum equipped with a HEPA filtration system.
11. A lunch break of 102 minutes was taken during the removal process.

D. Sample Collection and Analysis

o Objective

1. Sampling was done to characterize the conditions that can be expected during the removal of resilient sheet vinyl flooring with asbestos backing.

o Strategy

1. Base line air monitoring was conducted in the work area prior to and after the actual removal.
2. Personal air samples were collected from the breathing zone of the two mechanics. Each mechanic wore a personal air sampling pump with cassette attachment. Samples were collected for the entire removal period and results extrapolated to determine the eight-hour time weighted average (TWA) exposure level. An area sample was also collected during the removal. Samples were collected and analyzed using the National Institute for Occupational Safety and Health (NIOSH) method 7400 for Phase Contrast Microscopy (PCM).
3. Samples for the PCM asbestos analysis were collected on 25 millimeter mixed cellulose ester filter membranes with 0.8 to 1.2 μ m pore size, with conductive cowl on the cassettes.

For sampling the cassettes were attached with the face plate open to Gilian low volume sampling pumps, which were calibrated by a primary calibration source. The flow rate for the pumps was set prior to sampling at 2 liters/minute. The flow rate was maintained at 2 L/min. during the sampling period.

o Analysis

Samples were sent to Astech Inc. for analysis of asbestos via phase contrast microscopy NIOSH method 7400.

E. Results

The attached test report lists the results for the seven samples submitted. The samples represent the following:

- #1 - An area sample taken in the removal location prior to the work.
- #2 - An area sample taken during the removal operation.
- #3 - Personal sample from breathing zone of mechanic #1 during removal prior to lunch break
- #4 - Personal sample from breathing zone of mechanic #2 during removal prior to lunch break

- #5 - Blank cassette to verify background fiber levels in the cassettes
- #6 - An area sample taken in the removal area during the lunch break while no work was being performed
- #7 - An area sample taken after the work had ended in the removal area
- #8 - Personal sample from breathing zone of mechanic #1 during removal after lunch break
- #9 - Personal sample from breathing zone of mechanic #2 during removal after lunch break

The 8-hour time weighted average (TWA) exposure levels for mechanics #1 and #2 were calculated with the assistance of Dr. S. Brown of Environ Inc. using the formula below. Net fiber concentrations of the samples were used in order to measure the amount of fiber exposures attributed to the sheet vinyl flooring removal. Net concentrations were determined by subtracting the pre-removal background fiber concentration and the unexposed filter concentrations from the measured concentrations of the samples in question.

$$\text{TWA mech. \#1} = \frac{\left(\text{Exposure time for Sample 3} \right) \left(\text{Net conc. of Sample 3} \right) + \left(\text{Exposure time for Sample 8} \right) \left(\text{Net conc. of Sample 8} \right)}{480 \text{ min.}}$$

$$\text{TWA mech. \#1} = \frac{(78 \text{ min})(0.0236 \text{ f/cc}) + (119 \text{ min.})(0.0136 \text{ f/cc})}{480 \text{ min.}}$$

$$\text{TWA mech. \#1} = 0.0072 \text{ f/cc}$$

$$\text{TWA mech. \#2} = \frac{\left(\text{Exposure time for Sample 4} \right) \left(\text{Net conc. of Sample 4} \right) + \left(\text{Exposure time for Sample 9} \right) \left(\text{Net conc. of Sample 9} \right)}{480 \text{ min.}}$$

$$\text{TWA mech. \#2} = \frac{(75 \text{ min})(0.0256 \text{ f/cc}) + (118 \text{ min.})(0.0166 \text{ f/cc})}{480 \text{ min.}}$$

$$\text{TWA mech. \#2} = 0.0081 \text{ f/cc}$$

No short-term (30 min.) measurements were made; however a maximum 30-minute concentration can be estimated by multiplying the net concentration by the sampling duration in minutes and dividing by 30. The net concentrations were derived from the original measured values adjusted for blanks and background.

$$\begin{aligned} \text{Mech. \#1} &= \frac{(78 \text{ min.})(0.0236 \text{ f/cc})}{30} \\ \text{Estimate 1} & \\ &= 0.061 \text{ f/cc} \end{aligned}$$

$$\begin{aligned} \text{Mech. \#1} &= \frac{(119 \text{ min.})(0.0136 \text{ f/cc})}{30} \\ \text{Estimate 2} & \\ &= 0.054 \text{ f/cc} \end{aligned}$$

$$\begin{aligned} \text{Mech. \#2} &= \frac{(75 \text{ min.})(0.0256 \text{ f/cc})}{30} \\ \text{Estimate 1} & \\ &= 0.064 \text{ f/cc} \end{aligned}$$

$$\begin{aligned} \text{Mech. \#2} &= \frac{(118 \text{ min.})(0.0166 \text{ f/cc})}{30} \\ \text{Estimate 2} & \\ &= 0.065 \text{ f/cc} \end{aligned}$$

F. Conclusions

The study of this asbestos-containing sheet vinyl flooring removal using recommended work practices showed that the flooring mechanics' asbestos exposures via PCM analysis were 0.0072 f/cc and 0.0081 f/cc for an 8-hour TWA. These results are substantially below the action limit of 0.1 f/cc and the PEL of 0.2 f/cc under the OSHA asbestos standard. In addition, maximum 30-minute exposures for the flooring mechanics were 0.061 f/cc and 0.065 f/cc both of which are well below the OSHA excursion limit of 1 f/cc averaged over 30 minutes.


 M. A. Sapienza
 Group Director
 Quality, Testing, Install. & Develop.
 March 28, 1989

ASTECH, Inc.

DATA ATTACHMENT 1

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Rahway, N.J. 07065

(201) 396-4455

M J Sendaki

(Field Technician Signature)

DATE: 10-6-84	CLIENT: CONGOLEUM CORP	COMMENTS: FLOOR REMOVAL 861 SLOAN RD
JOB LOCATION: SB ROOM		TRENTON NJ 08619
JOB DESCRIPTION: CONGOLEUM WET REMOVAL TEST		

SAMPLE ID #	SAMPLE LOCATION	FILTER	LPM	PUMP #	TIME ON	TOTAL TIME	VOLUME LITERS	FIBERS / 100 FIELDS	FIBERS / CC	8-HOUR TWA
					TIME OFF					
1	PRE AREA SB ROOM	25 MM	10.4	AIRCON 2181	1942.6 2008.6	66	660.0	3	2.0074	
2	DURING Removal S.B. Room	25 MM	10	AIRCON 2181	2008.6 2084.8	76.2	762.0	17 1/2	.011	
3	DURING John TAYLOR Removal SB ROOM	25 MM	2	GILIAN 7706	1037	78	156.	9	2.031	
4	HTotal SB ROOM	25 MM	2	GILIAN 7707	1041	75	150.	8	2.033	
5	DEANK	25 MM						0.0	-	
6	Lunch 12:05 SB Room	25 MM	10	AIRCON 2181	2054.8 2186.8	102	1020.0	2.5	2.0048	
8	John TAYLOR SB Room Personal	25 MM	2	7706	145	119	228	7 1/2	2.021	
9	HTotal Personal SB Room	25 MM	2	7707	145	118	226	11	.024	
7	AREA AFTERNOON	25 MM	10	AIRCON 2181	2186.8 2307.7	120.9	1209.0	9	2.0041	