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U.S. Army Toxic and Hazardous Materials Agency

Report of Sampling and Analysis Results

Youngs Lake Army Housing Units
Renton, Washington

August 1990

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**SAMPLING AND ANALYSIS AT THE U.S. ARMY
FAMILY HOUSING UNIT (FHU) PROPERTY
RENTON, WASHINGTON**

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EXECUTIVE SUMMARY

The U.S. Army family housing units (FHUs) at Renton, Washington were inspected by Roy F. Weston, Inc. (WESTON) personnel during February 1990 to further evaluate the environmental concerns identified in the enhanced Preliminary Assessment reports prepared and submitted earlier by Argonne National Laboratory (ANL) for the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA). Three of the 28 single-family "Capehart" housing units were examined on 20 February to investigate the possible presence of asbestos-containing materials (ACM). An assessment of airborne asbestos exposure was performed at one unit on this property on 12 April 1990 by a WESTON Certified Industrial Hygienist (CIH), because asbestos fibers were detected in the dust deposited within the ductwork of the heating system.

The ANL Draft Sampling and Analysis Plan, Revision 1 (SAP) specified sampling the following materials, where present, which are suspected to contain asbestos, from ten per cent of the housing units or a minimum of three housing units, whichever is greater.

- Pipe run insulation.
- Dust accumulated inside heating ductwork within the concrete slab, where present and open.
- Vinyl floor tiles.

The WESTON personnel selected three housing units for inspection after review of maintenance records and drawings, discussions with housing management personnel, and determination that the units were in similar condition. The housing units chosen, Nos. L-05, L-11, and L-15, were considered to be representative of the other 25 units, but this was not confirmed by an examination of all the units.

Twelve dust samples and 16 samples of floor tile and vinyl sheeting were collected by WESTON and analyzed. These analyses revealed that asbestos is present in dust accumulated within the heating ductwork and in floor tile and vinyl sheeting at the three housing units examined. Asbestos was found in all of the twelve dust samples by transmission electron microscopy (TEM), and in at least two samples from each unit. Asbestos was quantified at 1% or greater by polarized light microscopy (PLM) in ten of the floor tile and vinyl sheeting samples, and was qualitatively identified in six other samples by TEM. No pipe insulation samples were collected since the pipes in the units examined were not insulated. During the sampling activity, other suspect materials observed were granular spray-applied paint on walls and ceilings and expansion joints on the heating units.

The following practices should be observed with regard to the known and suspected asbestos-containing materials identified:

- The risks posed by the asbestos-containing dust in the ductwork cannot be clearly evaluated, because the sampling and analysis program only included a qualitative screening of this material since no approved quantitative procedure exists. Further studies, such as air sampling, were recommended to determine if the asbestos is becoming airborne and to define what risks, if any, are presented by these findings. These findings were subsequently performed and the findings are presented in this report.

- The vinyl floor coverings pose no significant risk as long as they are in good condition and are not damaged by excessive wear or misuse. They should be managed in place under an Operations and Maintenance (O&M) program which describes procedures for the regular inspection of the floor coverings and the removal and replacement of any that become damaged.
- Other suspect materials identified but not sampled, including spray-applied texture paint and furnace expansion joints, should be assumed to contain asbestos and managed in place under an O&M program until they are either removed or determined to contain no asbestos.

Samples for airborne asbestos were collected from four floor vents, one located in each of the living room, living room near the kitchen, bedroom 1, and bedroom 2, in an unoccupied unit which had not been inspected previously. As a consequence, dust samples were also collected from these vents. The air samples were subjected to analysis by TEM to identify and quantify any asbestos fibers collected. No asbestos fibers were found in any of the samples from this house. The sample volumes collected resulted in detection limits for airborne asbestos fiber concentration of <0.005 fibers per cubic centimeter (f/cc), which does not pose a substantial risk to occupants. The sampling procedures employed were designed to simulate the worst-case concentration that is likely to be encountered. Chrysotile fibers were detected in all of the four dust samples collected during this follow-up study.

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SECTION 1. INTRODUCTION

**SAMPLING AND ANALYSIS AT THE U.S. ARMY
FAMILY HOUSING UNIT (FHU) PROPERTY
RENTON, WASHINGTON**

SECTION 1. INTRODUCTION

Roy F. Weston, Inc. (WESTON) was retained by Argonne National Laboratory (ANL) to provide assistance in gathering additional environmental data for the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA) at 53 family housing unit (FHU) properties in 12 states. The Renton, Washington property is one of these FHUs.

1.1 PURPOSE AND SCOPE

The purpose of this project was to provide the Department of the Army with sound environmental data on the properties which are scheduled for sale or realignment as a result of the Defense Authorization Amendments and Base Closure and Realignment Act (Public Law 100-526). Environmental assessments of each property covered by the Act are required by the Secretary of Defense prior to their closure or realignment. Such actions must be performed in accordance with applicable provisions of the National Environmental Policy Act (NEPA) to ensure that any environmental hazards will be identified and mitigated where required.

Previously, ANL conducted enhanced preliminary assessments (PAs) for each property. These enhanced PAs made recommendations regarding sampling and analysis to determine (1) whether and in what quantities asbestos is present in certain building construction materials (including pipe run insulation, dust accumulated in heating ductwork, vinyl floor tile, and exterior siding shingles, where present), (2) in selected contexts, whether and in what concentration soils and groundwater may be contaminated, and (3) whether and in what range transformer oils at selected sites may contain polychlorinated biphenyls (PCBs). WESTON gathered this data by implementing ANL's Draft FHU Sampling and Analysis Plan, Revision 1 (SAP). Subsequent to the initial studies, WESTON, ANL, and USATHAMA decided that a follow-up effort was required to determine if asbestos fibers were becoming airborne from the dust in the heating system. This study was implemented, and samples were collected to evaluate any risks to occupants from this source.

1.2 SITE DESCRIPTION

The Department of the Army's FHU property in Renton, Washington consists of 28 single-family housing units located on 9.42 acres. The site is a square-shape property with 116th Avenue as the western boundary. Private residential properties are located on the other three sides of the housing area.

The three-bedroom "Capehart"-style single-family housing units were constructed in 1958. The single-story, wood-frame units were built on concrete slab foundations with no basements or crawl spaces. The ducts for the original heating system and domestic water lines were embedded in the concrete slab, which was covered with vinyl floor tile. The units have pitched roofs surfaced with asphalt shingles and exteriors finished with wood siding.

1.3 REPORT ORGANIZATION

This report contains the results of the sampling and analysis program performed by WESTON. Section 2 contains a description of the asbestos sampling performed at the property and laboratory results for samples of suspected asbestos-containing material (ACM) collected. Copies of field notes and laboratory results pertaining to asbestos are provided in Appendices A.1 and A.2. Section 3 presents a description of the field sampling activities and results of the analyses for airborne asbestos fibers. Field notes and copies of the laboratory reports for this effort are presented in Appendices B.1 and B.2, respectively. Section 4 is a summation of all activities and findings for Youngs Lake.

SECTION 2. ASBESTOS-CONTAINING MATERIALS

SECTION 2. ASBESTOS-CONTAINING MATERIALS

WESTON personnel inspected three of the 28 "Capehart" units at the Renton family housing facility on 20 February 1990 for the presence of suspected asbestos-containing materials (ACM). Vinyl floor tile, vinyl sheeting, and dust accumulated within the heating ductwork were the only suspect materials found within the buildings that were sampled. All sampling was done following the requirements of ANL's SAP. Additionally, all field work was performed in accordance with applicable Federal regulations, including 40 CFR Part 61 Subpart M, 40 CFR Part 763 Subpart E, and 29 CFR Part 1910.1001.

2.1 SAMPLING RATIONALE

The sampling rationale used by WESTON for this project followed the recommendations set forth by ANL. The type of suspect ACM to be sampled, the number of housing units to be examined at each FHU facility, and number of samples to be taken for each material found were described in the SAP. The plan for Renton required sampling of the following materials, if present:

- Pipe run insulation.
- Accumulated dust inside heating ductwork if not sealed.
- Vinyl floor tiles.

In accordance with the SAP, three units were examined at this facility. The sampling plan, however, did not identify specific units which were to be sampled. The task of determining which housing units were representative of the facility as a whole and, therefore, would be sampled was left to the WESTON field team. After reviewing all available maintenance records and drawings and discussing the facility with Directorate of Engineering and Housing (DEH) personnel, it was determined that all of the units at the Renton FHU were similar in condition. Units L-05, L-11, and L-15 were chosen by the WESTON field team leader as representative units to be sampled.

The SAP specifies that a minimum of two pipe run insulation samples, four dust samples, and one sample of each color of floor tile be collected from each of the housing units examined. Twelve dust samples and 16 samples of vinyl floor tiles were collected at the facility. No pipe insulation samples were collected since the pipes in the units examined were not insulated.

2.2 FIELD ACTIVITIES AND OBSERVATIONS

Each of the units was inspected to determine if suspect materials were present. Heating ductwork vents in the units were not sealed, so dust samples were collected by wiping the inner surface of the duct near the designated exhaust vents with a fiber-free wipe selected for its ability to trap dust in a non-fibrous matrix. Each wipe was placed in the jaws of a flexible small parts pick-up tool and moistened with fiber free water. The grille was then removed and the tool inserted into the duct opening. The interior surface was wiped to collect dust on the moistened surface of the wipe. After the dust was gathered, the wipe was placed in a small plastic wide-mouth jar, sealed, labeled with the sample number, and shipped to the lab. The grille was then replaced and the tool was cleaned by rinsing and wet wiping the surfaces prior to collecting the next sample. Samples were collected from the living room, hall, bedroom, and main bathroom in all three units.

Five colors (three shades of green, gray, and brown) of 9" x 9" vinyl floor tile and one color (tan) of 12" x 12" vinyl floor tile and two colors (white and light green) vinyl sheeting were sampled. Unit L-05 contained tan 12" x 12" floor tile and light green vinyl sheeting. Unit L-15 contained green and gray 9" x 9" vinyl floor tile, green and brown 12" x 12" vinyl floor tile and white vinyl sheeting. Unit L-11 contained brown, gray, and three shades of green 9" x 9" floor tile, and two colors (brown and green) of 12" x 12" floor tile. One sample of each of the floor tile and vinyl sheeting types was taken in each housing unit, resulting in a total of 16 samples for laboratory determination of asbestos content. These samples were taken by breaking off a small piece of floor tile in an inconspicuous location. About one square inch of the tile surface area was taken for each sample. No effort was made to separate the mastic, which sometimes contains asbestos, from the floor tile samples themselves.

The vinyl floor covering in all three of the units inspected was in good condition. This material is considered to be a non-friable type of ACM, unless damaged. If significant damage occurs, such that the material becomes friable as defined in the asbestos National Emission Standard for Hazardous Air Pollutants (NESHAP), the U. S. Environmental Protection Agency (EPA) would classify these tiles as friable materials. However, an EPA interpretation was recently released that changes certain previous interpretations regarding non-friable ACM. On 23 February 1990, a memorandum was issued by the Director of Emissions Standards Division, the Director of Stationary Source Compliance Division, and the Associate Enforcement Counsel for Air Enforcement of the EPA Office of Air Quality Planning and Standards (OAQPS). This memorandum was circulated to other air quality officials and EPA regional offices in early March 1990. This latest position states that floor tiles and certain other non-friable materials do not have to be removed from a facility prior to demolition, unless they are severely damaged and thus are considered friable, or unless the demolition may cause fiber release through grinding or abrasion of the tiles. Floor tile removal shall be done if demolition is to be accomplished by burning, either of the unit or of the debris from demolition. However, if the floors in the housing units are to be renovated, special care must be taken during the process to prevent the release of asbestos fibers.

The WESTON field team was directed, as a part of the project scope contained in the SAP, to perform sampling and analysis of specific suspect ACM. Other suspect materials observed were granular spray-applied paint on walls, ceilings, and expansion joints on the heating units. Copies of the field notes are included in Appendix A.1.

2.3 LABORATORY PROCEDURES AND RESULTS

The bulk samples of building materials were analyzed for asbestos content by WESTON's optical microscopy laboratory in Auburn, Alabama. This laboratory is accredited by the American Industrial Hygiene Association (AIHA) and the National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP). The bulk samples were analyzed by Polarized Light Microscopy (PLM) using the EPA's "Interim Method for the Determination of Asbestos in Bulk Insulation Samples", EPA 600/M4-82-020, December 1982. Copies of the laboratory reports are included in Appendix A.2.

All analyses were performed in accordance with protocols set forth in the Laboratory Accreditation package submitted by WESTON under NVLAP. This document includes standard procedures for sample analysis and quality assurance/quality control (QA/QC) which were acceptable to NIST. The QA/QC protocols for the laboratory differ significantly from those commonly found in chemical analysis procedures, due to the nature of the analytical procedure. Lot blanks and sample spikes are not performed since there are no reagents, digestions, or other steps in the process that provide significant opportunities for sample contamination or analyte loss. Instead, all analyses are performed using the following steps:

- The WESTON laboratory routinely runs blank checks to ensure that equipment and refractive index oils are not contaminated, collects and analyzes samples of the air in the work areas to document that airborne asbestos fibers do not threaten worker health or contaminate samples, and analyzes samples submitted by NIST to document precision of results as required by the NVLAP program. Samples provided in past rounds of proficiency checks are used for analyst training and to document analyst proficiency. The use of third party laboratory comparisons is often done, and is accomplished by sending duplicates of samples to an outside laboratory and comparing the results obtained by the two facilities.

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The matter is further complicated by the fact that the PLM method was developed specifically for friable materials, but not for non-friable types of suspect ACM such as vinyl floor tiles, vinyl sheeting, and siding. In fact, no specific method has been developed and promulgated to date for such samples, so laboratories use PLM as the only available documented procedure for their analysis. PLM has an inherent limitation on fiber resolution of about 0.25 micrometer (μm) in diameter, while reliable detection and quantification of fibers smaller than 1 μm in diameter is difficult. The manufacturing process for vinyl floor tiles, for example, often produces the very small fiber diameters which cannot be seen by PLM. WESTON's experience is that frequently such samples do, in fact, contain significant quantities of asbestos. WESTON has developed a qualitative technique using TEM to detect the presence of such small fibers and minimize false negatives in the laboratory results. This technique, however, does not allow a good quantitative estimate of asbestos content.

For these reasons, the WESTON laboratories have implemented a policy of reporting asbestos presence as follows:

- Asbestos determined by PLM to be present at greater than 1% is reported as the quantity detected.
- If asbestos is estimated to be less than 1% by PLM, it is reported as "<1%". This estimate of asbestos content may be made when only one asbestos structure is observed.
- If asbestos is not detected in certain non-friable materials by PLM, then the samples are subjected to TEM analysis. The results are reported as positive if asbestos is detected by TEM.

Recommendations made in this report are based on the >1% regulatory limit, except for floor tiles as discussed earlier and except as otherwise noted. However, all samples in which asbestos was detected are discussed. This represents a conservative approach to the assessment of asbestos presence at the facility.

Table 2.1 contains a summary of all samples collected at the Renton FHU, including sample locations, material descriptions, and laboratory results. PLM results are quantitative while TEM results are qualitative. Quantity estimates for materials sampled that were suspected to contain asbestos are presented in Table 2.2. The field notes describing the observations are provided in Appendix A.1, while copies of the original laboratory reports are included as Appendix A.2.

Ten of the floor covering samples were found by PLM to contain asbestos at or greater than the 1% level. WESTON considers the 1% value reported for sample BU-096-20-WA-L11-AFT to be sufficient to define the samples as asbestos-containing, due to the analytical uncertainty of the PLM method when applied to floor tiles, previously discussed. Six of the samples, for which no asbestos was reported following PLM analysis, were found to contain asbestos fibers by the TEM procedure. While this result is qualitative in nature, consideration of the process through which floor tiles were manufactured leads to the conclusion that this material should be treated as ACM. Thus, all of the 16 floor tile and vinyl sheeting samples were found to contain asbestos. The 25 units not inspected should be considered to have ACM present in the floor tiles and vinyl sheeting unless additional sampling and analysis is performed and shows that no asbestos is present in these units.

TABLE 2.1
BULK SAMPLE SUMMARY
YOUNGS LAKE FAMILY HOUSING

SAMPLE IDENTIFICATION	MATERIAL TYPE	LOCATION	ASBESTOS CONTENT PLM ANALYSIS	CONFIRMATION TEM ANALYSIS
=====				
Unit L15 -----				
BU075-20-WA-L15-AFT	Green 9" x 9" floor tile	Living room/Hall/ Bedroom 2	Chrysotile, 3%	
BU076-20-WA-L15-AFT	White vinyl sheeting	Kitchen	None Detected	Positive
BU077-20-WA-L15-AFT	Green 12" x 12" floor tile	Hall/Living room	None Detected	Positive
BU078-20-WA-L15-AFT	Gray 9" x 9" floor tile	Bathroom 1/Bathroom 2	Chrysotile, 10%	
BU079-20-WA-L15-AFT	Lt brown 12" x 12" floor tile	Bedroom 3	Chrysotile, 12%	
BU080-20-WA-L15-AFT	Tan 12" x 12" floor tile	Bedroom 1	None Detected	Positive
BU081-20-WA-L15-AFT	Brown 12" x 12" floor tile	Hall	None Detected	Positive
BU082-20-WA-L15-ATD	Dust within ductwork	Bedroom 3	---	Positive
BU083-20-WA-L15-ATD	Dust within ductwork	Bathroom 1	---	Positive
BU084-20-WA-L15-ATD	Dust within ductwork	Hall	---	Positive
BU085-20-WA-L15-ATD	Dust within ductwork	Living room	---	Positive
Unit L05 -----				
BU086-20-WA-L05-AFT	Lt green vinyl sheeting	Bathroom 1/Bathroom 2/ Kitchen	Chrysotile, 25%	
BU087-20-WA-L05-AFT	Tan 12" x 12" floor tile	All bedrooms/Hall/ Living room	None Detected	Positive
BU088-20-WA-L05-ATD	Dust within ductwork	Bedroom 3	---	Positive
BU089-20-WA-L05-ATD	Dust within ductwork	Living room	---	Positive
BU090-20-WA-L05-ATD	Dust within ductwork	Bathroom 1	---	Positive
BU091-20-WA-L05-ATD	Dust within ductwork	Bedroom 1	---	Positive
Unit L11 -----				
BU092-20-WA-L11-AFT	Green 9" x 9" floor tile	Bedroom 1	Chrysotile, 7%	
BU093-20-WA-L11-AFT	Brown 9" x 9" floor tile	Bedroom 2	Chrysotile, 13%	
BU094-20-WA-L11-AFT	Brown 12" x 12" floor tile	Bedroom 2	None Detected	Positive
BU095-20-WA-L11-AFT	Gray 9" x 9" floor tile	Bathroom	Chrysotile, 7%	
BU096-20-WA-L11-AFT	Green 12" x 12" floor tile	Hall	Chrysotile, 1%	
BU097-20-WA-L11-AFT	Green 9" x 9" floor tile	Kitchen	Chrysotile, 10%	
BU098-20-WA-L11-AFT	Green 9" x 9" floor tile	Hall/Living room	Chrysotile, 10%	
BU099-20-WA-L11-ATD	Dust within ductwork	Hall	---	Positive
BU100-20-WA-L11-ATD	Dust within ductwork	Bathroom	---	Positive
BU101-20-WA-L11-ATD	Dust within ductwork	Bedroom 1	---	Positive
BU102-20-WA-L11-ATD	Dust within ductwork	Living room	---	Positive

TABLE 2.2
ASBESTOS CONTAINING MATERIALS
YOUNGS LAKE FAMILY HOUSING

SAMPLE IDENTIFICATION	MATERIAL TYPE	LOCATION	QUANTITY	UNITS
=====				
Unit L15				

BU075-20-WA-L15-AFT	Green 9" x 9" floor tile	Living room/Hall/ Bedroom 2	595	Square ft
BU076-20-WA-L15-AFT	White vinyl sheeting	Kitchen	72	Square ft
BU077-20-WA-L15-AFT	Green 12" x 12" floor tile	Hall/Living room	10	Square ft
BU078-20-WA-L15-AFT	Gray 9" x 9" floor tile	Bathroom 1/Bathroom 2	66	Square ft
BU079-20-WA-L15-AFT	Lt brown 12" x 12" floor tile	Bedroom 3	110	Square ft
BU080-20-WA-L15-AFT	Tan 12" x 12" floor tile	Bedroom 1	100	Square ft
BU081-20-WA-L15-AFT	Brown 12" x 12" floor tile	Hall	1	Square ft
BU082-20-WA-L15-ATD	Dust within ductwork	Bedroom 3	N/A	
BU083-20-WA-L15-ATD	Dust within ductwork	Bathroom 1	N/A	
BU084-20-WA-L15-ATD	Dust within ductwork	Hall	N/A	
BU085-20-WA-L15-ATD	Dust within ductwork	Living room	N/A	
Unit L05				

BU086-20-WA-L05-AFT	Lt green vinyl sheeting	Bathroom 1/Bathroom 2/ Kitchen	170	Square ft
BU087-20-WA-L05-AFT	Tan 12" x 12" floor tile	All bedrooms/Hall/ Living room	980	Square ft
BU088-20-WA-L05-ATD	Dust within ductwork	Bedroom 3	N/A	
BU089-20-WA-L05-ATD	Dust within ductwork	Living room	N/A	
BU090-20-WA-L05-ATD	Dust within ductwork	Bathroom 1	N/A	
BU091-20-WA-L05-ATD	Dust within ductwork	Bedroom 1	N/A	
Unit L11				

BU092-20-WA-L11-AFT	Green 9" x 9" floor tile	Bedroom 1	200	Square ft
BU093-20-WA-L11-AFT	Brown 9" x 9" floor tile	Bedroom 2	154	Square ft
BU094-20-WA-L11-AFT	Brown 12" x 12" floor tile	Bedroom 2	8	Square ft
BU095-20-WA-L11-AFT	Gray 9" x 9" floor tile	Bathroom	65	Square ft
BU096-20-WA-L11-AFT	Green 12" x 12" floor tile	Hall	10	Square ft
BU097-20-WA-L11-AFT	Green 9" x 9" floor tile	Kitchen	100	Square ft
BU098-20-WA-L11-AFT	Green 9" x 9" floor tile	Hall/Living room	390	Square ft
BU099-20-WA-L11-ATD	Dust within ductwork	Hall	N/A	
BU100-20-WA-L11-ATD	Dust within ductwork	Bathroom	N/A	
BU101-20-WA-L11-ATD	Dust within ductwork	Bedroom 1	N/A	
BU102-20-WA-L11-ATD	Dust within ductwork	Living room	N/A	

Analytical results for the dust samples taken from the heater ductwork indicate that this dust contains some asbestos fibers. Qualitative TEM analyses revealed the presence of asbestos in all of the twelve dust samples. At least two samples from each unit had detectable asbestos fibers. These data lead to the conclusion that asbestos is found in the dust trapped by the heating ducts.

2.4 CONCLUSIONS AND RECOMMENDATIONS

The sample analyses performed by WESTON have revealed that asbestos is present in most floor tile and vinyl sheeting samples collected in the three housing units examined and that the dust inside the heater supply ducts contains asbestos. These units are thought to be representative of the other 25 at the site, but this was not confirmed by sampling all units.

The asbestos dust accumulated within the heating ductwork represents an unusual problem, since the source of this asbestos is not readily apparent, and the quantity is not precisely known. As a conservative approach, the heating ductwork located within the concrete slab should be cleaned or permanently sealed when the units are renovated. Since the heating systems are currently operational, sealing the floor vents will require replacement with attic ducts and ceiling vents, or provisions of an alternate heating source. If the ducts are cleaned, a high-powered vacuum cleaner equipped with a high-efficiency particulate air (HEPA) filter should be employed, since other vacuum cleaners are not capable of trapping all of the small asbestos fibers that may be present.

The source of the asbestos in the ducts cannot be positively determined, due to the sampling and analysis procedures employed. However, there are several potential sources, based on observations at the numerous facilities inspected during this project. Units, presumed to be the original heaters, found at other facilities frequently contained an expansion joint which served to isolate the return air plenum from the heater itself, preventing the transmission of vibrations and noise to the ductwork. The fabric-like material used to form this joint was determined, in some cases, to be chrysotile asbestos in a nearly pure form. It is possible, even likely, that the heating systems in these units had similar expansion joints which have been removed. During the 25 to 30 years that the original units were in service, erosion of these joints was likely, and could have caused asbestos fibers to accumulate in the dust.

Another possibility is that residual debris from the removal of vinyl-asbestos floor tiles, such as was found in other sites, may have been left in the ducts during floor tile removal and replacement. Conversations with the TEM analysis indicate that there was some evidence of chlorine observed during the identification of the asbestos fibers by X-ray dispersion analysis in samples from some sites. The most likely source of this element, considering the site history, is the vinyl chloride polymer which forms the floor tile matrix. However, other asbestos sources, such as debris imported into the facilities from outside activities of the occupants, cannot be ruled out.

The vinyl floor coverings in the three housing units inspected were in good condition, but, should they become broken or damaged, asbestos fibers may be released. The recent EPA clarification of the definition for damaged non-friable materials apparently removes some concerns about the status of these materials at the time of renovation or demolition. Inspection of these normally non-friable materials prior to demolition is required, but, if they are in good condition at the time, they may be left in place as long as planned demolition procedures will not release a significant amount of asbestos fibers. However, if demolition will subject these non-friable materials to grinding, sanding, or abrading, or if demolition involves burning of the

structure or debris from the structure, all forms of ACM, including these floor coverings, must be removed in advance.

The vinyl floor coverings should be left in place and managed under an Operations and Maintenance (O&M) plan. An O&M plan must address the following:

- The locations of all known and suspected ACM.
- The procedures and frequency for periodically assessing the ACM in the facility.
- The procedures for safely handling the ACM during maintenance or removal activities.
- Designation of an asbestos coordinator for the facility.
- The responsibilities and requirements for training of personnel involved with maintenance and renovation of the facility.
- The record-keeping program for the facility.

The vinyl floor coverings should be removed during a planned renovation of the units, in accordance with the regulations applicable at the time.

Granular spray-applied paint and expansion joints were the only suspect materials noted, and these should be managed under an O&M program. Care should be taken during renovations or demolition to identify other suspect materials that may have been hidden from the view of the assessment team. The suspect materials observed by the field team, and any hidden suspect materials found later, should be analyzed for the presence of asbestos prior to being disturbed.

SECTION 3. AIRBORNE ASBESTOS ASSESSMENT

SECTION 3. AIRBORNE ASBESTOS ASSESSMENT

Sampling for airborne asbestos fibers was performed at one unit of the Youngs Lake FHU in Renton, Washington on 12 April 1990 by WESTON. Dr. Bruce Ferguson, a Certified Industrial Hygienist (CIH) visited the site and collected the samples using procedures described in the Asbestos Hazard Emergency Response Act (AHERA). These procedures were designed for verifying that clean-up of a contained area, following completion of an asbestos abatement action in public schools, was adequately performed. All samples were analyzed by TEM following the protocols specified in AHERA.

3.1 SAMPLING RATIONALE

WESTON followed the procedures and guidelines set forth during discussions among ANL, USATHAMA, and WESTON staff members, to provide a fast-track field sampling program and rapid analysis of samples collected. The urgency of this effort was driven by the finding that asbestos fibers were a component of the dust contained in the sub-slab ductwork of a number of the installations. The approach chosen required that the WESTON CIH collect four samples of air from selected heating registers, generally from one vent in each of the living room, kitchen, bedroom, and bathroom. Air samples were to be collected in one unoccupied unit at the site while the heating system was operating, to simulate the worst possible case for exposure of occupants. The vacant unit selected was to be one of those from which dust within ducts had been sampled during the initial investigations, where possible. If no unit that had been sampled previously was vacant at the time, another unit was to be chosen from among those available, and samples of dust from the ducts had to be collected. These samples were to be collected after completion of sampling for airborne fibers, using the procedures employed previously. Unit 10 was selected at the Youngs Lake site, since it was vacant, but it had not previously been sampled. Therefore, dust samples were also collected from the vents.

3.2 FIELD ACTIVITIES AND OBSERVATIONS

The sampling activities at this site were performed during the afternoon, on a warm spring day. The diaphragm pumps were unpacked, placed in the selected sampling locations, and turned on as soon as possible after arrival at the site to allow the mechanical components to warm up prior to checking flow rates. Since there were no floor ducts in the kitchen and bathroom of this unit, samples were taken from the living room near the kitchen and the second bedroom instead. Since the heating system had not been in operation recently, it was turned on as soon as the pumps were in operation, to allow the air flow to stabilize.

A test filter cassette, identical to those used for sample collection, was placed on the pump system being calibrated and the airflow into the filter was measured using a calibrated rotameter. This followed AHERA requirements and good industrial hygiene (IH) sampling protocols. After the pumps were calibrated, a sampling cassette made of an electrically conducting plastic was attached to the sample line, placed directly over the heating register to be sampled, and securely held in place with duct tape. The cassette contained a 25 mm diameter mixed cellulose ester (MCE) membrane filter, having a nominal pore size of 0.45 μm . The time at which sample collection was begun was recorded and the air was sampled for approximately three hours.

The pumps were operated for a length of time sufficient to draw about 1,600 liters (L) of air through each filter, based on the initial daily calibration. At the expiration of this time, the filter cassettes were

removed from the heating register, inverted while the airflow continued, and lightly tapped to dislodge any fibers that may have adhered to the cowl of the cassette. Then, the cassettes were carefully removed from the sampling pump, resealed with the plugs and end caps that are a part of the cassettes, and labeled. The flow rate of each pump was again determined by exactly the same procedure used prior to the start of sample collection. After all sampling was completed, the heating system was returned to the same condition and setting that was found on entry to the unit.

The volume of air drawn through each filter was calculated, based on the average sample flow rate and the duration of sample collection, and recorded on the cassette label. Each cassette was then sealed in a anti-static plastic zipper-seal bag and placed in a shipping carton with a custom-designed anti-static foam liner. All sampling equipment, samples and other gear were then removed from the unit and the site was secured prior to departure.

Samples were collected from four interior locations two of which were those planned and two of which were selected in the field due to circumstances at the facility. The kitchen and bathroom vents were located in the wall so samples were obtained from a living room vent near the kitchen and from the second bedroom. In addition, a field blank was prepared and a background sample of ambient outside air was taken near the entry door at the rear of the house. No significant problems were encountered during the sample collection activities. After completion of air sampling, the dust samples were taken using the procedures described in the ANL SAP.

During the sampling effort the facility was examined to identify any potential sources of asbestos that may be responsible for the asbestos fibers found in the dust. The heating system has a expansion joint that appeared to have been in place for some time. This type of material sometimes contains asbestos.

3.3 LABORATORY PROCEDURES AND RESULTS

Samples were shipped to the laboratory soon after collection by common carrier. The dust samples were examined using TEM, as described in Section 2. The four samples of air from within the unit were analyzed by WESTON's NVLAP-accredited TEM facility, using the sample preparation and analytical procedures set forth in the EPA AHERA method. A section of the exposed filter was cut from each sample and three wedges were placed on copper wire grids for TEM mounting. The samples were etched in a plasma asher, which also destroyed some of the organic materials that may have been collected, and vacuum-coated with a thin layer of carbon, embedding the fibers that were on the filter surface. Each carbon-coated grid was placed in a Jaffe wick washer, in which the MCE filter matrix was dissolved and wicked away, leaving behind the carbon film containing any asbestos fibers collected. The grids were then examined and found to be ready for analysis.

Once the sample grids were prepared, each grid was examined by the TEM protocols of AHERA. A specified number of grid openings were scanned looking for fibers that may be asbestos. Typically, between six and ten grid openings had to be examined to comply with the detection limits set forth in the regulations. Whenever a fiber was observed during this examination, the microscopist examined its morphology and determined its elemental composition from the emitted X-ray spectrum. If these indicated that it may be an asbestiform mineral, the crystal lattice structure was examined by observation of its electron diffraction pattern. The fiber was then classified as non-asbestos or by the type of asbestos determined to be present during the analysis, as appropriate.

The results for the four samples from inside Unit 10 are presented in Table 3.1. No asbestos fibers were detected in any of the air samples from this facility. The limit of detection for these samples is between 0.004 and 0.005 fibers per cubic centimeter (f/cc). Based on these findings, the background sample and field blank were not examined. Chrysotile asbestos was found in all of the four dust samples collected in this unit. This is consistent with finding of asbestos in all of the 12 samples of dust collected from the other units at this location.

3.4 CONCLUSIONS AND RECOMMENDATIONS

The air samples collected indicate that asbestos fibers from the dust found within the heating system ductwork are not being released in significant quantities at this facility. The airborne asbestos concentration was lower than the detection limit and below the AHERA threshold. The limits of detection were <0.005 f/cc, which is at or below the acceptability limit set forth in AHERA for clearance of an abatement area in a school, and were far lower than the OSHA Permissible Exposure Limit (PEL) for workers of 0.2 f/cc.

While asbestos has been shown to pose a health risk to humans at high fiber concentrations, there are no definitive studies that indicate that a risk is associated with low-level exposures such as the 0.005 f/cc AHERA limit. Therefore, sampling and analysis for airborne asbestos at this site did not reveal any health risk to the occupants of the houses, based on the TEM analyses of Environmental Hygiene Agency (AHEA) that, if the units are to remain under the management, operational control, or ownership of the Army, additional sampling and analysis for airborne asbestos be undertaken. These studies should be performed to provide data from at least ten percent of a minimum of three of the housing units, whichever is greater. This additional sampling and analysis effort, along with the other recommended actions, will help to ensure that there is no long-term exposure risk to the occupants or to maintenance personnel.

TABLE 3.1. RESULTS OF AIRBORNE ASBESTOS SAMPLING AND ANALYSIS
YOUNGS LAKE FAMILY HOUSING UNITS, RENTON, WA

(ALL VALUES IN FIBERS/CC)

SAMPLE NUMBER	SAMPLE LOCATION	ASBESTOS IN DUST	ASBESTOS CONCENTRATION	ASBESTOS TYPE FOUND
L-10-A	Living Room (at Front Door)	YES	ND < 0.004	ND
L-10-B	Living Room (near Kitchen)	YES	ND < 0.004	ND
L-10-C	Bedroom 1	YES	ND < 0.005	ND
L-10-D	Bedroom 2	YES	ND < 0.005	ND

ND = Not Detected at the Limit of Detection Cited.

Note: The asbestos in all dust samples was chrysotile.

SECTION 4. SUMMARY OF FINDINGS

SECTION 4. SUMMARY OF FINDINGS

Sampling and analyses performed at the Youngs Lake FHU in Renton, Washington reveal the presence of issues of concern from an environmental standpoint. The most significant are the detection of asbestos in all of the 16 dust samples and in all of the 16 samples of floor tile and vinyl sheeting.

The following practices should be observed with regard to the known and suspected asbestos-containing materials identified:

- The vinyl floor coverings pose no significant risk as long as they are in good condition and are not damaged by excessive wear or misuse. They should be left in place and managed under an O&M program which describes procedures for the regular inspection of the floor coverings and the removal and replacement of any that become damaged.
- Other suspect materials identified at the site, including spray-applied texture paint and furnace expansion joints, should be assumed to contain asbestos and managed in place under an O&M program until they are either removed or determined to contain no asbestos.
- Additional sampling and analysis for airborne asbestos at this site is recommended by AEHA, if the units are to remain under the management, operational control, or ownership of the Army. These studies should be performed to provide data from at least ten percent or a minimum of three of the housing units, whichever is greater.

The air monitoring performed in Unit 10 indicated that no detectable asbestos was being emitted into the air from dust collected in the heating ducts. The detection limit of the method, <0.005 f/cc, is below the AHERA limit and well below the OSHA PEL of 0.2 f/cc.

APPENDIX A.1. FIELD DATA, ASBESTOS SAMPLING

SITE SURVEY LOG

CLIENT Argonne National Labs WESTON WORK ORDER NO. 2104-13-01
 FACILITY/BLDG. NO. Youngs Lake Family Housing, L-15
 FACILITY CONTACT Bobby E. Lewis TELEPHONE NUMBER (206) 967-4512
 TECHNICIAN NAME Michael Kindley SIGNATURE Michael Kindley
 TECHNICIAN NAME Rolf Erya SIGNATURE Rolf Erya
 TIME ARRIVED 0835 TIME DEPARTED 0940 DATE 20 Feb 90
 dd mm yy

SPECIFIC SITE ACTIVITIES, COMMENTS, INTERVIEW RESULTS & BRIEF DESCRIPTION OF FACILITY

Frank Niemiec, Housing Assistant from Ft. Lewis met us at the hotel in Kent at 0820. We proceeded to the Youngs Lake site. Mr. Niemiec said that three houses had been picked out for us to survey at Youngs Lake.

L-15 is a three-bedroom Capehart-style house - one story, wood frame, concrete foundation. Interior walls have plaster board walls with a granular spray-on material on walls and ceilings. Vinyl floor tile and insulation in floor. Ins and gravel roof.

No pipe insulation was found in the building. All pipes were bare. Also no support connected to building. No transite panels. No attic area in building.

Based on talks with Joe Behrent, Family Housing Engineer, on Feb 6, 1990, no buildings have been renovated. DEH office has chosen three buildings for us to survey. One of each style of house present was chosen.

No dust sample taken in Kitchen because there is no dust^{vent} in Kitchen area. There is a worn, split expansion joint on furnace.

ACTIVITY CHECKLIST

Interviews Completed	<u>No</u>	Number of Samples	<u>14</u>
Drawings Reviewed	<u>No</u>	Survey Form Completed	<u>Yes</u>
Drawings Attached	<u>Yes</u>	Site Log Completed	<u>Yes</u>
Visual Inspection	<u>Yes</u>	Chain-of-Custody Initiated	<u>Yes</u>
Number of Photos	<u>0</u>	Exp. Assess. Form Init.	<u>Yes</u>
Q.A. Check ☒	SIGNATURE <u>Michael Skotnicki</u>	DATE <u>21 MAR 90</u>	dd mm yy

ASBESTOS SURVEY DATA

0613

BLDG. NO.: L1115
 INSTALLATION U1210
 TASK TEAM MEMBERS
Rolf Frya
Michael Kintley

W.O. No. 2104-13-01
 CLIENT: ARGONNE NATIONAL LAB

BLDG. NAME: Family Housing L-15
 BLDG. DESCRIPTION: Capehart Style

DATE (dd/mm/yy): 20/02/90
 TIME ARRIVED: 0835

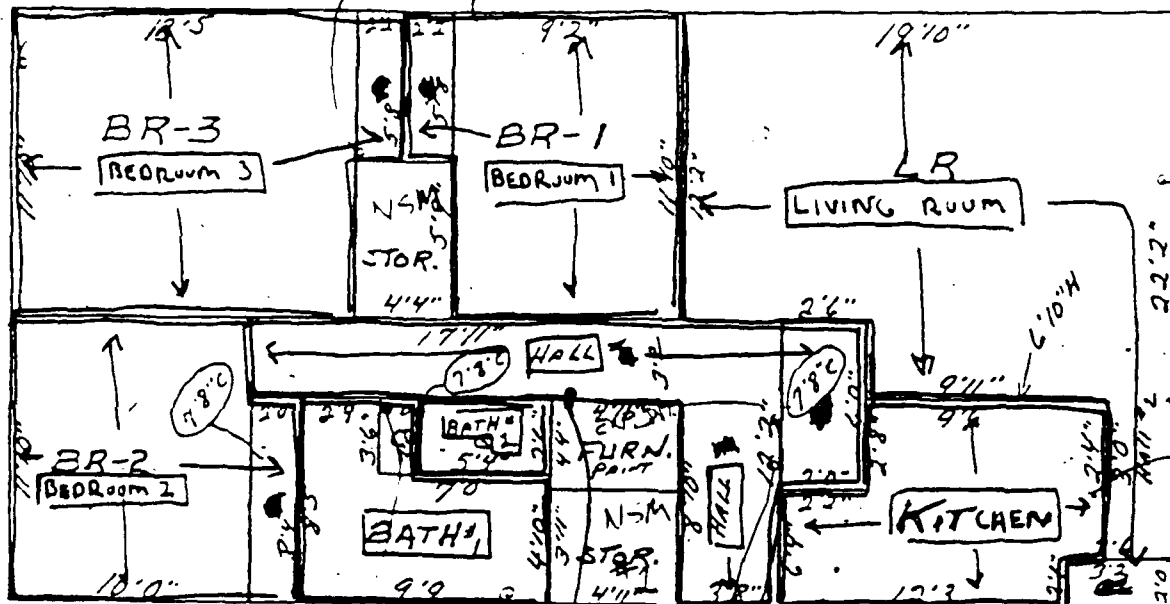
ITEM NO.	LAB SAMPLE NO.	BASE NO.	STATE	UNIT NO.	SAMPLE CODE	AREA	QUANTITY	PHOTO	E.A. FORM NO.	NOTES
1.	B100115-210-WA-L115-AFIT					LIVING ROOM	5915		1123A	0.1
2.	B100116-210-WA-L115-AFIT					KITCHEN	1712		1123B	0.2
3.	B100117-210-WA-L115-AFIT					HALL	1110		1123C	0.3
4.	B100118-210-WA-L115-AFIT					BATHROOM	1616		1123D	0.4
5.	B100119-210-WA-L115-AFIT					BEDROOM	1110		1123E	0.5
6.	B100120-210-WA-L115-AFIT					BEDROOM	1110		1123F	0.6
7.	B100121-210-WA-L115-AFIT					HALL	1111		1123A	0.7
8.	B100122-210-WA-L115-AFIT					BEDROOM	1311		1111	0.8
9.	B100123-210-WA-L115-AFIT					BATHROOM	1111		1111	0.9
10.	B100124-210-WA-L115-AFIT					KITCHEN	1111		1111	0.8
11.	B100125-210-WA-L115-AFIT					LIVING ROOM	1111		1111	0.8
12.	1111-1-1-1-1-1-1					NITROGEN BLENDED	1111		1111	0.1

NOTE NO.	NOTES/REMARKS/COMMENTS/DETAILS/OTHER MATERIALS, QUANTITY, ETC.
01	Green 9" x 9" floor tile. Occurs also in Hall, Bedroom 2
02	White tiled flooring (linoleum)
03	Green 12" x 12" floor tile cut into 4" x 12" strips under sliding doors. Also occurs in Living Room
04	Gray 9" x 9" floor tile. Occurs also in Bathroom 2
05	Light brown 12" x 12" floor tile
06	Tan 12" x 12" floor tile
07	Brown 12" x 12" floor tile. In 4" x 12" strip under closet door.
08	Dust sample taken inside floor duct
09	There is a worn cloth expansion joint in Furnace Room. Also inside walls and ceilings are covered by a granular spray-on material. Not sampled

TECHNICIAN SIGNATURE Michael Kintley

QUALITY ASSURANCE SIGNATURE Michael Skotnicki

Youngs Luke



Closets were included with room area adjacent to it.

Housing type
L-15

mirror image.

SITE SURVEY LOG

CLIENT Argonne National Labs WESTON WORK ORDER NO. 2104-13-01
 FACILITY/BLDG. NO. Youngs Lake Family Housing, L-5
 FACILITY CONTACT Bobby E Lewis TELEPHONE NUMBER (206) 967-4512
 TECHNICIAN NAME Michael Kindley SIGNATURE Michael Kindley
 TECHNICIAN NAME Rolf Erga SIGNATURE Rolf Erga
 TIME ARRIVED 0742 TIME DEPARTED 1010 DATE 20 Feb 90
 dd mm yy

SPECIFIC SITE ACTIVITIES, COMMENTS, INTERVIEW RESULTS & BRIEF DESCRIPTION OF FACILITY

Building is a three-bedroom Capehart style house. It has one-story, wood frame, concrete foundation, with vinyl floor tile and plaster board walls. Walls and ceiling are covered by a granular spray-on type paint.

No pipe insulation was found in building. All pipes were bare.

A wooden cloth expansion joint was found on the furnace unit.

There is no transite on outside walls.

There is a tar and gravel roof.

No dust sample taken in Kitchen. No dust ^{vent} in this area.

ACTIVITY CHECKLIST

Interviews Completed No Number of Samples 6
 Drawings Reviewed No Survey Form Completed Yes
 Drawings Attached Yes Site Log Completed Yes
 Visual Inspection Yes Chain-of-Custody Initiated Yes
 Number of Photos 0 Exp. Assess. Form Init. Yes
 Q.A. Check ☒ SIGNATURE Michael Skotnicki DATE 21 MAR/90
 dd mm yy

0617

W.O. No. 2104-13-01

CLIENT: ARGONNE NATIONAL LAB

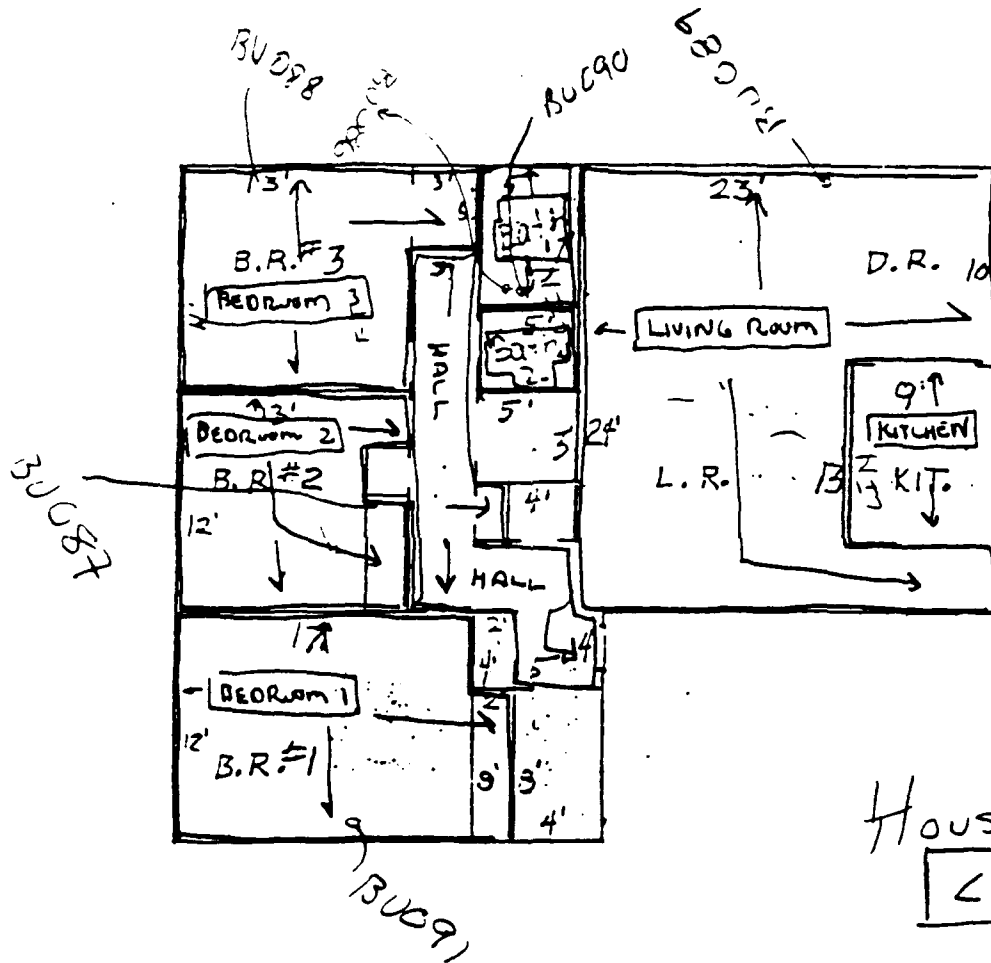
DATE (dd/mm/yy): 20/02/90

TIME ARRIVED: 0 1 1 2

NOTE NO.	NOTES/REMARKS/COMMENTS/DETAILS/OTHER MATERIALS, QUANTITY, ETC.
01	Light green rolled flooring (linoleum). Also covers in Bathroom 2 and Kitchen.
02	Tan 12" x 12" floor tile. Also covers in Bedroom 1, Bedroom 3, Hall, Living Room, and Closets. Closets are considered part of the room in which ^{they} are occur.
03	Dust sample taken in floor dust.
04	Expansion joint on furnace. Granular spray-on paint on inside walls and ceilings. Not sampled.

Michael Skotnicki

Younis Lake



Housing Type
L-5

L-5

PETERS EDWARD A
362-1464 Dty
277-1464 hm

#49

SITE SURVEY LOG

CLIENT Argonne National Labs WESTON WORK ORDER NO. 2104-13-01
 FACILITY/BLDG. NO. Young Lake Family Housing, Unit L11
 FACILITY CONTACT Bobby E. Lewis TELEPHONE NUMBER (200) 907-7512
 TECHNICIAN NAME Michael Kindley SIGNATURE Michael Kindley
 TECHNICIAN NAME Rolf Esja SIGNATURE Rolf Esja
 TIME ARRIVED 1015 TIME DEPARTED 1050 DATE 20 Feb 90
 dd mm yy

SPECIFIC SITE ACTIVITIES, COMMENTS, INTERVIEW RESULTS & BRIEF DESCRIPTION OF FACILITY

Building is a two-bedroom Capehart-style house. It is one-story with
 wood frame, concrete foundation, vinyl floor tile and plaster board
 walls. Inside walls and ceilings are covered by a granular, spray-on
 paint. There is a wooden expansion joint on furnace unit.

There isn't any pipe insulation in the building. All pipes are bare.
 Closets are included with the area of the rooms in which they
 occur.

No carport (garage) or transite siding.

Tar and gravel roof.

* Mr. Esja and I walked around the whole housing complex and could
 find no garages or carports with transite siding.

No dust sample taken in Kitchen. No dust ^{vent} in this area.

ACTIVITY CHECKLIST

Interviews Completed	<u>No</u>	Number of Samples	<u>11</u>
Drawings Reviewed	<u>No</u>	Survey Form Completed	<u>Yes</u>
Drawings Attached	<u>Yes</u>	Site Log Completed	<u>Yes</u>
Visual Inspection	<u>Yes</u>	Chain-of-Custody Initiated	<u>Yes</u>
Number of Photos	<u>0</u>	Exp. Assess. Form Init.	<u>Yes</u>
Q.A. Check ☒	SIGNATURE <u>Michael Skofrichi</u>	DATE <u>21 MAR/90</u>	
		dd mm yy	

ASBESTOS SURVEY DATA

0651

BLDG. NO.: L1111
 INSTALLATION 01210

TASK TEAM MEMBERS

R. L. Engle
Michael Kendrick

W.O. No. 2104-13-01
 CLIENT: ARGONNE NATIONAL LAB

BLDG. NAME: Family Housing L11
 BLDG. DESCRIPTION: Capehart Style

DATE (dd/mm/yy): 20/02/90
 TIME ARRIVED: 1015

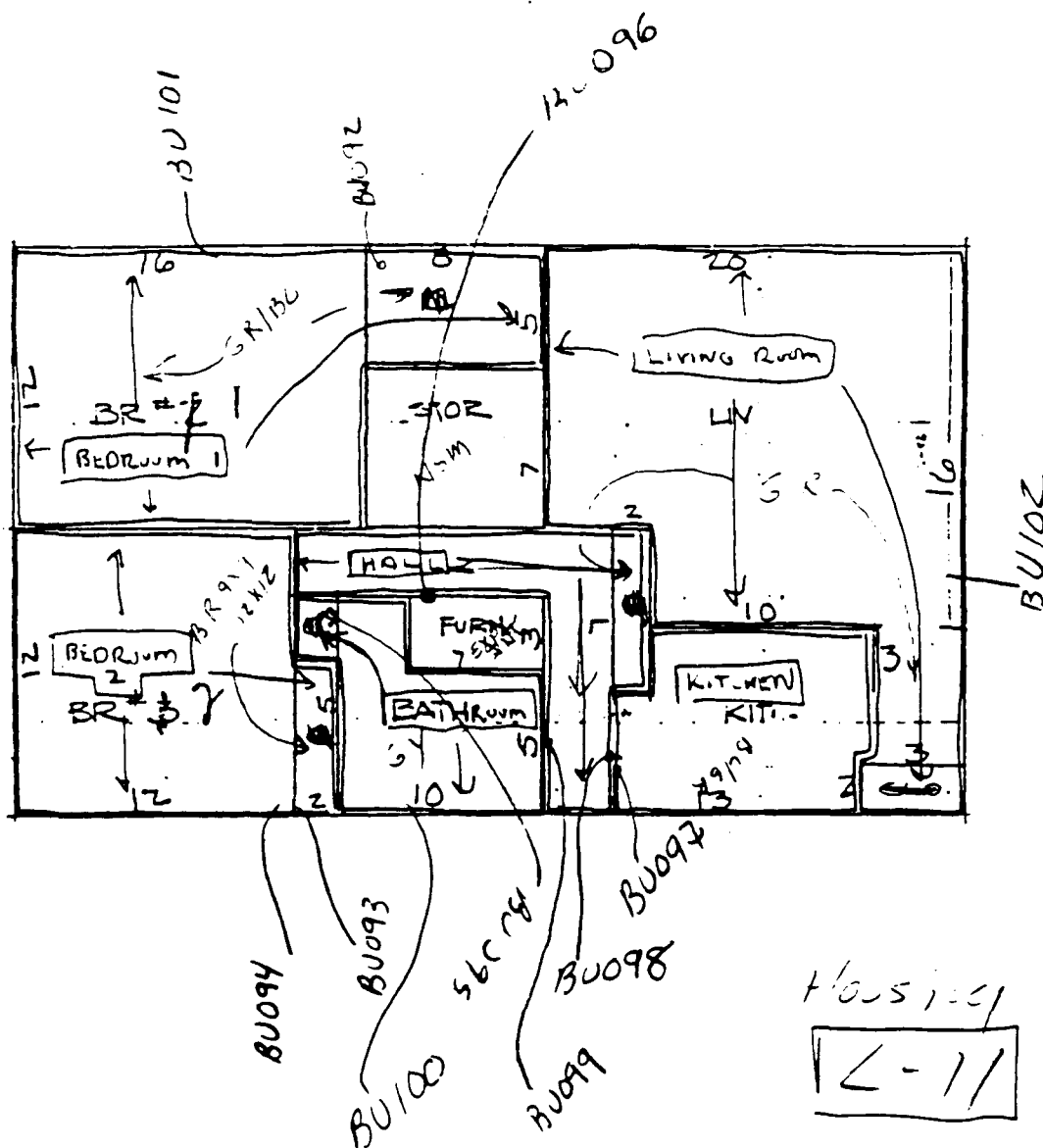
ITEM NO.	LAB SAMPLE NO.	BASE NO.	STATE	UNIT NO.	SAMPLE CODE	AREA	QUANTITY	PHOTO	E.A. FORM NO.	NOTES
1.	B100112-240-WA-L111-AFIT					BEDROOM 11	2100	-	111231D	0.1
2.	B100113-240-WA-L111-AFIT					BEDROOM 12	1154	-	111231E	0.2
3.	B100114-240-WA-L111-AFIT					BEDROOM 14	1118	-	111231F	0.2
4.	B100115-240-WA-L111-AFIT					BEDROOM 15	1165	-	111231A	0.1
5.	B100116-240-WA-L111-AFIT					HALL	1110	-	111241B	0.5
6.	B100117-240-WA-L111-AFIT					KITCHEN	1100	-	111241C	0.6
7.	B100118-240-WA-L111-AFIT					HALL	1340	-	111241D	0.7
8.	B100119-240-WA-L111-AFIT					HALL		-		0.8
9.	B100120-240-WA-L111-AFIT					BEDROOM 11		-		0.8
10.	B100121-240-WA-L111-AFIT					BEDROOM 11		-		0.8
11.	B100122-240-WA-L111-AFIT					LIVING ROOM		-		0.8
12.	1111-1-1-1-1-1-1					NOTED		-		0.9

NOTE NO.	NOTES/REMARKS/COMMENTS/DETAILS/OTHER MATERIALS, QUANTITY, ETC.
01	Green 9" x 9" floor tile with black and white streaks
02	Brown 9" x 9" floor tile
03	Brown 12" x 12" floor tile. Under closet sliding door.
04	Gray 9" x 9" floor tile
05	Green 12" x 12" floor tile. Under closet sliding doors
06	Green 9" x 9" floor tile. Slightly different shade of green than that tile in Bedroom 1
07	Green 9" x 9" floor tile. Slightly different shade of green than that taken in Bedroom 1 and Kitchen. Also under Living Room.
08	Dust sample taken in ducts.
09	Expansion joint on furnace. Granular, textured paint on walls and ceiling. Not as thick as in other houses, tho. Not sampled.

TECHNICIAN SIGNATURE Michael Kendrick

QUALITY ASSURANCE SIGNATURE Michael Skutnicki

Yours, Luke



L-11

FRETSCHER SHARON

#53

383-3577 2*7

229-5166 km

APPENDIX A.2. LABORATORY DATA, ASBESTOS SAMPLES

BULK SAMPLE ANALYSIS SUMMARY

Weston W.O. No. 2104-13-01-0000

Sample Number BU075 through Sample BU098

AO LAB ID NO	CLIENT/CLIENT ID	LOCATION	MATERIAL DESCRIPTION *	DATE RECEIVED	RESULTS **					LAYERS	ANALYST
					CH	AM	CR	OT	TL		
BU075	20-WA-L15-AFT	LIVNRM	NF, GR, 9X9 FT	02/22/90	3	ND	ND	ND	3	No	06071
BU076	20-WA-L15-AFT	KITCHN	NF, WH, LINOLEUM	02/22/90	ND	ND	ND	ND	ND	No	06071
BU077	20-WA-L15-AFT	HALL	NF, GR, 12X12 FT	02/22/90	ND	ND	ND	ND	ND	No	06071
BU078	20-WA-L15-AFT	BATHRM	NF, GY, 9X9 FT	02/22/90	10	ND	ND	ND	10	No	06071
BU079	20-WA-L15-AFT	BEDRM3	NF, BR, 12X12 FT	02/22/90	12	ND	ND	ND	12	Yes	06071
BU080	20-WA-L15-AFT	BEDRM1	NF, TN, 12X12 FT	02/22/90	ND	ND	ND	ND	ND	No	06071
BU081	20-WA-L15-AFT	HALL	NF, BR, 12X12 FT	02/22/90	ND	ND	ND	ND	ND	No	06071
BU086	20-WA-L05-AFT	BATHRM	NF, GR, LINOLEUM	02/22/90	25	ND	ND	ND	25	Yes	06071
BU087	20-WA-L05-AFT	BEDRM2	NF, TN, 12X12 FT	02/22/90	ND	ND	ND	ND	ND	No	07323
BU092	20-WA-L11-AFT	BEDRM1	NF, GR, 9X9 FT	02/22/90	7	ND	ND	ND	7	Yes	07323
BU093	20-WA-L11-AFT	BEDRM2	NF, BR, 9X9 FT	02/22/90	13	ND	ND	ND	13	Yes	07323
BU094	20-WA-L11-AFT	BEDRM2	NF, BR, 12X12 FT	02/22/90	ND	ND	ND	ND	ND	No	07323
BU095	20-WA-L11-AFT	BATHRM	NF, GY, 9X9 FT	02/22/90	7	ND	ND	ND	7	Yes	07323
BU096	20-WA-L11-AFT	HALL	NF, GR, 12X12 FT	02/22/90	1	ND	ND	ND	1	No	07323
BU097	20-WA-L11-AFT	KITCHN	NF, GR, 9X9 FT	02/22/90	10	ND	ND	ND	10	Yes	07323
BU098	20-WA-L11-AFT	HALL	NF, GR, 9X9 FT	02/22/90	10	ND	ND	ND	10	Yes	07323

* MATERIAL DESCRIPTION	FRIABLE ¹	COLOR ²		SYSTEM ³
Friable ¹ , Color ² , System ³ , Type	F - Friable NF - Non-Friable	BK - Black BL - Blue BR - Brown GR - Green GY - Gray	RD - Red TN - Tan WH - White YL - Yellow	CHW - Chilled Water DOM - Domestic Water HHW - Heating Hot Water STM - Steam UNK - Unknown
** RESULTS				
CH - Chrysotile AM - Amosite CR - Crocidolite	OT - Other TL - Total			

Upon issue, this report may be reproduced only in full.

All analyses are performed in accordance with the methods set forth in U.S. EPA 600/M4-82-020, as amended. Weston's Optical Microscopy Laboratory is accredited by the National Institute of Standards and Technology's National Voluntary Laboratory Accreditation Program for asbestos fiber analysis (Laboratory Code 1254).



ROY F WESTON, INC.
1635 PUMPHREY AVE.
AUBURN, AL 36830
PHONE: (205) 826-6100
FAX: (205) 826-8232

Transmission Electron Microscopy
Asbestos Summary Report

Client: Argonne National Laboratories Weston W.O. No.: 2104-13-01-0000

Sample Type(s): Dust and Floor Tiles Sampling Location: Youngs Lake

QUALITATIVE ANALYSIS

FLOOR TILES: A 0.5 to 2.0 gram portion of each floor tile sample was ultrasonically disaggregated in four milliliters of deionized, 0.2 μ m membrane filtered water. After the coarse fraction settled, a drop of the suspended, clay-sized fraction was placed on a Formvar coated 200 mesh Cu TEM grid and allowed to dry. The grid was carbon coated for thermal stability in the electron beam and examined with a Philips CM12 transmission electron microscope operating at 120 kilovolts accelerating voltage.

DUST WIPE SAMPLES: A generous loading of dust was collected on a pre-wetted, 25 square centimeter section of a cleanroom wipe. The wipe was placed in a two ounce wide mouth collection vial and returned to the laboratory. Ten to fifteen milliliters of filtered, deionized water was added to suspend the dust. The suspension was ultrasonically dispersed and the coarse fraction was allowed to settle. A drop of the suspension was placed on a Formvar coated 200 mesh Cu TEM grid and allowed to dry. The grid was carbon coated as above and examined by transmission electron microscopy at 120 kilovolts accelerating voltage.

ANALYTICAL RESULTS

SAMPLE IDENTIFICATION

RESULTS

BU076-20-WA-L15-AFT	Positive
BU077-20-WA-L15-AFT	Positive
BU080-20-WA-L15-AFT	Positive
BU081-20-WA-L15-AFT	Positive
BU082-20-WA-L15-ATD	Positive
BU083-20-WA-L15-ATD	Positive



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ANALYTICAL RESULTS
(continued)

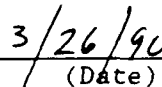
SAMPLE IDENTIFICATION

RESULTS

BU084-20-WA-L15-ATD	Positive
BU085-20-WA-L15-ATD	Positive
BU087-20-WA-L05-AFT	Positive
BU088-20-WA-L05-ATD	Positive
BU089-20-WA-L05-ATD	Positive
BU090-20-WA-L05-ATD	Positive
BU091-20-WA-L05-ATD	Positive
BU094-20-WA-L11-AFT	Positive
BU099-20-WA-L11-ATD	Positive
BU100-20-WA-L11-ATD	Positive
BU101-20-WA-L11-ATD	Positive
BU102-20-WA-L11-ATD	Positive



Approved for Transmittal)


(Date)

- * This test report relates only to the specific items tested.
- ** These sample results may only be reproduced in full, and are valid only if approved for transmittal.

APPENDIX B.1. FIELD DATA, AIRBORNE ASBESTOS SAMPLING

12 April 1990

Notes by Bruce Ferguson

Project: Argonne National Laboratories

Dust & Air Sampling from Housing Units

Work Order No. 2104-13-01-0040

- 02-000/

Went to Ft. Lewis Housing Unit and met with Mr. Bob Lewis. We reviewed the vacant units that we could test and the midway complex and the Young's Lake complex. None of the units that we had sampled previously were vacant. We randomly selected one of the vacant units in each complex. They gave us keys to the units and we departed.

Larry Si and I arrived at the Midway complex at approximately 9:45 a.m. We got the equipment and calibrated all of the pumps. We started sampling at approximately 10:25.

A sketch of the housing unit M-18 was prepared to locate the registers. We removed the grill and inserted the sampling cassette at the opening of each register. The sample I.D.'s and register locations are shown on the sketch.

At beginning the sampling, the ambient temperature in the room was approximately 50°. It was necessary to turn the heat on to make air flow (There was no fan setting on the thermostat). At the end of the sampling period the temperature in the room was approximately 82°.

Throughout the sampling, the doors and windows were kept closed. The unit heated during the entire sampling period and flow was present in each of the ducts.

The sampling was terminated at approximately 1:00 p.m. Post calibration was performed on each pump and we departed the location.

I arrived at the Young's Lake complex at approximately 2:00 p.m. The sign at the entrance to the complex actually identifies it as Nike Manor. I used the post calibration from the Midway testing and set-up the pumps.

I prepared a sketch of the house and noted the registers that which I sampled. Sampling began at approximately at 2:15 p.m. The ambient temperature at the beginning of the sampling was approximately 65° in the building. After the heater had been on for the duration of the sampling, the temperature was approximately 82°.

All sampling proceeded smoothly. At the completion of the sampling time (approximately 16:30) I recalibrated all pumps, calculated the data and departed the site.

AIR MONITORING DATA

CLIENT Argonne National Labs WORKER ORDER NUMBER 2104-13-01-0040
 PROJECT LOCATION Young's Lake
 WORK AREA ID NO Living Room End wall Right Hand Register SAMPLE NO 4-10-A

SAMPLE TYPE

PERSONNEL

NAME

☒ AMBIENT

WORK AREA

LOCATION

DATE

☒ Duct

CLEARANCE

APPROVAL

CLEARANCE

INITIAL

DATE

OTHER

TASK NAME

SEE ADDITIONAL PAGE

SAMPLE DATA

ANALYST K

INSTRUMENT AC99 A+B

TIME 3 9.5 9.2

TIME 4 9.0 1398

1413

1641

152

B Ferguson

4/12/90

ANALYTICAL DATA

ANALYST

DATE

TIME

INSTRUMENT

LOCATION

WORK AREA

DATE

TIME

INSTRUMENT

LOCATION

WORK AREA

DATE

TIME

INSTRUMENT

LOCATION

WORK AREA

DATE

TIME

INSTRUMENT

LOCATION

WORK AREA

DATE

TIME

INSTRUMENT

LOCATION

WORK AREA

DATE

TIME

INSTRUMENT

LOCATION

WORK AREA

TEMP

1	2	3	4	5	6	7	8	9	10
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									

NOTES SKETCHES REMARKS

See master sketch

AIR MONITORING DATA

CLIENT Argonne National Labs WORKER ORDER NUMBER 2104-13-01-0040
 PROJECT LOCATION Young's Lake
 WORK AREA ID NO. Living Room Back wall Right Hand Register SAMPLE NO L-10-B

SAMPLE TYPE

PERSONNEL

NAME

TASK

☒ AMBIENT

☐ WORK AREA

☐ AIR DUCT, H.V.

☐ BACKLASH

☒ OTHER Duct

☐ CLEAN AREA

☐ AIR DUCT, H.V.

CLEARANCE

☐ TOTAL

☐ FINAL

☐ TEST

☐ TWA SAMPLE

☐ BEYOND FINAL

SAMPLE DATA

PUMPING FA mm

500

☒ OFF

PUMP ID

AC 70 A+B

1414

1643

151

B. Ferguson

4/12/90

PUMP Ca In/a

3

11.0

11.0

PUMP Ca F/a

4

11.0

1661

ANALYTICAL DATA

ANALYST

DATE

TIME

LOCATION

ANALYST

DATE

TIME

LOCATION

BOD (FA)

VAL (MFA) 1000

DL 10 fibers 100 fields

These data reported results were obtained when the sample was analyzed in accordance with NIOSH 7400

TEAM

NOTES SKETCHES REMARKS

See master sketch

AIR MONITORING DATA

CLIENT Argonne National Labs WORKER ORDER NUMBER 2404-13-01-0040
 PROJECT LOCATION Young's Lake
 WORK AREA ID NO Bedroom 1 End wall only Register SAMPLE NO L-10-C

SAMPLE TYPE	☒ AMBIENT ☐ WORK AREA ☐ ADJACENT ROOM ☐ CLEAN ROOM ☐ AFD EXHAUST ☐ OTHER	CLEARANCE INITIAL ONAL RECORD OTHER TWO SAMPLE SEE ADDITIONAL
PERSONNEL DATE TIME	Duct	

SAMPLE DATA			
MFC <u>AC 78 AYB</u> MFC <u>3 9.0 8.8</u> MFC <u>4 9.6 1329</u>	<u>1416</u> <u>1645</u> <u>151</u> <u>B. Ferguson</u> <u>4/12/90</u>		

ANALYTICAL DATA																																																																																																																										
ANALYST DATE TIME LOCATION METHOD EQUIPMENT RESULTS COMMENTS	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td></td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> <td style="text-align: center;">4</td> <td style="text-align: center;">5</td> <td style="text-align: center;">6</td> <td style="text-align: center;">7</td> <td style="text-align: center;">8</td> <td style="text-align: center;">9</td> <td style="text-align: center;">10</td> </tr> <tr><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>2</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>4</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>5</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>6</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>7</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>8</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>9</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>10</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table>		1	2	3	4	5	6	7	8	9	10	1											2											3											4											5											6											7											8											9											10										
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NOTES SKETCHES REMARKS
See Master Drawing Bedroom 1 is Front Bedroom

AIR MONITORING DATA

CLIENT Argonne National Labs WORKER ORDER NUMBER 2104-13-01-0040
PROJECT LOCATION Young's Lake
WORK AREA ID NO Bedroom 2, Back wall only Register SAMPLE NO L-10-D

SAMPLE TYPE		1. AMBIENT	2. CLEARANCE
PERSONNEL	WORK AREA	CLEAR ROOM	INITIAL
	ADJACENT ROOM	RECEIVING	FINAL
	BASEMENT		OTHER
	OTHER		UNCLASSIFIED
			SECRET

SAMPLE DATA				1416	1647	149
AC	80	A ^X B		B. Ferguson		4/12/90
	3	10.5	10.5			
	4	10.5	1564			

[illegible]

NOTES SKETCHES REMARKS

see master sketch

Bedroom 2 is Back Bedroom by No 1

AIR MONITORING DATA

CLIENT Argonne National Lab WORKER ORDER NUMBER 2104-13-01-0040
 PROJECT LOCATION Youngs Lake Complex
 WORK AREA ID NO outside by back door SAMPLE NO L-10-E

SAMPLE TYPE

☒ AMBIENT
☐ WORK AREA
☐ CLEAN ROOM
☐ ADJACENT TO
☐ AFTER EXHAUST
☐ CLEARANCE
☐ INITIAL
☐ FINAL
☐ OTHER
☒ OTHER outside

SAMPLE DATA

PUMP NO. 355 ☒ USE
 PUMP ID AC97 A+B
 PUMP RATE 3 11.0 10.8
 PUMP RATE 4 10.5 1609
 1417 1648 149
B. Ferguson 4/12/90

ANALYTICAL DATA

ANALYST _____

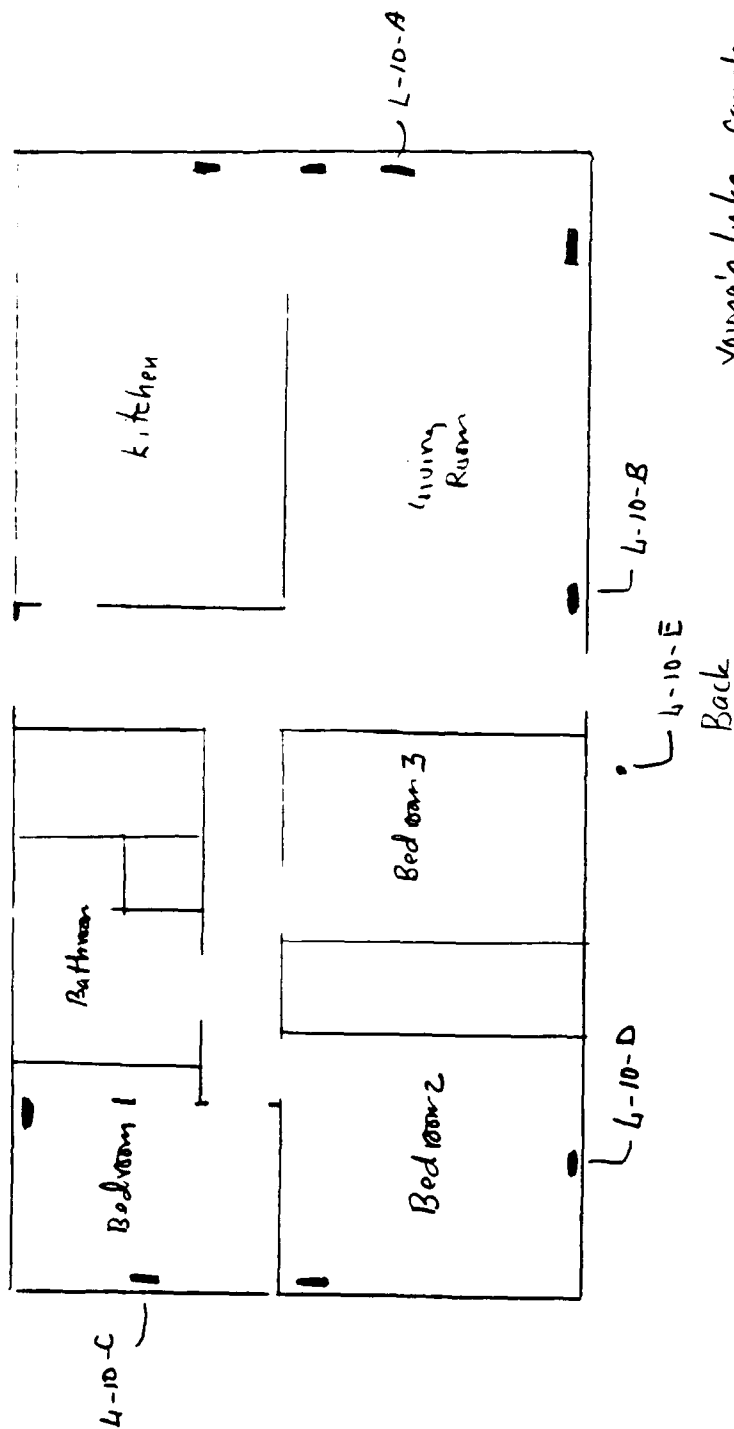
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2										
3										
4										
5										
6										
7										
8										
9										
10										

TEM 10.5
 BOLLER 1000
 CL 10 fibers 100 fields
 The above reported results were obtained when the sample was analyzed in accordance with NIOSH 7400

NOTES SKETCHES REMARKS

See master sketch

Front



Young's Lake Complex

Unit L-10

■ Floor Register

sample 10 as for Dust and Air

APPENDIX B.2. LABORATORY DATA, AIRBORNE ASBESTOS SAMPLING



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TRANSMISSION ELECTRON MICROSCOPY
ASBESTOS ANALYSIS REPORT

Client: ARGONNE
Client Sample ID: L-10-A

Weston W.O. No.: 2104-13-02-0000
Weston Sample ID No.: EE867

Received by: Barry Rayfield
Analyzed by: Greg Hall

Date Received: 04/13/90
Date Analyzed: 04/16/90

Filter Type: 0.45 μ m, 25 mm, MEC
Number of Grids Examined: 2
Average Grid Square Area: 0.0088 mm²
Sample Volume: 1398.0 liters
EPA Analysis: AHERA

Filter Area: 385 mm²
Number of Grid Squares Examined: 7
Total Area Examined: 0.0616 mm²
Detection Limit: 0.004 fibers/cc
Grid Archive No.: 0219-A-6,7

ANALYTICAL RESULTS

	Chrysotile		Amphiboles		Ambiguous	Non-Asbestos
	<5 μ m	$\geq$ 5 μ m	<5 μ m	$\geq$ 5 μ m		
Number of Fibers Analyzed:	0	0	0	0	0	1
Number of Bundles Analyzed:	0	0	0	0	0	0
Number of Clusters Analyzed:	0	0	0	0	0	0
Number of Matrices Analyzed:	0	0	0	0	0	0

SUMMARY

Concentration of Asbestos Structures < 5 μ m in length: ND (structures/cc)
Concentration of Asbestos Structures $\geq$ 5 μ m in length: ND (structures/cc)
Concentration of Asbestos Structures < 5 μ m in length: ND (structures/mm²)
Concentration of Asbestos Structures $\geq$ 5 μ m in length: ND (structures/mm²)
Total Concentration of Asbestos Structures ND (structures/cc)
Total Concentration of Asbestos Structures ND (structures/mm²)

Comments:


(Approved for Transmittal)

April 23, 1990
(Date)

This test report relates only to the specific items tested.



ROY F. WESTON, INC.
1635 PUMPHREY AVE.
AUBURN, AL 36830
PHONE: (205) 826-6100
FAX: (205) 826-8232

TRANSMISSION ELECTRON MICROSCOPY
ASBESTOS ANALYSIS REPORT

Client: ARGONNE
Client Sample ID: L-10-B

Weston W.O. No.: 2104-13-02-0000
Weston Sample ID No.: EE868

Received by: Barry Rayfield
Analyzed by: Greg Hall

Date Received: 04/13/90
Date Analyzed: 04/16/90

Filter Type: 0.45 μ m, 25 mm, MEC
Number of Grids Examined: 2
Average Grid Square Area: 0.0088 mm²
Sample Volume: 1661.0 liters
EPA Analysis: AHERA

Filter Area: 385 mm²
Number of Grid Squares Examined: 6
Total Area Examined: 0.0528 mm²
Detection Limit: 0.004 fibers/cc
Grid Archive No.: 0219-A-9,10

ANALYTICAL RESULTS

	<u>Chrysotile</u>		<u>Amphiboles</u>		<u>Ambiguous</u>	<u>Non-Asbestos</u>
	<u><5μm</u>	<u>$\geq$5μm</u>	<u><5μm</u>	<u>$\geq$5μm</u>		
Number of Fibers Analyzed:	0	0	0	0	0	0
Number of Bundles Analyzed:	0	0	0	0	0	0
Number of Clusters Analyzed:	0	0	0	0	0	0
Number of Matrices Analyzed:	0	0	0	0	0	0

SUMMARY

Concentration of Asbestos Structures < 5 μ m in length: ND (structures/cc)

Concentration of Asbestos Structures $\geq$ 5 μ m in length: ND (structures/cc)

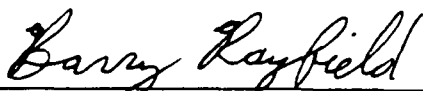
Concentration of Asbestos Structures < 5 μ m in length: ND (structures/mm²)

Concentration of Asbestos Structures $\geq$ 5 μ m in length: ND (structures/mm²)

Total Concentration of Asbestos Structures ND (structures/cc)

Total Concentration of Asbestos Structures ND (structures/mm²)

Comments: One matrix with a non-emergent chrysotile fiber was identified.


(Approved for Transmittal)

April 23, 1990
(Date)

This test report relates only to the specific items tested.



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TRANSMISSION ELECTRON MICROSCOPY
ASBESTOS ANALYSIS REPORT

Client: ARGONNE
Client Sample ID: L-10-C

Weston W.O. No.: 2104-13-02-0000
Weston Sample ID No.: EE869

Received by: Barry Rayfield
Analyzed by: Greg Hall

Date Received: 04/13/90
Date Analyzed: 04/16/90

Filter Type: 0.45 μ m, 25 mm, MEC
Number of Grids Examined: 2
Average Grid Square Area: 0.0088 mm²
Sample Volume: 1329.0 liters
EPA Analysis: AHERA

Filter Area: 385 mm²
Number of Grid Squares Examined: 7
Total Area Examined: 0.0616 mm²
Detection Limit: 0.005 fibers/cc
Grid Archive No.: 0219-B-8,9

ANALYTICAL RESULTS

	<u>Chrysotile</u>		<u>Amphiboles</u>		Ambiguous	Non-Asbestos
	<5 μ m	$\geq$ 5 μ m	<5 μ m	$\geq$ 5 μ m		
Number of Fibers Analyzed:	0	0	0	0	0	0
Number of Bundles Analyzed:	0	0	0	0	0	0
Number of Clusters Analyzed:	0	0	0	0	0	0
Number of Matrices Analyzed:	0	0	0	0	0	0

SUMMARY

Concentration of Asbestos Structures < 5 μ m in length: ND (structures/cc)
Concentration of Asbestos Structures $\geq$ 5 μ m in length: ND (structures/cc)
Concentration of Asbestos Structures < 5 μ m in length: ND (structures/mm²)
Concentration of Asbestos Structures $\geq$ 5 μ m in length: ND (structures/mm²)
Total Concentration of Asbestos Structures ND (structures/cc)
Total Concentration of Asbestos Structures ND (structures/mm²)

Comments:


(Approved for Transmittal)

April 23, 1990
(Date)

This test report relates only to the specific items tested.



ROY F WESTON, INC.
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TRANSMISSION ELECTRON MICROSCOPY
ASBESTOS ANALYSIS REPORT

Client: ARGONNE
Client Sample ID: L-10-D

Weston W.O. No.: 2104-13-02-0000
Weston Sample ID No.: EE870

Received by: Barry Rayfield
Analyzed by: Greg Hall

Date Received: 04/13/90
Date Analyzed: 04/16/90

Filter Type: 0.45 μ m, 25 mm, MEC
Number of Grids Examined: 2
Average Grid Square Area: 0.0088 mm²
Sample Volume: 1564.0 liters
EPA Analysis: AHERA

Filter Area: 385 mm²
Number of Grid Squares Examined: 6
Total Area Examined: 0.0528 mm²
Detection Limit: 0.005 fibers/cc
Grid Archive No.: 0219-B-10,C-7

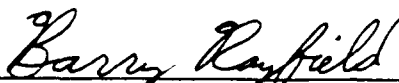
ANALYTICAL RESULTS

	<u>Chrysotile</u>		<u>Amphiboles</u>		Ambiguous	Non-Asbestos
	<5 μ m	$\geq$ 5 μ m	<5 μ m	$\geq$ 5 μ m		
Number of Fibers Analyzed:	0	0	0	0	0	0
Number of Bundles Analyzed:	0	0	0	0	0	0
Number of Clusters Analyzed:	0	0	0	0	0	0
Number of Matrices Analyzed:	0	0	0	0	0	0

SUMMARY

Concentration of Asbestos Structures < 5 μ m in length: ND (structures/cc)
Concentration of Asbestos Structures $\geq$ 5 μ m in length: ND (structures/cc)
Concentration of Asbestos Structures < 5 μ m in length: ND (structures/mm²)
Concentration of Asbestos Structures $\geq$ 5 μ m in length: ND (structures/mm²)
Total Concentration of Asbestos Structures ND (structures/cc)
Total Concentration of Asbestos Structures ND (structures/mm²)

Comments:


(Approved for Transmittal)

April 23, 1990
(Date)

This test report relates only to the specific items tested.



ROY F WESTON, INC
1635 PUMPHREY AVE
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TRANSMISSION ELECTRON MICROSCOPY
ASBESTOS ANALYSIS REPORT

Client: ARGONNE
Client Sample ID: L-10-A

Weston W.O. No.: 2104-13-02-0000
Weston Sample ID No.: WG478

Received by: Barry Rayfield
Analyzed by: Barry Rayfield

Date Received: 04/13/90
Date Analyzed: 04/16/90

Sample Type: DUST WIPE

QUALITATIVE ANALYSIS

A generous loading of dust was collected on a pre-wetted, 25 square centimeter section of a cleanroom wipe. The wipe was placed in a two ounce wide mouth collection vial and returned to the laboratory. Ten to fifteen milliliters of 0.2 micrometer filtered, deionized water was added to suspend the dust. The suspension was ultrasonically dispersed and the coarse fraction was allowed to settle. A drop of the suspension was placed on a Formvar coated 200 mesh Cu TEM grid and allowed to dry. The grid was carbon coated for thermal stability in the electron beam and examined by transmission electron microscopy at 120 kilovolts accelerating voltage.

RESULTS

Chrysotile asbestos structures were detected. An electron micrograph (B758), electron diffraction pattern (B757), and energy dispersive spectrum (WG478.eds) were recorded.


(Approved for Transmittal)

April 30, 1990
(Date)

This test report relates only to the specific items tested.



ROY F WESTON, INC.
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PHONE: (205) 826-6100
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TRANSMISSION ELECTRON MICROSCOPY
ASBESTOS ANALYSIS REPORT

Client: ARGONNE
Client Sample ID: L-10-B

Weston W.O. No.: 2104-13-02-0000
Weston Sample ID No.: WG479

Received by: Barry Rayfield
Analyzed by: Barry Rayfield

Date Received: 04/13/90
Date Analyzed: 04/16/90

Sample Type: DUST WIPE

QUALITATIVE ANALYSIS

A generous loading of dust was collected on a pre-wetted, 25 square centimeter section of a cleanroom wipe. The wipe was placed in a two ounce wide mouth collection vial and returned to the laboratory. Ten to fifteen milliliters of 0.2 micrometer filtered, deionized water was added to suspend the dust. The suspension was ultrasonically dispersed and the coarse fraction was allowed to settle. A drop of the suspension was placed on a Formvar coated 200 mesh Cu TEM grid and allowed to dry. The grid was carbon coated for thermal stability in the electron beam and examined by transmission electron microscopy at 120 kilovolts accelerating voltage.

RESULTS

Chrysotile asbestos structures were detected. An energy dispersive spectrum (WG479.eds) was recorded.

Barry Rayfield
(Approved for Transmittal)

April 30, 1990
(Date)

This test report relates only to the specific items tested.



ROY F. WESTON, INC.
1635 PUMPHREY AVE.
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PHONE: (205) 826-6100
FAX: (205) 826-8232

TRANSMISSION ELECTRON MICROSCOPY
ASBESTOS ANALYSIS REPORT

Client: ARGONNE
Client Sample ID: L-10-C

Weston W.O. No.: 2104-13-02-0000
Weston Sample ID No.: WG480

Received by: Barry Rayfield
Analyzed by: Barry Rayfield

Date Received: 04/13/90
Date Analyzed: 04/16/90

Sample Type: DUST WIPE

QUALITATIVE ANALYSIS

A generous loading of dust was collected on a pre-wetted, 25 square centimeter section of a cleanroom wipe. The wipe was placed in a two ounce wide mouth collection vial and returned to the laboratory. Ten to fifteen milliliters of 0.2 micrometer filtered, deionized water was added to suspend the dust. The suspension was ultrasonically dispersed and the coarse fraction was allowed to settle. A drop of the suspension was placed on a Formvar coated 200 mesh Cu TEM grid and allowed to dry. The grid was carbon coated for thermal stability in the electron beam and examined by transmission electron microscopy at 120 kilovolts accelerating voltage.

RESULTS

Chrysotile structures were detected. An energy dispersive spectrum (WG480.eds) was recorded.

Barry Rayfield
(Approved for Transmittal)

April 30, 1990
(Date)

This test report relates only to the specific items tested.



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1635 PUMPHREY AVE.
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TRANSMISSION ELECTRON MICROSCOPY
ASBESTOS ANALYSIS REPORT

Client: ARGONNE
Client Sample ID: L-10-D

Weston W.O. No.: 2104-13-02-0000
Weston Sample ID No.: WG481

Received by: Barry Rayfield
Analyzed by: Barry Rayfield

Date Received: 04/13/90
Date Analyzed: 04/16/90

Sample Type: DUST WIPE

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