



Hazardous / Regulated Materials Survey  
And Inspection Report

of

**328 E. Larch Avenue,  
Muskegon, Michigan 49442**



Prepared for:  
City of Muskegon  
City of Muskegon - Planning Department  
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Muskegon, MI 49440

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Date of Report - 3/21/2018

PSI Project No. 0166-1046-1-5

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## 1 EXECUTIVE SUMMARY

Professional Service Industries, Inc. (PSI), and Intertek company, was retained by City of Muskegon – Planning Department, to conduct a limited survey for asbestos-containing materials (ACM) and regulated or hazardous materials (HAZMATs) inventory at 328 E. Larch Avenue, Muskegon, Michigan 49442.

The subject building is approximately **1,642** square feet (SF) in size and consists of a 2-story structure that was constructed in **1800**. The subject building was unoccupied during the assessment.

The purpose of the limited assessment was to provide information regarding the presence, condition, and estimated quantity of accessible ACMs and HAZMATs located on the subject property at the time of the survey. This survey was conducted in preparation for the upcoming demolition.

The assessment was conducted on **3/6/2018**. A total of **97** samples/layers were collected from **29** suspect asbestos-containing homogeneous materials identified during the assessment. The samples were analyzed by polarized light microscopy (PLM). A material is considered by the U.S. Environmental Protection Agency (EPA), the U.S. Occupational Safety and Health Administration (OSHA) and the State of Michigan to be ACM if PLM results detect greater than one percent (>1%) asbestos.

**Four ACMs (>1% asbestos) were identified through laboratory analysis during this investigation.**

Material Number & Sample Number	Material Description	Adhesive	Material Location	Estimated Quantity
328-3A-B	Roof Flashing (Black)	None	Roof	115 LF
328-19A-C	Paper Duct Wrap (White)	None	Basement/Vents	160 SF
328-20A-B	9"x9" Floor Tile (Brown) w/Adhesive	Positive	Basement	50 SF
328-22A-C	Spray-on Pipe Insulation (Beige)	None	Basement	215 LF



Nine suspected HAZMAT categories were identified through visual observation during this investigation:

Inspection Item	Constituent of Concern	Quantity	Location/Comments
Fire Extinguishers	CFC / HCFC	1	1st Floor Kitchen
Light Ballasts	PCB	1	Basement
Miscellaneous Items (Glue, Solvents, Cleaners, etc.)	Varied	8	Basement, Bathroom,
Paint Cans	Lead	5	Entrance, Kitchen Entrance
Refrigerators / Freezers	CFC / HCFC	1	2nd Floor Kitchen
Smoke Detectors	Mercury/ Radioactive	2	2nd Floor Living Room, Basement
Thermostats	Mercury	1	Basement
Tires	Municipal Solid Waste	4	Entrance, Basement
Fluorescent Light Bulbs	Mercury	3	Basement, 1st Left Bedroom 1st Floor

**Inaccessible areas and observation made during this investigation:**

- None

**Additional issues identified by Inspector:**

- None

This summary does not contain all the information presented in the full report. The report should be read in its entirety to obtain a more complete understanding of the information provided and to aid in any decisions made or actions taken based on this information.



## 2 GENERAL BUILDING AND SURVEY INFORMATION

### 2.1 BUILDING INFORMATION

Subject Property: 328 E. Larch Avenue,  
Muskegon, Michigan 49442

Construction Date: 1800

Number of Floors: 2

Square Footage: Approximately 1,642 Square Feet

Construction Type: Wood Frame w/Vinyl Siding

Building Occupant(s): None

### 2.2 INSPECTION INFORMATION

PSI Inspector(s): Alex R. Sasse

Signature:



State of Michigan Inspector No. A47045

Date(s) of Inspection: 3/6/2018

Report Reviewed By: W. James Boland, PC

Signature:



### 3 FINDINGS

#### 3.1 ASBESTOS RESULTS

A total of **97** samples/layers were collected from **29** suspect homogenous materials during the limited asbestos survey. In addition, several suspect homogeneous materials were observed during the limited asbestos survey but were not sampled, and are assumed to be ACM until sampling and laboratory analysis can be conducted.

The “Report of Bulk Sample Analysis for Asbestos,” the “Asbestos Bulk Sample Log,” Photographs, and Asbestos Glossary are included in the Appendices. Table 1 attached to this report lists the suspect ACMs observed throughout the building that were sampled, along with the results of the inspection and laboratory analysis.

Table 1 provides descriptions of the materials, their general locations, condition, and friability, EPA National Emission Standard for Hazardous Air Pollutants (NESHAP) category, OSHA abatement classification and estimated quantity.

#### 3.2 HAZMAT INSPECTION RESULTS

Nine suspected HAZMAT categories were observed on the subject property as outlined in Table 2. Table 2 lists the component, container, or equipment that is suspected of containing hazardous or regulated substances, the suspected constituent of concern, and the approximate quantity. The items listed in the hazardous materials table can become hazardous during demolition.

The scope of work for this project did not include testing for lead-based paint. Based on the age of the subject structure it is presumed that lead based paints are most likely present in the structure. Although current regulations do not require removal of lead-based paint prior to demolition, PSI recommends testing for airborne lead during demolition activities to ensure that worker exposure does not exceed permissible exposure limits. In addition, PSI recommends avoiding activities that may increase worker exposure to potential airborne lead. Activities that can increase worker exposure include torch cutting, sanding, grinding, cutting, or abrading lead-based painted materials.



## 4 CONCLUSIONS & RECOMMENDATIONS

### 4.1 CONCLUSIONS

Four ACMs were identified on the subject property.

Nine suspected HAZMAT categories were identified on the subject property.

#### Inaccessible Areas / Areas Not Included:

- None

### 4.2 RECOMMENDATIONS

#### ACM

Regulated ACM (RACM) and Category II Non-Friable ACM must be properly removed by a licensed asbestos abatement contractor prior to demolition that would disturb the material. Federal, State and Local regulations and guidelines should be strictly adhered to when removing the ACM.

Category I Non-Friable ACM may often be left in place during demolition if not made friable by cutting, grinding or sanding. If left in place, these materials cannot be recycled or used as clean fill.

Any areas that were noted as being inaccessible during this assessment or any concealed areas, such as behind walls, where suspect ACMs are discovered, will require a survey for ACM.

PSI has provided the regulatory abatement methods as defined by OSHA in Appendix F for each class of work applied to the materials noted in this report. These procedures can be performed by the demolition contractor if they are licensed to perform abatement in Michigan.

#### HAZMATs

PSI recommends disposing of the hazardous materials identified on the site in accordance to applicable regulations. Any unknown containers present on the site need to be verified through testing followed by proper disposal in accordance to applicable regulations.



## TABLES

**TABLE 1 – SUSPECT ACMS – SAMPLED**

Site:328 E. Larch Avenue, Muskegon, Michigan 49442

Survey Date:3/6/2018

Material Number & Sample Number	Material Description <sup>1</sup>	Material Location/ Functional Space <sup>2</sup>	F/NF <sup>3</sup>	Cond. <sup>4</sup>	% Asbestos & type <sup>5</sup>	EPA NESHAP Category <sup>6,7</sup>	Osha Class Designation <sup>8</sup>	Estimated Quantity
328-1A-B	Vapor Barrier (Brown)	Exterior Walls	F	SD	NAD	NA	NA	3,284 SF
328-2A-B	Exterior Sealant (Gray/White)	Exterior Walls	NF	SD	NAD	NA	NA	654 LF
<b>328-3A-B</b>	<b>Roof Flashing (Black)</b>	<b>Roof</b>	<b>NF</b>	<b>SD</b>	<b>5%Ch</b>	<b>Cat I NF</b>	<b>Class II</b>	<b>115 LF</b>
328-4A-B	Asphaltic Paper (Black)	Roof	NF	SD	NAD	NA	NA	400 SF
328-5A-B	Drywall/Joint Compound/Tape (White)	Garage, 1st Floor Bedrooms, Basement, 2nd Floor Walls/Ceilings	F	SD	NAD	NA	NA	1,585 SF
328-6A-B	Window Glaze (White)	Windows	NF	SD	NAD	NA	NA	32 Windows
328-7A-E	Plaster w/Skimcoat (White)	Living Room, 1st Floor Bedrooms, Kitchen, Bathroom	F	SD	NAD	NA	NA	4,925 SF
328-8A-B	Wall Adhesive (Tan)	1st Floor Bedrooms	NF	SD	NAD	NA	NA	650 SF
328-9A-B	12"x12" Floor Tile (Gray) w/Adhesive	1st Floor Back Bedroom	NF	SD	NAD/ NAD	NA	NA	105 SF
328-10A-B	Floor Sheeting (Black/Beige/Red) w/Adhesive	Kitchen	F	SD	NAD/ NAD	NA	NA	115 SF
328-11A-B	12"x12" Floor Tile (Blue/Beige/Red) w/Adhesive	1st Floor Kitchen & Kitchen Entry	NF	SD	NAD/ NAD	NA	NA	60 SF
328-12A-B	1'x1' Ceiling Tile (White)	Basement Stairs	F	SD	NAD	NA	NA	45 SF
328-13A-B	2'x4' Ceiling Tile (White)	1st Floor Kitchen	F	SD	NAD	NA	NA	115 SF
328-14A-B	12"x12" Floor Tile (Faux Wood) w/Adhesive	1st Floor Bathroom	F	SD	NAD/ NAD	NA	NA	20 SF
328-15A-B	Wallboard (Beige/Tan) w/Adhesive	1st Floor Bathroom	F	SD	NAD/ NAD	NA	NA	55 SF

- 1 Homogeneous materials/systems may contain an indefinite/indistinguishable number of layers that may not be visually identified by the Inspector at the time of the survey. Bulk sample analysis (Appendix B) will report all possible layers that may be contained within the homogeneous materials/system. Therefore, laboratory results may differ from the chain of custody (Appendix C) description.
- 2 Identifying perimeter wall sides with letters A, B, C, and D. Side A for single-family housing is the street side for the address. Side B, C, and D are identified clockwise from side A as one faces the dwelling; thus Side B is to the left, Side C is Across from Side A, and Side D is to the right of Side A.
- 3 F = Friable; NF = Non-friable
- 4 Cond. = Condition of Materials; Either Good (G), Damaged (D) or Significantly Damaged (SD)
- 5 NAD = No Asbestos Detected, Ch = Chrysotile, Am = Amosite, PT = Point Count Analysis
- 6 NESHAP Category - Regulated ACM (RACM), Cat I NF=Category I Non-Friable ACM, Cat II NF= Category II Non-Friable ACM
- 7 NA = Not Applicable
- 8 **OSHA/EPA Class Definitions:**  
**Class I** Asbestos work applies to activities involving the removal of TSI and surfacing ACM and PACM.  
**Class II** Asbestos work applies to activities involving the removal of ACM which is not thermal system insulation or surfacing material. This includes, but is not limited to, the removal of asbestos-containing wallboard, floor tile and sheeting, roofing and siding shingles, and construction mastics.  
**Class III** Asbestos work applies to repair and maintenance operations, where "ACM", including TSI and surfacing ACM and PACM, is likely to be disturbed. **Class IV** Asbestos work applies to maintenance and custodial activities during which employees contact but do not disturb ACM or PACM and activities to clean up dust, waste and debris resulting from Class I, II, and III activities.

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328-11A-B	12"x12" Floor Tile (Blue/Beige/Red) w/Adhesive	1st Floor Kitchen & Kitchen Entry	NF	SD	NAD/ NAD	NA	NA	60 SF
328-12A-B	1'x1' Ceiling Tile (White)	Basement Stairs	F	SD	NAD	NA	NA	45 SF
328-13A-B	2'x4' Ceiling Tile (White)	1st Floor Kitchen	F	SD	NAD	NA	NA	115 SF
328-14A-B	12"x12" Floor Tile (Faux Wood) w/Adhesive	1st Floor Bathroom	F	SD	NAD/ NAD	NA	NA	20 SF
328-15A-B	Wallboard (Beige/Tan) w/Adhesive	1st Floor Bathroom	F	SD	NAD/ NAD	NA	NA	55 SF
328-16A-B	Floor Sheeting (White/Red) w/Adhesive	1st Floor Bathroom	F	SD	NAD/ NAD	NA	NA	30 SF
328-17A-B	Wallboard (White/Brown/Beige) w/Adhesive/Sheeting	1st Floor Bathroom	F	SD	NAD/ NAD	NA	NA	50 SF
328-18A-B	Multi-Layered Floor Covering (Red/Brown) w/Adhesive	Basement Stairs	F	SD	NAD/ NAD	NA	NA	35 SF
<b>328-19A-C</b>	<b>Paper Duct Wrap (White)</b>	<b>Basement/Vents</b>	<b>F</b>	<b>SD</b>	<b>65%Ch</b>	<b>RACM</b>	<b>Class I</b>	<b>160 SF</b>
<b>328-20A-B</b>	<b>9"x9" Floor Tile (Brown) w/Adhesive</b>	<b>Basement</b>	<b>NF</b>	<b>SD</b>	<b>5%Ch/ 3%Ch</b>	<b>Cat I NF</b>	<b>Class II</b>	<b>50 SF</b>

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328-21-A-B	Cement Patch (Gray/Black)	Basement	NF	SD	NAD	NA	NA	6 SF
<b>328-22A-C</b>	<b>Spray-on Pipe Insulation (Beige)</b>	<b>Basement</b>	<b>F</b>	<b>SD</b>	<b>7%Ch/2%Tr/ 88%Vermiculite</b>	<b>RACM</b>	<b>Class I</b>	<b>215 LF</b>
328-23A-B	Wall Adhesive (Beige)	Basement	NF	SD	NAD	NA	NA	75 SF
328-24A-B	Blown-in Insulation (Brown)	Exterior Walls, 2nd Floor, Attic	F	SD	NAD	NA	NA	5,747 SF
328-25A-B	2'x4' Ceiling Tile (White/Yellow)	2nd Floor Stairs	F	SD	NAD	NA	NA	35 SF
328-26A-B	Multi-Layered Floor Covering (Gray/Beige) w/Adhesive	2nd Floor Kitchen, Bathroom	F	SD	NAD/ NAD	NA	NA	130 SF
328-27A-B	Floor Sheeting (Beige) w/Adhesive	2nd Floor Living Room	F	SD	NAD/ NAD	NA	NA	100 SF
328-28A-B	Roofing System (Black)	Roof	F	SD	NAD	NA	NA	1,775 SF
328-29A-B	Floor Sheeting (Green) w/Adhesive	2nd Floor Closet	F	SD	NAD/ NAD	NA	NA	35 SF

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**Table 2: Suspected HAZMATs Inventory Checklist**

<b>Address: 328 E. Larch Avenue, Muskegon, Michigan 49442</b>			
<b>Inspection Item</b>	<b>Constituent of Concern</b>	<b>Quantity</b>	<b>Location/Comments</b>
Above Ground Storage Tanks	Fuels / Chemicals	NA	NA
Air Conditioners	CFC / HCFC	NA	NA
Batteries	Lead	NA	NA
CRTs / TV Screens / Monitors	Lead/Mercury	NA	NA
Dehumidifiers	CFC / HCFC	NA	NA
Drums	Varied	NA	NA
Exit Signs	Mercury / H-3	NA	NA
<b>Fire Extinguishers</b>	<b>CFC / HCFC</b>	<b>1</b>	<b>1st Floor Kitchen</b>
Leaded Glass	Lead	NA	NA
<b>Light Ballasts</b>	<b>PCB</b>	<b>1</b>	<b>Basement</b>
<b>Miscellaneous Items</b> (Glue, Solvents, Cleaners, etc.)	<b>Varied</b>	<b>8</b>	<b>Basement, Bathroom,</b>
<b>Paint Cans</b>	<b>Lead</b>	<b>5</b>	<b>Entrance, Kitchen Entrance</b>
<b>Refrigerators / Freezers</b>	<b>CFC / HCFC</b>	<b>1</b>	<b>2nd Floor Kitchen</b>
Rooftop Lead Sewer Stacks	Lead	NA	NA
Security Alarms	Mercury	NA	NA
Security Systems	Mercury	NA	NA
<b>Smoke Detectors</b>	<b>Mercury/ Radioactive</b>	<b>2</b>	<b>2nd Floor Living Room, Basement</b>
<b>Thermostats</b>	<b>Mercury</b>	<b>1</b>	<b>Basement</b>
<b>Tires</b>	<b>Municipal Solid Waste</b>	<b>4</b>	<b>Entrance, Basement</b>
Underground Storage Tanks	Fuels / Chemicals	NA	NA
Unlabeled Containers	Any	NA	NA
<b>Fluorescent Light Bulbs</b>	<b>Mercury</b>	<b>3</b>	<b>Basement, 1st Left Bedroom 1st Floor</b>

## **APPENDIX A – SCOPE, METHODS, AND REGULATORY GUIDELINES**

## **A1 INTRODUCTION**

### **A1.1 SCOPE OF SERVICES**

The scope of services for this project consisted of conducting a limited hazardous and regulated materials survey, sampling and analysis of accessible and exposed areas on the subject property.

The limited assessment included areas within the structure where building materials could potentially be impacted during scheduled demolition. The limited investigation included a visual inspection of the subject area(s), sample collection, PLM sample analysis, quantification of ACMs, suspected hazardous materials, and report preparation and review.

### **A1.2 PURPOSE**

The purpose of this survey was to provide general information for the subject property regarding the presence, condition, and quantity of accessible and/or exposed friable and non-friable building materials that contain asbestos as well as substances that would require special handling and disposal prior to demolition.

### **A1.3 AUTHORIZATION**

Authorization to perform this work was given by City of Muskegon – Planning Department, as project administrator through the issuance of a Notice to Proceed.

### **A1.4 LIMITATIONS**

The asbestos survey was intended to meet the requirements of the EPA NESHAP regulation for demolition or renovation. The survey included a thorough inspection of all areas on the subject property.

Vermiculite, if identified, was assumed to be asbestos containing for the purposes of this study. These materials can be treated as non-regulated demolition debris provided they are not rendered friable during the demolition process.

Destructive sampling, such as behind finished surfaces (plaster/drywall walls, above hard ceilings, etc.); inside mechanical chases, behind mirrored walls, under carpet or tiled floors, etc., was generally conducted to try to assess inaccessible or concealed materials. The inspection team selected representative areas to perform an intrusive evaluation of void spaces within the building or structure. Such inspections were made by creating an opening of sufficient size to determine the presence, condition and quantity of suspect ACM within. Void spaces which were evaluated included locations of suspected pipe or HVAC chases, wall cavities where fireproofing or other ACM was suspected, above finished ceiling systems where ACM was likely to exist, within pipe trenches or within concealed locations. Although PSI made an attempt to identify all areas of ACM, an exhaustive investigation of void spaces was not included in the scope of services for this project. Inaccessible is defined as areas of the building that were locked, or where

admittance was not possible. It also includes areas/materials that could not be tested (sampled) without destruction of the structure or a portion of the structure, and areas/materials that could not be safely reached by the Inspector or inspection team. In the event that access to a portion of the building was not obtained (which otherwise would have been tested), such limitations specifically are identified in the Findings Section of this report.

PSI did not sample any system which presented a hazard to the inspection team such as energized electrical systems, confined spaces, or structurally unsafe areas.

The HAZMATs survey was visual only and did not include sampling of identified materials.

### **A1.5 WARRANTY**

The field and laboratory results reported herein are considered sufficient in detail and scope to determine the presence of accessible and/or exposed suspect ACM/HAZMATs for the subject property. PSI warrants that the findings contained herein have been prepared in general accordance with accepted professional practices at the time of its preparation as applied by professionals in the community. Changes in the state of the art or in applicable regulations cannot be anticipated and have not been addressed in this report.

The survey and analytical methods have been used to provide the client with information regarding the presence of accessible and/or exposed suspect ACM/HAZMATs existing at the time of the inspection. Test results are valid only for the material(s) tested. There is a distinct possibility that conditions may exist which could not be identified within the scope of the study or which were not apparent during the site visit. This inspection covered only those areas that were exposed and/or physically accessible to the Inspector. The study is also limited to the information available from the client at the time it was conducted.

As directed by the client, PSI did not provide any service to investigate or detect the presence of moisture, mold or other biological contaminants in or around any structure, or any service that was designed or intended to prevent or lower the risk of the occurrence of the amplification of the same. Client acknowledges that mold is ubiquitous to the environment with mold amplification occurring when building materials are impacted by moisture. Client further acknowledges that site conditions are outside of PSI's control, and that mold amplification will likely occur, or continue to occur, in the presence of moisture. As such, PSI cannot and shall not be held responsible for the occurrence or recurrence of mold amplification. No other warranties are implied or expressed.

## **A2 METHODOLOGY**

Inspection and sampling procedures were performed in general accordance with the guidelines published by the EPA. The inspection and survey described below was performed by an EPA and Michigan accredited Inspector.

### **A2.1 RECORD DOCUMENT REVIEW**

Prior to conducting the visual inspection, PSI typically reviews documents provided by the client and all applicable State Authorities, including: drawings, floor plans, historical data, maintenance records, previous survey reports, laboratory reports, etc. for information regarding construction history and building materials.

Digital documents (i.e. photographs, certified sanborn maps, exc.) were provided by the client when available for review as a part of this Asbestos and HAZMAT Survey.

### **A2.2 VISUAL INSPECTION PROCEDURES**

#### **A2.2.1 Asbestos**

An initial property walkthrough was conducted to determine the presence of suspect asbestos-containing materials that were accessible and/or exposed within all areas scheduled for upcoming demolition activities. A site drawing was created by the Inspector to identify the orientation of the site, identify each exterior area, and functional space. The site drawing also identifies the location, sample number, and results of all bulk samples collected by the Inspector. Each functional space and sample location was field marked with florescent spray paint as designated by the client.

Materials which were similar in color, texture, general appearance and which appear to have been installed at the same time were grouped in Homogeneous Sampling Areas. Such materials are termed "homogeneous materials" by the EPA. During this walkthrough, the approximate locations of these homogeneous materials were also noted.

The Inspector evaluated the overall condition of the material and determined whether the materials were friable or non-friable by touching the material, where practical. A friable material is defined as any material able to be crushed, crumbled, pulverized or reduced to a powder by hand pressure when dry.

Each material was further assessed for overall condition. Conditions were rated as good, damaged or significantly damaged. PSI's Inspector also identified the EPA NESHAP classification of the material based on the materials current condition. PSI's Inspector provided estimated quantities of the materials identified as ACM, based only on materials that were accessible and exposed.

Homogeneous materials/systems may contain an indefinite/indistinguishable number of layers that may not be visually identified by the Inspector at the time of the survey. Bulk sample analysis (Appendix B) will report all possible layers that may be contained within the homogeneous materials/system. Therefore laboratory results may differ from the chain of custody (Appendix C) description.

### **A2.2.2 HAZMAT Inventory**

Materials or equipment that have been traditionally known to contain hazardous or regulated materials such as lead, PCBs, mercury, and CFCs are identified and quantified during the HAZMAT Inventory. These are materials that should be removed, reclaimed, and/or properly disposed of prior to demolition. In addition, Inspectors noted containers observed with chemicals subject to disposal regulations or that would pose demolition worker exposure potential, such as cleaners, varnishes, glues, etc.

### **A2.3 ASBESTOS SAMPLING PROCEDURES**

Following the walkthrough, the Inspector collected samples of suspect materials.

Sampling locations were chosen to be representative of the homogeneous sampling area. While an effort was made to collect samples randomly, samples were taken preferentially from areas already damaged or areas which were the least visible to minimize disturbance of the material.

Each sample location was sprayed with amended water and was kept wet during the entire sampling process. Samples were collected by coring through the material from the surface down to the base substrate. All layers of the material were extracted and placed into a sample container for transport to the laboratory. Sample containers were sealed and labeled with a unique sample identification number. Where appropriate, sampled materials were sealed with an encapsulant or covered with tape after sampling. PSI is not responsible for restoring the sampled areas to their pre-sampled condition.

In accordance with the agreement between PSI and the client, vermiculite insulation was assumed to be an asbestos containing material as part of this survey.

### **A2.4 ASBESTOS ANALYSIS PROCEDURES**

All samples were analyzed by one of the following pre-approved laboratories

- Professional Service Industries, Inc.  
850 Poplar Street,  
Pittsburgh, PA 15220
- EuroFins (CEI Labs, Inc.)  
730 Southeast Maynard Road,  
Cary, NC 27511

These Laboratories are all National Voluntary Laboratory Accreditation Program (NVLAP) Accredited.

The samples were analyzed for asbestos on a “positive-stop” basis by PLM and in accordance with the “EPA Method for the Determination of Asbestos in Bulk Building Materials” (EPA/600/R-93/116 July 1993). Analysis was performed by observing the bulk samples and slide preparation(s) for microscopic examination and identification. The samples were mounted on slides and then analyzed for asbestos (chrysotile, amosite, crocidolite, anthophyllite, actinolite/tremolite), and fibrous non-asbestos constituents (mineral wool, fiberglass, cellulose, etc.). Asbestos was identified by refractive indices, morphology, color, pleochroism, birefringence, extinction characteristics, and signs of elongation. The same characteristics were used to identify the non-asbestos constituents.

Using a stereoscope, the microscopist visually estimated relative amounts of each constituent by determining the volume of each constituent in proportion to the total volume of the sample.

The EPA method allows samples which are visually determined to have less than 1% asbestos to be quantified using a Point Count procedure. An ocular reticule (cross hair or point array) is used to visually superimpose a point or points on the microscope field of view. A total of 400 points superimposed on either asbestos fibers or non-asbestos matrix material must be counted over at least eight different preparations of representative subsamples. If an asbestos fiber and matrix particle overlap so that a point is superimposed on their visual intersection, a point is scored for both categories. Point counting provides a quantification of the area percent asbestos. Point counted results supersede the results of the visual estimation.

It should be noted that some ACM might not be accurately identified or quantified by PLM. As an example, the original fabrication of vinyl floor tiles routinely involved milling of asbestos fibers to extremely small sizes. As a result, these fibers may go undetected under the standard PLM method. Transmission Electron Microscopy (TEM) is recommended for a more definitive analysis of these materials.

#### **A2.4.1 Laboratory Quality Control Program**

Each laboratory maintains an in-house quality control program. This program involves blind reanalysis of ten (10) percent of all samples, precision and accuracy controls, and use of standard bulk reference materials. In addition, the Laboratories are accredited by NVLAP, which also has quality control procedures inherent in its program.

**APPENDIX B – REPORT OF BULK SAMPLE ANALYSIS FOR ASBESTOS**

March 12, 2018

PSI Engineering, Consulting, Testing  
37483 Interchange Dr.  
Farmington Hills, MI 48335

**CLIENT PROJECT:** 0166-1046-1-5; City of Muskegon - 328 E. Larch Avenue  
**CEI LAB CODE:** A18-3848

Dear Customer:

Enclosed are asbestos analysis results for PLM Bulk samples received at our laboratory on March 8, 2018. The samples were analyzed for asbestos using polarizing light microscopy (PLM) per the EPA 600 Method.

Sample results containing >1% asbestos are considered asbestos-containing materials (ACMs) per EPA regulatory requirements. The detection limit for the EPA 600 Method is <1% asbestos by weight as determined by visual estimation.

Thank you for your business and we look forward to continuing good relations. If you have any questions, please feel free to call our office at 919-481-1413.

Kind Regards,



Tianbao Bai, Ph.D., CIH  
Laboratory Director



CEI

# Asbestos Report Summary

By: POLARIZING LIGHT MICROSCOPY

**PROJECT:** 0166-1046-1-5; City of Muskegon - 328 E. **LAB CODE:** A18-3848  
Larch Avenue

**METHOD:** EPA 600 / R93 / 116 and EPA 600 / M4-82 / 020

Client ID	Layer	Lab ID	Color	Sample Description	ASBESTOS %
328-1A		A2648645	Brown	Vapor Barrier	None Detected
328-1B		A2648646	Brown	Vapor Barrier	None Detected
328-2A		A2648647	Clear,Off-white	Caulking	None Detected
328-2B		A2648648	Clear,Off-white	Caulking	None Detected
328-3A		A2648649	Black	Flashing	<b>Chrysotile 5%</b>
328-3B		A2648650		Sample Not Analyzed per COC	
328-4A		A2648651	Black	Asphalt Paper	None Detected
328-4B		A2648652	Black	Asphalt Paper	None Detected
328-5A	Layer 1	A2648653	Off-white	Tape	None Detected
	Layer 2	A2648653	Off-white	Drywall	None Detected
328-5B	Layer 1	A2648654	Off-white	Tape	None Detected
	Layer 2	A2648654	Off-white	Drywall	None Detected
328-6A		A2648655	Off-white	Window Glazing	None Detected
328-6B		A2648656	Off-white	Window Glazing	None Detected
328-7A		A2648657	Tan,Brown	Plaster	None Detected
328-7B		A2648658	Tan,Brown	Plaster	None Detected
328-7C		A2648659	Tan,Brown	Plaster	None Detected
328-7D		A2648660	Tan,Brown	Plaster	None Detected
328-7E		A2648661	Tan,Brown	Plaster	None Detected
328-8A		A2648662	Tan	Wall Adhesive	None Detected
328-8B		A2648663	Tan	Wall Adhesive	None Detected
328-9A		A2648664A	Gray	Floor Tile	None Detected
		A2648664B	Clear	Adhesive	None Detected
		A2648664C	Brown	Adhesive	None Detected
328-9B		A2648665A	Gray	Floor Tile	None Detected
		A2648665B	Clear	Adhesive	None Detected
		A2648665C	Brown	Adhesive	None Detected
328-10A		A2648666A	Beige	Sheet Flooring	None Detected
		A2648666B	Yellow	Adhesive	None Detected
328-10B		A2648667A	Beige	Sheet Flooring	None Detected
		A2648667B	Yellow	Adhesive	None Detected



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# Asbestos Report Summary

By: POLARIZING LIGHT MICROSCOPY

**PROJECT:** 0166-1046-1-5; City of Muskegon - 328 E. Larch Avenue **LAB CODE:** A18-3848

**METHOD:** EPA 600 / R93 / 116 and EPA 600 / M4-82 / 020

Client ID	Layer	Lab ID	Color	Sample Description	ASBESTOS %
328-11A		A2648668A	Blue	Floor Tile	None Detected
		A2648668B	Clear	Adhesive	None Detected
		A2648668C	Brown	Adhesive	None Detected
328-11B		A2648669A	Blue	Floor Tile	None Detected
		A2648669B	Clear	Adhesive	None Detected
		A2648669C	Brown	Adhesive	None Detected
328-12A		A2648670	Brown	Ceiling Tile	None Detected
328-12B		A2648671	Brown	Ceiling Tile	None Detected
328-13A		A2648672	Gray	Ceiling Tile	None Detected
328-13B		A2648673	Gray	Ceiling Tile	None Detected
328-14A		A2648674A	Faux,Wood	Floor Tile	None Detected
		A2648674B	Yellow	Adhesive	None Detected
328-14B		A2648675A	Faux,Wood	Floor Tile	None Detected
		A2648675B	Yellow	Adhesive	None Detected
328-15A		A2648676A	White	Wallboard	None Detected
		A2648676B	Tan	Adhesive	None Detected
328-15B		A2648677A	White	Wallboard	None Detected
		A2648677B	Tan	Adhesive	None Detected
328-16A		A2648678A	Off-white,Red	Sheet Flooring	None Detected
		A2648678B	Brown	Adhesive	None Detected
328-16B		A2648679A	Off-white,Red	Sheet Flooring	None Detected
		A2648679B	Brown	Adhesive	None Detected
328-17A		A2648680A	Green,Yellow	Wallpaper	None Detected
		A2648680B	Brown	Wallboard	None Detected
		A2648680C	Brown	Adhesive	None Detected
328-17B		A2648681A	Green,Yellow	Wallpaper	None Detected
		A2648681B	Tan	Plaster	None Detected
		A2648681C	Brown	Wallboard	None Detected
		A2648681D	Brown	Adhesive	None Detected
328-18A		A2648682A	Red,Orange	Floor Tile	None Detected
		A2648682B	Black	Mastic	None Detected

# Asbestos Report Summary

By: POLARIZING LIGHT MICROSCOPY

**PROJECT:** 0166-1046-1-5; City of Muskegon - 328 E. Larch Avenue **LAB CODE:** A18-3848

**METHOD:** EPA 600 / R93 / 116 and EPA 600 / M4-82 / 020

Client ID	Layer	Lab ID	Color	Sample Description	ASBESTOS %
		A2648682C	Black	Felt Paper	None Detected
328-18B		A2648683A	Red,Orange	Floor Tile	None Detected
		A2648683B	Black	Mastic	None Detected
		A2648683C	Black	Felt Paper	None Detected
328-19A		A2648684	Off-white	Duct Wrap	<b>Chrysotile 65%</b>
328-19B		A2648685		Sample Not Analyzed per COC	
328-19C		A2648686		Sample Not Analyzed per COC	
328-20A		A2648687A	Red,Brown	Floor Tile	<b>Chrysotile 5%</b>
		A2648687B	Black	Mastic	<b>Chrysotile 3%</b>
328-20B		A2648688		Sample Not Analyzed per COC	
328-21A		A2648689	Black,Gray	Cement Patch	None Detected
328-21B		A2648690	Black,Gray	Cement Patch	None Detected
328-22A		A2648691	Gold	Spray-on Insulation (vermiculite Containing)	<b>Chrysotile 7%</b> <b>Tremolite 2%</b>
328-22B		A2648692		Sample Not Analyzed per COC	
328-22C		A2648693		Sample Not Analyzed per COC	
328-23A		A2648694	Tan	Wall Adhesive	None Detected
328-23B		A2648695	Tan	Wall Adhesive	None Detected
328-24A		A2648696	Brown	Insulation	None Detected
328-24B		A2648697	Brown	Insulation	None Detected
328-25A		A2648698	White,Yellow	Ceiling Tile	None Detected
328-25B		A2648699	White,Yellow	Ceiling Tile	None Detected
328-26A		A2648700A	Gray	Floor Tile	None Detected
		A2648700B	Yellow	Adhesive	None Detected
		A2648700C	Gray	Floor Tile	None Detected
		A2648700D	Yellow	Adhesive	None Detected
		A2648700E	Off-white,Yellow	Sheet Flooring	None Detected
328-26B		A2648701A	Gray	Floor Tile	None Detected
		A2648701B	Yellow	Adhesive	None Detected
		A2648701C	Gray	Floor Tile	None Detected
		A2648701D	Yellow	Adhesive	None Detected



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# Asbestos Report Summary

By: POLARIZING LIGHT MICROSCOPY

**PROJECT:** 0166-1046-1-5; City of Muskegon - 328 E. **LAB CODE:** A18-3848  
Larch Avenue

**METHOD:** EPA 600 / R93 / 116 and EPA 600 / M4-82 / 020

Client ID	Layer	Lab ID	Color	Sample Description	ASBESTOS %
		A2648701E	Off-white, Yellow	Sheet Flooring	None Detected
328-27A		A2648702A	Beige, Yellow	Sheet Flooring	None Detected
		A2648702B	Red	Adhesive	None Detected
328-27B		A2648703A	Beige, Yellow	Sheet Flooring	None Detected
		A2648703B	Red	Adhesive	None Detected
328-28A		A2648704A	Black	Shingle	None Detected
		A2648704B	Black	Tarpaper	None Detected
328-28B		A2648705A	Black	Shingle	None Detected
		A2648705B	Black	Tarpaper	None Detected
328-29A		A2648706	Green	Sheet Flooring	None Detected
328-29B		A2648707	Green	Sheet Flooring	None Detected

# ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

**Client:** PSI Engineering, Consulting, Testing  
 37483 Interchange Dr.  
 Farmington Hills, MI 48335

**Lab Code:** A18-3848  
**Date Received:** 03-08-18  
**Date Analyzed:** 03-12-18  
**Date Reported:** 03-12-18

**Project:** 0166-1046-1-5; City of Muskegon - 328 E. Larch Avenue

## ASBESTOS BULK PLM, EPA 600 METHOD

Client ID Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS				ASBESTOS %
			Fibrous		Non-Fibrous		
<b>328-1A</b> A2648645	Vapor Barrier	Homogeneous Brown Fibrous Loosely Bound	80%	Cellulose	20%	Binder	None Detected
<b>328-1B</b> A2648646	Vapor Barrier	Homogeneous Brown Fibrous Loosely Bound	80%	Cellulose	20%	Binder	None Detected
<b>328-2A</b> A2648647	Caulking	Heterogeneous Clear, Off-white Non-fibrous Bound			70%	Rubber	None Detected
					30%	Paint	
<b>328-2B</b> A2648648	Caulking	Heterogeneous Clear, Off-white Non-fibrous Bound			70%	Rubber	None Detected
					30%	Paint	
<b>328-3A</b> A2648649	Flashing	Homogeneous Black Fibrous Bound			95%	Binder	<b>5% Chrysotile</b>
<b>328-3B</b> A2648650	Sample Not Analyzed per COC						
<b>328-4A</b> A2648651	Asphalt Paper	Heterogeneous Black Fibrous Bound	15%	Cellulose	50%	Tar	None Detected
			15%	Fiberglass	20%	Gravel	
<b>328-4B</b> A2648652	Asphalt Paper	Heterogeneous Black Fibrous Bound	15%	Cellulose	50%	Tar	None Detected
			15%	Fiberglass	20%	Gravel	

# ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

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 37483 Interchange Dr.  
 Farmington Hills, MI 48335

**Lab Code:** A18-3848  
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**Project:** 0166-1046-1-5; City of Muskegon - 328 E. Larch Avenue

## ASBESTOS BULK PLM, EPA 600 METHOD

Client ID Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS				ASBESTOS %
			Fibrous		Non-Fibrous		
<b>328-5A</b> Layer 1 A2648653	Tape	Heterogeneous	50%	Cellulose	30%	Paint	None Detected
		Off-white Fibrous Bound			20%	Binder	
Layer 2 A2648653	Drywall	Heterogeneous	10%	Cellulose	90%	Gypsum	None Detected
		Off-white Non-fibrous Loosely Bound					
Lab Notes: *No Joint Compound Present							
<b>328-5B</b> Layer 1 A2648654	Tape	Heterogeneous	50%	Cellulose	30%	Paint	None Detected
		Off-white Fibrous Bound			20%	Binder	
Layer 2 A2648654	Drywall	Heterogeneous	10%	Cellulose	90%	Gypsum	None Detected
		Off-white Non-fibrous Loosely Bound					
Lab Notes: *No Joint Compound Present							
<b>328-6A</b> A2648655	Window Glazing	Heterogeneous			50%	Binder	None Detected
		Off-white Non-fibrous Bound			30%	Silicates	
<b>328-6B</b> A2648656	Window Glazing	Heterogeneous			50%	Binder	None Detected
		Off-white Non-fibrous Bound			30%	Silicates	
<b>328-7A</b> A2648657	Plaster	Heterogeneous	<1%	Hair	85%	Silicates	None Detected
		Tan,Brown Fibrous Loosely Bound			15%	Paint	

Lab Notes: \*No Skim Coat Present

# ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

**Client:** PSI Engineering, Consulting, Testing  
 37483 Interchange Dr.  
 Farmington Hills, MI 48335

**Lab Code:** A18-3848  
**Date Received:** 03-08-18  
**Date Analyzed:** 03-12-18  
**Date Reported:** 03-12-18

**Project:** 0166-1046-1-5; City of Muskegon - 328 E. Larch Avenue

## ASBESTOS BULK PLM, EPA 600 METHOD

Client ID Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS				ASBESTOS %
			Fibrous	Hair	Non-Fibrous		
<b>328-7B</b> A2648658	Plaster	Heterogeneous Tan,Brown Fibrous Loosely Bound	<1%	Hair	85% 15%	Silicates Paint	None Detected
Lab Notes: *No Skim Coat Present							
<b>328-7C</b> A2648659	Plaster	Heterogeneous Tan,Brown Fibrous Loosely Bound	<1%	Hair	85% 15%	Silicates Paint	None Detected
Lab Notes: *No Skim Coat Present							
<b>328-7D</b> A2648660	Plaster	Heterogeneous Tan,Brown Fibrous Loosely Bound	<1%	Hair	85% 15%	Silicates Paint	None Detected
Lab Notes: *No Skim Coat Present							
<b>328-7E</b> A2648661	Plaster	Heterogeneous Tan,Brown Fibrous Loosely Bound	<1%	Hair	85% 15%	Silicates Paint	None Detected
Lab Notes: *No Skim Coat Present							
<b>328-8A</b> A2648662	Wall Adhesive	Homogeneous Tan Non-fibrous Bound			100%	Mastic	None Detected
<b>328-8B</b> A2648663	Wall Adhesive	Homogeneous Tan Non-fibrous Bound			100%	Mastic	None Detected

# ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

**Client:** PSI Engineering, Consulting, Testing  
 37483 Interchange Dr.  
 Farmington Hills, MI 48335

**Lab Code:** A18-3848  
**Date Received:** 03-08-18  
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**Date Reported:** 03-12-18

**Project:** 0166-1046-1-5; City of Muskegon - 328 E. Larch Avenue

## ASBESTOS BULK PLM, EPA 600 METHOD

Client ID Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS				ASBESTOS %
			Fibrous		Non-Fibrous		
<b>328-9A</b> A2648664A	Floor Tile	Homogeneous	60%	Cellulose	40%	Vinyl	None Detected
		Gray			40%	Binder	
		Non-fibrous Bound					
A2648664B	Adhesive	Homogeneous	100%	Cellulose		Mastic	None Detected
		Clear					
		Non-fibrous Bound					
A2648664C	Adhesive	Homogeneous	10%	Cellulose	90%	Mastic	None Detected
		Brown					
		Fibrous Bound					
<b>328-9B</b> A2648665A	Floor Tile	Homogeneous	60%	Cellulose	40%	Vinyl	None Detected
		Gray			40%	Binder	
		Non-fibrous Bound					
A2648665B	Adhesive	Homogeneous	100%	Cellulose		Mastic	None Detected
		Clear					
		Non-fibrous Bound					
A2648665C	Adhesive	Homogeneous	10%	Cellulose	90%	Mastic	None Detected
		Brown					
		Fibrous Bound					
<b>328-10A</b> A2648666A	Sheet Flooring	Heterogeneous	20%	Cellulose	50%	Vinyl	None Detected
		Beige	10%	Fiberglass	20%	Binder	
		Fibrous					
		Bound					

# ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

**Client:** PSI Engineering, Consulting, Testing  
 37483 Interchange Dr.  
 Farmington Hills, MI 48335

**Lab Code:** A18-3848  
**Date Received:** 03-08-18  
**Date Analyzed:** 03-12-18  
**Date Reported:** 03-12-18

**Project:** 0166-1046-1-5; City of Muskegon - 328 E. Larch Avenue

## ASBESTOS BULK PLM, EPA 600 METHOD

Client ID Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS				ASBESTOS %
			Fibrous		Non-Fibrous		
A2648666B	Adhesive	Heterogeneous Yellow Fibrous Bound	5%	Cellulose	95%	Mastic	None Detected
<b>328-10B</b> A2648667A	Sheet Flooring	Heterogeneous Beige Fibrous Bound	20%	Cellulose	50%	Vinyl	None Detected
			10%	Fiberglass	20%	Binder	
A2648667B	Adhesive	Heterogeneous Yellow Fibrous Bound	5%	Cellulose	95%	Mastic	None Detected
<b>328-11A</b> A2648668A	Floor Tile	Homogeneous Blue Non-fibrous Bound			60%	Vinyl	None Detected
					40%	Binder	
A2648668B	Adhesive	Homogeneous Clear Non-fibrous Bound			100%	Mastic	None Detected
A2648668C	Adhesive	Homogeneous Brown Non-fibrous Bound			100%	Mastic	None Detected
<b>328-11B</b> A2648669A	Floor Tile	Homogeneous Blue Non-fibrous Bound			60%	Vinyl	None Detected
					40%	Binder	

# ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

**Client:** PSI Engineering, Consulting, Testing  
 37483 Interchange Dr.  
 Farmington Hills, MI 48335

**Lab Code:** A18-3848  
**Date Received:** 03-08-18  
**Date Analyzed:** 03-12-18  
**Date Reported:** 03-12-18

**Project:** 0166-1046-1-5; City of Muskegon - 328 E. Larch Avenue

## ASBESTOS BULK PLM, EPA 600 METHOD

Client ID Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS				ASBESTOS %
			Fibrous		Non-Fibrous		
A2648669B	Adhesive	Homogeneous Clear Non-fibrous Bound	100%		Mastic		None Detected
A2648669C	Adhesive	Homogeneous Brown Non-fibrous Bound	100%		Mastic		None Detected
<b>328-12A</b> A2648670	Ceiling Tile	Homogeneous Brown Fibrous Loosely Bound	90%	Cellulose	10%	Paint	None Detected
<b>328-12B</b> A2648671	Ceiling Tile	Homogeneous Brown Fibrous Loosely Bound	90%	Cellulose	10%	Paint	None Detected
<b>328-13A</b> A2648672	Ceiling Tile	Homogeneous Gray Fibrous Loosely Bound	35%	Cellulose	20%	Perlite	None Detected
			35%	Fiberglass	10%	Paint	
<b>328-13B</b> A2648673	Ceiling Tile	Homogeneous Gray Fibrous Loosely Bound	35%	Cellulose	20%	Perlite	None Detected
			35%	Fiberglass	10%	Paint	
<b>328-14A</b> A2648674A	Floor Tile	Homogeneous Faux,Wood Non-fibrous Bound			60%	Vinyl	None Detected
					40%	Binder	

# ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

**Client:** PSI Engineering, Consulting, Testing  
 37483 Interchange Dr.  
 Farmington Hills, MI 48335

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**Project:** 0166-1046-1-5; City of Muskegon - 328 E. Larch Avenue

## ASBESTOS BULK PLM, EPA 600 METHOD

Client ID Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS		ASBESTOS %
			Fibrous	Non-Fibrous	
A2648674B	Adhesive	Homogeneous Yellow Non-fibrous Bound	100%	Mastic	None Detected
<b>328-14B</b> A2648675A	Floor Tile	Homogeneous Faux,Wood Non-fibrous Bound	60% 40%	Vinyl Binder	None Detected
A2648675B	Adhesive	Homogeneous Yellow Non-fibrous Bound	100%	Mastic	None Detected
<b>328-15A</b> A2648676A	Wallboard	Homogeneous White Non-fibrous Bound	95% 5%	Vinyl Binder	None Detected
A2648676B	Adhesive	Homogeneous Tan Non-fibrous Bound	100%	Mastic	None Detected
<b>328-15B</b> A2648677A	Wallboard	Homogeneous White Non-fibrous Bound	95% 5%	Vinyl Binder	None Detected
A2648677B	Adhesive	Homogeneous Tan Non-fibrous Bound	100%	Mastic	None Detected

# ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

**Client:** PSI Engineering, Consulting, Testing  
 37483 Interchange Dr.  
 Farmington Hills, MI 48335

**Lab Code:** A18-3848  
**Date Received:** 03-08-18  
**Date Analyzed:** 03-12-18  
**Date Reported:** 03-12-18

**Project:** 0166-1046-1-5; City of Muskegon - 328 E. Larch Avenue

## ASBESTOS BULK PLM, EPA 600 METHOD

Client ID Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS				ASBESTOS %
			Fibrous		Non-Fibrous		
<b>328-16A</b> A2648678A	Sheet Flooring	Heterogeneous	20%	Cellulose	50%	Vinyl	None Detected
		Off-white,Red Fibrous Bound	10%	Fiberglass	20%	Binder	
A2648678B	Adhesive	Homogeneous Brown Non-fibrous Bound			100%	Mastic	None Detected
<b>328-16B</b> A2648679A	Sheet Flooring	Heterogeneous	20%	Cellulose	50%	Vinyl	None Detected
		Off-white,Red Fibrous Bound	10%	Fiberglass	20%	Binder	
A2648679B	Adhesive	Homogeneous Brown Non-fibrous Bound			100%	Mastic	None Detected
<b>328-17A</b> A2648680A	Wallpaper	Heterogeneous	50%	Cellulose	15%	Binder	None Detected
		Green,Yellow Fibrous Bound			20%	Paint	
A2648680B	Wallboard	Heterogeneous Brown Fibrous Bound	90%	Cellulose	10%	Paint	None Detected
A2648680C	Adhesive	Homogeneous Brown Non-fibrous Bound			100%	Mastic	None Detected

# ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

**Client:** PSI Engineering, Consulting, Testing  
 37483 Interchange Dr.  
 Farmington Hills, MI 48335

**Lab Code:** A18-3848  
**Date Received:** 03-08-18  
**Date Analyzed:** 03-12-18  
**Date Reported:** 03-12-18

**Project:** 0166-1046-1-5; City of Muskegon - 328 E. Larch Avenue

## ASBESTOS BULK PLM, EPA 600 METHOD

Client ID Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS				ASBESTOS %
			Fibrous		Non-Fibrous		
<b>328-17B</b> A2648681A	Wallpaper	Heterogeneous	50%	Cellulose	15%	Binder	None Detected
		Green, Yellow			20%	Paint	
		Fibrous			15%	Mastic	
		Bound					
A2648681B	Plaster	Heterogeneous	<1%	Hair	85%	Silicates	None Detected
		Tan			15%	Paint	
		Fibrous					
		Loosely Bound					
A2648681C	Wallboard	Heterogeneous	90%	Cellulose	10%	Paint	None Detected
		Brown					
		Fibrous					
		Bound					
A2648681D	Adhesive	Homogeneous			100%	Mastic	None Detected
		Brown					
		Non-fibrous					
		Bound					
<b>328-18A</b> A2648682A	Floor Tile	Homogeneous			60%	Vinyl	None Detected
		Red, Orange			40%	Binder	
		Non-fibrous					
		Bound					
A2648682B	Mastic	Heterogeneous	40%	Cellulose	60%	Tar	None Detected
		Black					
		Fibrous					
		Bound					
A2648682C	Felt Paper	Heterogeneous	60%	Cellulose	20%	Tar	None Detected
		Black			20%	Binder	
		Fibrous					
		Bound					

# ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

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## ASBESTOS BULK PLM, EPA 600 METHOD

Client ID Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS				ASBESTOS %
			Fibrous		Non-Fibrous		
328-18B A2648683A	Floor Tile	Homogeneous	60%	Vinyl		None Detected	
		Red,Orange Non-fibrous Bound	40%	Binder			
A2648683B	Mastic	Heterogeneous Black Fibrous Bound	40%	Cellulose	60%	Tar	None Detected
A2648683C	Felt Paper	Heterogeneous	60%	Cellulose	20%	Tar	None Detected
		Black Fibrous Bound			20%	Binder	
328-19A A2648684	Duct Wrap	Homogeneous Off-white Fibrous Bound			35%	Binder	65% Chrysotile
328-19B A2648685	Sample Not Analyzed per COC						
328-19C A2648686	Sample Not Analyzed per COC						
328-20A A2648687A	Floor Tile	Homogeneous	60%	Vinyl		5% Chrysotile	
		Red,Brown Non-fibrous Bound	35%	Binder			
A2648687B	Mastic	Heterogeneous Black Non-fibrous Bound			97%	Mastic	3% Chrysotile
328-20B A2648688	Sample Not Analyzed per COC						

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## ASBESTOS BULK PLM, EPA 600 METHOD

Client ID Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS			ASBESTOS %	
			Fibrous	Non-Fibrous			
<b>328-21A</b> A2648689	Cement Patch	Heterogeneous Black, Gray Non-fibrous Tightly Bound	80%	Silicates	20%	Binder	None Detected
<b>328-21B</b> A2648690	Cement Patch	Heterogeneous Black, Gray Non-fibrous Tightly Bound	80%	Silicates	20%	Binder	None Detected
<b>328-22A</b> A2648691	Spray-on Insulation (vermiculite Containing)	Heterogeneous Gold Fibrous Loosely Bound	88%	Vermiculite	3%	Binder	<b>7% Chrysotile 2% Tremolite</b>
<b>328-22B</b> A2648692	Sample Not Analyzed per COC						
<b>328-22C</b> A2648693	Sample Not Analyzed per COC						
<b>328-23A</b> A2648694	Wall Adhesive	Homogeneous Tan Fibrous Bound	5%	Cellulose	95%	Mastic	None Detected
<b>328-23B</b> A2648695	Wall Adhesive	Homogeneous Tan Fibrous Bound	5%	Cellulose	95%	Mastic	None Detected
<b>328-24A</b> A2648696	Insulation	Heterogeneous Brown Fibrous Loose	100%	Cellulose			None Detected

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 Farmington Hills, MI 48335

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**Project:** 0166-1046-1-5; City of Muskegon - 328 E. Larch Avenue

## ASBESTOS BULK PLM, EPA 600 METHOD

Client ID Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS			ASBESTOS %
			Fibrous	Non-Fibrous		
<b>328-24B</b> A2648697	Insulation	Heterogeneous Brown Fibrous Loose	100%	Cellulose		None Detected
<b>328-25A</b> A2648698	Ceiling Tile	Heterogeneous White, Yellow Fibrous Bound	80%	Fiberglass	20% Vinyl	None Detected
<b>328-25B</b> A2648699	Ceiling Tile	Heterogeneous White, Yellow Fibrous Bound	80%	Fiberglass	20% Vinyl	None Detected
<b>328-26A</b> A2648700A	Floor Tile	Homogeneous Gray Non-fibrous Bound			80% Vinyl 20% Binder	None Detected
A2648700B	Adhesive	Homogeneous Yellow Non-fibrous Bound			100% Mastic	None Detected
A2648700C	Floor Tile	Homogeneous Gray Non-fibrous Bound			80% Vinyl 20% Binder	None Detected
A2648700D	Adhesive	Homogeneous Yellow Non-fibrous Bound			100% Mastic	None Detected

# ASBESTOS BULK ANALYSIS

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**Project:** 0166-1046-1-5; City of Muskegon - 328 E. Larch Avenue

## ASBESTOS BULK PLM, EPA 600 METHOD

Client ID Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS				ASBESTOS %
			Fibrous		Non-Fibrous		
A2648700E	Sheet Flooring	Heterogeneous Off-white, Yellow Fibrous Bound	30%	Cellulose	40%	Vinyl 30% Tar	None Detected
<b>328-26B</b> A2648701A	Floor Tile	Homogeneous Gray Non-fibrous Bound			80%	Vinyl 20% Binder	None Detected
A2648701B	Adhesive	Homogeneous Yellow Non-fibrous Bound			100%	Mastic	None Detected
A2648701C	Floor Tile	Homogeneous Gray Non-fibrous Bound			80%	Vinyl 20% Binder	None Detected
A2648701D	Adhesive	Homogeneous Yellow Non-fibrous Bound			100%	Mastic	None Detected
A2648701E	Sheet Flooring	Heterogeneous Off-white, Yellow Fibrous Bound	30%	Cellulose	40%	Vinyl 30% Tar	None Detected
<b>328-27A</b> A2648702A	Sheet Flooring	Heterogeneous Beige, Yellow Fibrous Bound	30%	Cellulose	40%	Vinyl 30% Tar	None Detected



CEI

# ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

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37483 Interchange Dr.  
Farmington Hills, MI 48335

**Lab Code:** A18-3848  
**Date Received:** 03-08-18  
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**Date Reported:** 03-12-18

**Project:** 0166-1046-1-5; City of Muskegon - 328 E. Larch Avenue

## ASBESTOS BULK PLM, EPA 600 METHOD

Client ID Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS				ASBESTOS %
			Fibrous		Non-Fibrous		
A2648702B	Adhesive	Homogeneous Red Non-fibrous Bound			100%	Mastic	None Detected
<b>328-27B</b> A2648703A	Sheet Flooring	Heterogeneous Beige, Yellow Fibrous Bound	30%	Cellulose	40%	Vinyl	None Detected
					30%	Tar	
A2648703B	Adhesive	Homogeneous Red Non-fibrous Bound			100%	Mastic	None Detected
<b>328-28A</b> A2648704A	Shingle	Heterogeneous Black Fibrous Bound	15%	Cellulose	50%	Tar	None Detected
			5%	Fiberglass	30%	Gravel	
A2648704B	Tarpaper	Homogeneous Black Fibrous Bound	50%	Cellulose	50%	Tar	None Detected
<b>328-28B</b> A2648705A	Shingle	Heterogeneous Black Fibrous Bound	15%	Cellulose	50%	Tar	None Detected
			5%	Fiberglass	30%	Gravel	
A2648705B	Tarpaper	Homogeneous Black Fibrous Bound	50%	Cellulose	50%	Tar	None Detected

# ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

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 37483 Interchange Dr.  
 Farmington Hills, MI 48335

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**Date Reported:** 03-12-18

**Project:** 0166-1046-1-5; City of Muskegon - 328 E. Larch Avenue

## ASBESTOS BULK PLM, EPA 600 METHOD

Client ID	Lab	Lab	NON-ASBESTOS COMPONENTS				ASBESTOS
Lab ID	Description	Attributes	Fibrous			Non-Fibrous	%
<b>328-29A</b> A2648706	Sheet Flooring	Heterogeneous Green Fibrous Bound	30%	Cellulose	40%	Vinyl Tar	None Detected
Lab Notes: *No Adhesive							
<b>328-29B</b> A2648707	Sheet Flooring	Heterogeneous Green Fibrous Bound	30%	Cellulose	40%	Vinyl Tar	None Detected
Lab Notes: *No Adhesive							

---

---

**LEGEND:**    Non-Anth        = Non-Asbestiform Anthophyllite  
                 Non-Trem        = Non-Asbestiform Tremolite  
                 Calc Carb        = Calcium Carbonate

---

**METHOD:** EPA 600 / R93 / 116 and EPA 600 / M4-82 / 020

---

**REPORTING LIMIT:** <1% by visual estimation

---

**REPORTING LIMIT FOR POINT COUNTS:** 0.25% by 400 Points or 0.1% by 1,000 Points

---

**REGULATORY LIMIT:** >1% by weight

---

Due to the limitations of the EPA 600 method, nonfriable organically bound materials (NOBs) such as vinyl floor tiles can be difficult to analyze via polarized light microscopy (PLM). EPA recommends that all NOBs analyzed by PLM, and found not to contain asbestos, be further analyzed by Transmission Electron Microscopy (TEM). Please note that PLM analysis of dust and soil samples for asbestos is not covered under NVLAP accreditation. Estimated measurement of uncertainty is available on request.

This report relates only to the samples tested or analyzed and may not be reproduced, except in full, without written approval by Eurofins CEI. Eurofins CEI makes no warranty representation regarding the accuracy of client submitted information in preparing and presenting analytical results. Interpretation of the analytical results is the sole responsibility of the client. Samples were received in acceptable condition unless otherwise noted. This report may not be used by the client to claim product endorsement by NVLAP or any other agency of the U.S. Government.

**ANALYST:** \_\_\_\_\_

  
Danielle Carrier

**APPROVED BY:** \_\_\_\_\_

  
Tianbao Bai, Ph.D., CIH  
Laboratory Director

**APPENDIX C – ASBESTOS BULK SAMPLE LOG/CHAIN OF CUSTODY**



45749 Helm Street,  
Plymouth, Michigan 48170  
Phone: 734-453-7900

### CHAIN OF CUSTODY

(63) A18-3848  
A2648645  
8707

Client Name: City of Muskegon - Planning Department  
Address: 933 Terrace Street, Room 202  
City, St., Zip: Muskegon, MI 49440  
Phone/Fax: 0

Date of Survey: 6-Mar-18  
Project Name: City of Muskegon - 328 E. Larch Avenue  
Project Number: 0166-1046-1-5  
Contact Person: Jim Boland/Nick George/Matt Sherrard

ARS/MF

**TURN AROUND TIME**

**Analytical Method(s) Requested:**

Rush		24 Hour		Asbestos:	Bulk	X	Wipe		Pnt. Cnt.		PCM	
48 Hour	X	72 Hour		Lead:	Bulk		Wipe		Air		Paint	Soil
Other		TTP	X	Mold:	Bulk		Tape		BioCell		BioSis	Other
				TEM:	AHERA	7400		Bulk/NOB		EPA	Level II	

Lab ID#	Client ID #	Material/Description	Volume	Area	Results
	328-1A-B	Vapor Barrier (Brown)			
	328-2A-B	Exterior Sealant (Gray/White)			
	328-3A-B	Roof Flashing (Black)			
	328-4A-B	Asphaltic Paper (Black)			
	328-5A-B	Drywall/Joint Compound/Tape (White)			
	328-6A-B	Window Glaze (White)			
	328-7A-E	Plaster w/Skimcoat (White)			
	328-8A-B	Wall Adhesive (Tan)			
	328-9A-B	12"x12" Floor Tile w/Adhesive (Gray)			
	328-10A-B	Floor Sheeting w/Adhesive (Black/Beige/Red)			
	328-11A-B	12"x12" Floor Tile w/Adhesive (Blue/Beige/Red)			
	328-12A-B	1'x1' Ceiling Tile (White)			
	328-13A-B	2'x4' Ceiling Tile (White)			
	328-14A-B	12"x12" Floor Tile w/Adhesive (Faux Wood)			
	328-15A-B	Wallboard w/Adhesive (Beige/Tan)			
	328-16A-B	Floor Sheeting w/Adhesive (White/Red)			
	328-17A-B	Wallboard w/Adhesive/Sheeting (White/Brown/Beige)			
	328-18A-B	Multi-Layered Floor Covering w/Adhesive (Red/Brown)			
	328-19A-C	Paper Duct Wrap (White)			
	328-20A-B	9"x9" Floor Tile w/Adhesive (Brown)			

By: [Signature]  
Date: 03/06/18

By: [Signature]  
Date: 3/8 0920

By: \_\_\_\_\_  
Date: \_\_\_\_\_

By: \_\_\_\_\_  
Date: \_\_\_\_\_



**APPENDIX D – PHOTOGRAPHIC LOG**

**Muskegon County Land Bank Authority – Identified Asbestos Materials**  
**328 Larch Avenue,**  
**Muskegon, Muskegon County, MI 49442**



Front View of Subject Property



Front View of Subject Building



Back View of Subject Building



Left View of Subject Building



Right View of Subject Building



Additional View of Subject Building

PSI Project Number:  
0166-1046-1-5

Prepared By:  
Diane Reid



**Muskegon County Land Bank Authority – Identified Asbestos Materials**  
**328 Larch Avenue,**  
**Muskegon, Muskegon County, MI 49442**



View of Asbestos Containing – Roof Flashing  
(Black)



View of Asbestos Containing – Paper Duct Wrap  
(White)



View of Asbestos Containing – 9"x9" Floor Tile  
w/Adhesive (Brown)



View of Asbestos Containing – Spray On  
Pipe Insulation (Beige)



## **APPENDIX E – ASBESTOS GLOSSARY OF TERMS**

## Asbestos Glossary of Terms

### **-A-**

**Abatement** – The encapsulation, enclosure, removal or repair of a material.

**ABIH** - American Board of Industrial Hygiene

**ACBM** - Asbestos-containing building material. Means surfacing ACM, thermal system insulation ACM, or miscellaneous ACM that is found in or on interior structural members or other parts of a building.

**ACM** - Asbestos Containing Material. Any material containing greater than 1% asbestos by weight.

**Acoustical Insulation** - The general application or use of asbestos for the control of sound due to its lack of reverberant surfaces.

**Acoustical Tile** - A finishing material in a building usually found in the ceiling or walls for the purpose of noise control.

**Adenocarcinoma** - A type of cancer that begins in the cells that line certain internal organs such as the lungs.

**Accessible** - When referring to ACM, the material is subject to disturbance by occupants or maintenance personnel in the course of their normal activities.

**Adequately Wet** - Sufficiently mix or penetrate with liquid to prevent the release of particulates. If visible emissions are observed coming from asbestos-containing material, then that material has not been adequately wet.

**Adjuvant therapy** - A supplemental treatment to the main medical procedure. This treatment usually comes in the form of radiation therapy or chemotherapy and is employed after surgery.

**Advanced Cancer** - The stages of cancer in which the disease has spread from its original location in the body.

**Aggressive Sampling** - Air sampling which takes place after final clean-up while the air is being physically agitated to produce an asbestos "worst case" scenario.

**Aggressive method** - Removal or disturbance of building material by sanding, abrading, grinding or other method that breaks, crumbles, or disintegrates intact ACM.

**AHERA** – The Asbestos Hazard Emergency Response Act (AHERA); Environmental Protection Agency (EPA), 40 CFR 763, Asbestos-Containing Materials in Schools

**AIB** - Asbestos Insulation Board. Used primarily for fire protection, thermal insulation, partitioning, and ducts (plenums).

**AIHA** - American Industrial Hygiene Association

**AIHA Accredited Laboratory** - A certification given by the AIHA to an analytical laboratory that has successfully participated in the "Proficiency Analytical Testing" program for quality control as established by the National Institute for Occupational Safety and Health. Airborne Asbestos Analysis: Determination of the amount of asbestos fibers suspended in a given amount of air.

**Airborne Asbestos Analysis** - Determination of the amount of asbestos fibers suspended in a given amount of air.

**Airborne Fiber Count Certificates** - These are Certificates issued following airborne asbestos analysis for a variety of purposes such as reassurance testing, asbestos works leak testing, and personal testing. See also Certificate of Re-Occupation

**Air Diffuser** - A device designed to disperse an air stream throughout a given area.

**Air Erosion** - The passage of air over friable ACM which may result in the release of asbestos fibers.

**Air Lock** - A system of enclosures consisting of two polyethylene curtained doorways at least three feet apart that does not permit air movement between clean and contaminated areas.

**Air Monitor** - An industrial hygienist or other qualified individual who collects air samples and monitors the asbestos abatement worksite.

**Air Monitoring** - The process of measuring the airborne fiber concentration of a specific quantity of air over a given amount of time.

**Air Plenum** - Any space used to convey air in a building or structure. The space above a suspended ceiling is often used as an air plenum.

**Algorithm** - A universally accepted procedure developed for the purpose of solving a particular problem. algorithms developed for asbestos provide a numerical index for evaluating a degree of hazard in a particular area. The Sawyer Algorithm and the Ferris Index are two, but neither are widely used today.

**Alveoli** - Located in clusters around the respiratory bronchi of the lungs, this is the area in which true respiration takes place.

**Ambient Air** - The surrounding air or atmosphere in a given area under normal conditions.

**Amended water** - Water to which a wetting agent has been added to increase the ability of the liquid to penetrate ACM.

**Amosite** - An asbestiform mineral of the amphibole group containing approximately 50% silicon and 40% iron (II) oxide, and is made up of straight, brittle fibers, light gray to pale brown in color.

**Amphibole Asbestos** - Asbestos characterized by straight fibers with a chain-like structure. Two common forms are amosite (brown) and crocidolite (blue).

**ANSI** - American National Standards Institute

**Appropriate Protective Clothing** - Protective outer clothing, which is worn by an individual who is engaged in an asbestos project regardless of the concentration of asbestos fibers in the air within the asbestos project. Protective clothing consists of coveralls or similar whole body covering, head covers and foot covers.

**Appropriate Respirator** - An appropriate air-purifying respirator providing protection against radionuclides and against dust, fumes and mists in air and which provide the following respiratory protection for airborne concentrations of asbestos fibers:

- Airborne concentration of asbestos **not in excess of one (1) fiber per cubic centimeter** shall require a half-mask air-purifying respirator, other than a disposable respirator, equipped with high-efficiency filters.
- Airborne concentration of asbestos **not in excess of five (5) fibers per cubic centimeter** shall require a full facepiece air-purifying respirator equipped with high-efficiency filters.
- Airborne concentration of asbestos **not in excess of ten (10) fibers per cubic centimeter** shall require a powered air purifying respirator equipped with high efficiency filters or a supplied-air respirator operated in continuous flow mode.
- Airborne concentration of asbestos **not in excess of one hundred (100) fibers per cubic centimeter** shall require a full facepiece supplied-air respirator operated in pressure demand mode.
- Airborne concentration of asbestos **greater than one hundred (100) fibers per cubic centimeter** shall require a full facepiece supplied air respirator operated in pressure demand mode equipped with an auxiliary positive pressure self-contained breathing apparatus.

**Appropriate Warning Sign** - A sign not less than eleven (11) inches wide which contains the equivalent of the following legend, printed in letters of sufficient size and contrast to be readily visible and legible: **DANGER ASBESTOS CANCER AND LUNG DISEASE HAZARD AUTHORIZED PERSONNEL ONLY RESPIRATORS AND PROTECTIVE CLOTHING ARE REQUIRED IN THIS AREA**

**Approved Asbestos Waste Disposal Site** - A solid waste disposal area that is operated under a permit issued by the State of Michigan Department of Environmental Quality and is authorized to receive asbestos containing solid wastes.

**Asbestiform** – Tending to separate into fibers having length to width ratios from 10:1 to over 100:1.

**Asbestiform Minerals** - Minerals which, due to their crystal structures and chemical composition, tend to be separated into fibers and can be classified as a form of asbestos.

**Asbestos** - Any of a group of commercially mined minerals that tend to break into fibers. The regulated asbestos minerals are the serpentine mineral chrysotile and the asbestiform varieties of the amphibole minerals grunerite (amosite), riebeckite (crocidilite), tremolite, actinolite and anthophyllite. Amphibole minerals occur in both the regulated, asbestiform varieties and the non-regulated, non-asbestiform varieties. The fibers are resistant to high temperatures, have high tensile strength, and in some cases can be woven into cloth.

**Asbestosis** - A chronic fibrosis of the lungs typically caused by prolonged, heavy exposures to asbestos, usually affecting miners, ship-builders and mill-workers. There are different scales of asbestosis but in the worst cases, it will restrict breathing and often be degenerative. It takes between 15 and 30 years for the disease to manifest following exposure to asbestos.

**Asbestos Abatement** - The encapsulation, enclosure, removal or repair of an asbestos containing material.

**Asbestos Cement** - A hard product that contains approx. 15% asbestos fibers which can be any of the three main types. This is a relatively low risk material provided that it remains intact. When used for roofing the risks to operatives can be greater from falls than asbestos exposure.

**Asbestos Consultant** - Any person who is contracted to provide professional health and safety services relating to asbestos-containing construction materials. The activities of an asbestos consultant include building inspection, abatement project design, contract administration, sample collection, preparation of asbestos management plans, clearance monitoring, and supervision of site surveillance technicians.

**Asbestos-containing Construction Material (ACM)** - Any manufactured construction material which contains more than one 1 percent asbestos by weight.

**Asbestos-containing Waste Materials** - Asbestos Mill tailings or any other waste materials that may contain commercial asbestos. This term includes filters from control devices, friable asbestos waste material, and bags or other similar packaging contaminated with commercial asbestos. As applied to demolition and renovation operations, this term also includes regulated asbestos-containing material waste and materials contaminated with asbestos including disposable equipment and clothing.

**Asbestos Control** - Minimizing the generation of airborne asbestos fibers until a permanent solution is developed.

**Asbestos Danger Label** - A label which contains the following legend, printed in letters of sufficient size and contrast to be readily visible and legible: **DANGER CONTAINS ASBESTOS FIBERS AVOID CREATING DUST CANCER AND LUNG DISEASE HAZARD**



**Asbestos Debris/Dust** - Pieces of ACM that can be identified by color, texture, or composition; or dust, if the dust is determined by an accredited laboratory to be ACM.

**Asbestos Encapsulation Project** - Activities, which include the coating of ACM surface material with a penetrating or bridging type of sealing material for the intended purpose of preventing the continued release of asbestos fibers from the material into the air. This definition shall not include the repainting of a previously painted non-friable ACM surface which is not damaged primarily for improving the appearance of such surface.

**Asbestos Enclosure Project** - Activities which physically isolate friable asbestos, and which control and contain fibers released from asbestos-containing material by constructing a permanent airtight barrier between the asbestos-containing material and the occupied building space.

**Asbestos Exposure Assessment System** - A decision tool which can be used to determine the extent of the asbestos hazard that exists in a building, and which can also be used to develop corrective actions.

**Asbestos Mill** - Any facility engaged in converting, or in any intermediate step in converting, asbestos ore into commercial asbestos. Outside storage of asbestos material is not considered a part of asbestos mill.

**Asbestos Occupation** - An inspector, management planner, project designer, project monitor, supervisor, or worker.

**Asbestos Pleural Disease** - A disease characterized specifically by scarring of the membranes lining the lungs and chest cavity.

**Asbestos Project** - An asbestos encapsulation project, an asbestos removal project, an asbestos enclosure project, an asbestos related demolition project or an asbestos related dismantling project, but shall not include any activities which affect three (3) square feet or less or three (3) linear feet or less of ACM on or in a structure or equipment or any appurtenances thereto, or (b) any activities physically performed by a homeowner, a member of the homeowner's family, or an unpaid volunteer on or in the homeowner's residential property of four units or less.

**Asbestos Related Demolition** - Activities which include the razing of all or a portion of a structure which contains friable ACM or other ACM which may become friable when cut, crushed, ground, abraded, pulverized, or burned.

**Asbestos Related Dismantling Project** - Activities which include the disassembly, handling and moving of the components of any structure or equipment which has been coated with ACM without first removing this material from the structure or from the equipment.

**Asbestos Regulations** – Federal, State, and Local laws which regulate including but not limited to, the handling, removal, disposal, disturbance, exposure, identification, etc. of asbestos containing materials and identify the work practices and procedures for industry and the responsibilities for employers.

**Asbestos Removal Project** - Activities, which include the physical removal of friable ACM from the surface of a structure or from equipment, which is intended to remain in place after the removal. Such project shall also include the physical removal of ACM from a structure or equipment after such structure or equipment has been removed as part of an asbestos related dismantling project.

**Asbestos-Related Work** - Any activity which by disturbing asbestos-containing construction materials may release asbestos fibers into the air and which is not related to its manufacture, the mining or excavation of asbestos-bearing ore or materials, or the installation or repair of automotive materials containing asbestos.

**Asbestos Standard** - Reference to the OSHA requirements in the general industry standards regarding asbestos exposure (29 CFR 1910.1001), and EPA National Emission Standard for Hazardous Air Pollutants (NESHAP) (40 CFR 61, subpart M).

**Asbestos Tailings** - Any solid waste that contains asbestos and is a product of asbestos mining or milling operations.

**Aspect Ratio** - The length of a fiber vs. its width.

**Atmospheres Immediately Dangerous to Life or Health (ADLH)** - A hazardous atmosphere to which exposure will result in serious injury or death in a matter of minutes, or cause serious delayed effects.

**Authorized person** - Any person authorized by the employer and required by work duties to be present in regulated areas.

## -B-

**Biopsy** - A tissue sample removed and analyzed to determine the presence of cancer cells.

**Blue Asbestos** - A fibrous, lavender-blue mineral which, although used less in construction and industry than other forms of asbestos, is more commonly associated with mesothelioma.

**Bridging Encapsulant** - The application of a sealant over the surface of asbestos-containing material to prevent the release of asbestos fibers.

**Bronchi** - Primary branches of the trachea (windpipe).

**Bulk Sample** - A sample of material such as boarding, insulation or debris taken by an accredited surveyor to be tested for asbestos fibre content by an accredited laboratory.

**Bronchogenic Cancer** - An abnormal cell growth in the primary branches or the trachea (windpipe).

**Bronchoscopy** - A procedure during which an examiner uses a viewing tube to evaluate a patient's lung and airways.

**Business Entity** - A partnership, firm, association, corporation, sole proprietorship, public entity or other public or private business concern involved in an asbestos project except an entity solely involved as a management planner or project designer.

## -C-

**Cancer** - A cellular tumor which normally leads to premature death of its host unless controlled.

**Carcinogen** - A substance that can cause cancer or help it grow.

**Category I Nonfriable Asbestos-Containing Material (ACM)** - Asbestos-containing packing, gaskets, resilient floor covering, and asphalt roofing products containing more than 1 percent asbestos as determined using the method specified in appendix A, subpart F, 40 CFR part 763, section 1, Polarized Light Microscopy.

**Category II Nonfriable ACM** - Any material, excluding Category I nonfriable ACM, containing more than 1 percent asbestos as determined by using the methods specified in appendix A, subpart F, 40 CFR part 763, section 1, Polarized Light Microscopy that when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.

**Cementitious** - A material that is typically a densely packed granular matrix of sand and limestone and is typically considered, non-friable.

**Certified Supervisor** - An individual who is capable of identifying asbestos hazards in the workplace and who has sufficient experience and authority to take prompt corrective measures to eliminate them.

**CFC REFRIGERANTS** – (Chlorofluorocarbon) is an organic compound that contains only carbon, chlorine, and fluorine, produced as a volatile derivative of methane, ethane, and propane. Found in air conditioners, refrigerators, freezers, and dehumidifiers.

**CFM** - Cubic feet per minute

**CFR** – The Code of Federal Regulations

**CHMM** – Certified Hazardous Materials Manager

**Chrysotile** - The technical name for white asbestos.

**CIH** - An industrial hygienist who has been granted certification by the American Board of Industrial Hygiene.

**Cilia** - Tiny hair-like structures in the windpipe and bronchi of the lung passages that help force undesirable particles and liquids up and out of the lungs.

**Class I asbestos work** - Activities involving the removal of thermal system insulation (TSI) and surfacing ACM and PACM. These types of activities will not be conducted by university employees.

**Class II asbestos work** - Activities involving the removal of ACM which is not thermal system insulation or surfacing material. This includes, but is not limited to, the removal of asbestos-containing wallboard, floor tile and sheeting, roofing and siding shingles, and construction mastics.

**Class III asbestos work** - Repair and maintenance operations, where "ACM" including TSI and surfacing ACM and PACM, is likely to be disturbed.

**Class IV asbestos work** - Maintenance and custodial activities during which employees contact but do not disturb ACM or PACM and activities to clean up dust, waste and debris resulting from Class I, II, and III activities.

**Clean Area** - The first stage of the decontamination enclosure system in which workers prepare to enter the work area.

**Clean Room** - An uncontaminated room having facilities for the storage of street clothing and uncontaminated materials and equipment.

**Clearance Criteria** – The specified and/or regulated upper limit of acceptability for asbestos air sample results.

**Closely Resemble** - The major workplace conditions which have contributed to the levels of historic asbestos exposure, and are no more protective than conditions of the current workplace.

**Commercial Asbestos:** Any material containing asbestos that is extracted from ore and has value because of its asbestos content.

**Competent Person** - One who has received specialized training and is capable of identifying asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure and has the authority to take prompt corrective measures to eliminate hazards.

**Contract Specifications (Asbestos Abatement Project Design)** - A set of contract documents/guidelines that a contractor must follow when conducting an asbestos abatement job.

**Critical Barrier**- One or more layers of plastic sealed over all openings into a work area or any other similarly placed physical barrier sufficient to prevent airborne asbestos from migrating to an adjacent area.

**Contaminated Items** - Any objects that have been exposed to airborne asbestos fibers without being sealed off or isolated.

**Containment Area** - A negative pressure asbestos project work area and decontamination facility configured so as to isolate asbestos project activities from areas, which are to remain uncontaminated.

**Control Curtain** - A closure device constructed of plastic sheeting not less than 6 mil thick and installed in an entryway into an area contaminated or to be contaminated with ACM. A control curtain is intended to restrict the movement of air into, and from, a contaminated area. This curtain consists of three constructed baffles that cover the entire area of the entryway and are fastened securely along the top of the entryway framework and along alternate sides in a manner that will require individuals to walk the entire width of the entryway between adjacent baffles as they pass around the three panels.

**Crocidolite** - The technical name for blue asbestos.

**Curtained Doorway** - A device to allow ingress or egress from one room to another while permitting minimal air movement between the rooms, typically constructed by placing two overlapping sheets of plastic over an existing or temporarily framed doorway, securing each along the top of the doorway, securing the vertical edge of one sheet along one vertical side of the doorway and securing the vertical edge of the other sheet along the opposite side of the doorway.

**Cutting** - Penetrating with a sharp-edged instrument and includes sawing, but does not include shearing, slicing, or punching.

## -D-

**Damaged Friable Miscellaneous ACM** - Friable miscellaneous ACM which has deteriorated or sustained physical injury such that the internal structure (cohesion) of the material is inadequate or, if applicable, which has delaminated such that its bond to the substrate (adhesion) is inadequate or which for any other reason lacks fiber cohesion or adhesion qualities. Such damage or deterioration may be illustrated by the separation of ACM into layers; separation of ACM from the substrate; flaking, blistering, or crumbling of the ACM surface; water damage; significant or repeated water stains, scrapes, gouges, mars or other signs of physical injury on the ACM. Asbestos debris originating from the ACM in question may also indicate damage.

**Damaged Friable Surfacing ACM** - Friable surfacing Asbestos Containing Material which has deteriorated or sustained physical injury such that the internal structure (cohesion) of the asbestos material is inadequate or which has delaminated such that its bond to the substrate (adhesion) is inadequate, or which, for any other reason, lacks fiber cohesion or adhesion qualities. Such damage or deterioration may be illustrated by the separation of ACM into layers; separation of ACM from the substrate; flaking, blistering,, or crumbling of the ACM surface; water damage; significant or repeat water stains, scrapes, gouges, mares or other signs of physical injury on the ACM. Asbestos debris originating from the ACM in question may also indicate damage.

**Damaged or Significantly Damaged Thermal System Insulation ACM** - Thermal system insulation ACM on pipes, boilers, tanks, ducts, and other thermal system insulation equipment where the insulation has lost its structural integrity, or its covering, in whole or in part, is crushed, water stained, gouged, punctured, missing, or not intact such that it is not able to contain fibers. Damage may be further illustrated by occasional punctures, gouges or other signs of physical injury to ACM; occasional water damage on the protective coverings/jackets; or exposed ACM ends or joints. Asbestos debris originating from the ACM in question may also indicate damage.

**Decontamination** - A series of connected rooms with polyethylene enclosure system curtained doorways for the purpose of preventing contamination of areas adjacent to the work area.

**Decontamination Area** - An enclosed area adjacent and connected to the regulated area and consisting of an equipment room, shower area, and clean room, which is used for the decontamination of workers, materials, and equipment contaminated with asbestos.

**Decontamination Facility** - That portion of the containment area containing an equipment room, shower facility and a clean change room.

**Decortication** - The removal of the constricting layer of abnormal tissue from the surface of the lung

**Delaminate** - To separate into layers. In asbestos terms, to separate from the substrate.

**Demolition** - The wrecking, razing, or removal of any structure or load-supporting structural item of any structure, including any related material handling operations, and includes the intentional burning of any structure.

**Diffuse pleural thickening** - The widespread thickening of the pleura as a result of exposure to asbestos.

**Dirty Area** - Any area in which the concentration of airborne asbestos fibers exceeds 0.01 f/cc, or where there is visible asbestos residue.

**Dispersion Staining** - Used in conjunction with polarized light to identify bulk samples. A particle (fiber) identification technique based on the difference between light dispersion of a particle (fiber) and liquid medium in which it is immersed.

**Disturbance** - Activities that disrupt, crumble, or generate visible debris from ACM or PACM. Disturbance includes cutting away small amounts of ACM and PACM that can be contained in one standard sized glove bag or waste bag in order to access a building component.

**Duct Tape** - Heavy gauge tape capable of sealing joints or adjacent sheets of polyethylene.

**Dust Mask** - Single use or disposable dust respirator with a low protection factor, not suitable for protection against asbestos fibers.

**Dyspnoea** - Breathlessness, possibly caused by asbestos damage to the lungs

**Dyspnoeic** - Breathless, possibly due to lung damage caused by asbestos

## -E-

**Eight-Hour (8) Time Weighted Average (TWA)** – A measure of the varying exposure concentrations encountered in an eight-hour day.

**Electron Microscopy** - A method of asbestos sample analysis which utilizes an electron beam to differentiate between fibers.

**Emergency Renovation Operation** - A renovation operation that was not planned but results from a sudden, unexpected event that, if not immediately attended to, presents a safety or public health hazard, is necessary to protect equipment from damage, or is necessary to avoid imposing an unreasonable financial burden. This term includes operations necessitated by nonroutine failures of equipment.

**Employee Exposure** - That exposure to airborne asbestos that would occur if the employee were not using respiratory protective equipment.

**Employee Notification** - Informing employees or building occupants if asbestos is present in the building, also informing them of the hazards associated with asbestos exposure, what is being done to eliminate the problem, etc.

**Employer's Liability** - Legal responsibility imposed on an employer requiring him/her to pay damages to an injured employee.

**Encapsulant (sealant)** - A substance applied to asbestos-containing material which controls the release of airborne asbestos-fibers.

**Encapsulation** - The treatment of ACM with a material that surrounds or embeds asbestos in an adhesive matrix to prevent the release of Asbestos fibers, as the encapsulant creates a membrane over the surface (bridging encapsulant) or penetrates the material and binds its components together (penetrating encapsulant).

**Enclosure** - An area that is sealed off with an artificial barrier for the purpose of abatement activities.

**Environmental Consultant** - Any person (including partnership, firm, association, corporation, sole proprietorship, or other private business concern) who is contracted to provide professional health and safety services relating to asbestos-containing construction materials and other hazardous/regulated materials. The activities of a Consultant may include site survey and inspection, abatement project design, contract administration, sample collection, preparation of asbestos management plans, post-abatement verification, clearance monitoring, and supervision of site surveillance technicians.

**EPA** - Environmental Protection Agency; a federal government agency dealing with environmental regulations; 401 M Street, S.W., Washington, D.C. 20460.

**EPA Regulations** - Regulatory standards which cover emissions into the outside environment from a workplace and disposal of hazardous wastes from job sites, as well as, asbestos issues in school buildings.

**Equipment or Equipment Item** - An item that is designed or intended to perform an operation and includes any attached item which assists in the operation.

**Equipment Room (change room)** - A contaminated room located within the decontamination area that is supplied with impermeable bags or containers for the disposal of contaminated protective clothing and equipment.

## -F-

**Fabricating** - Any processing (e.g. cutting, sawing, drilling) of a manufactured product that contains commercial asbestos, with the exception of processing at temporary sites (field fabricating) for the construction or restoration of facilities. In the case of friction products, fabricating includes bonding, debonding, grinding, sawing, drilling, or other similar operations performed as part of fabricating.

**Facepiece** - The portion of a respirator which covers the wearer's nose, mouth, and eyes in a full facepiece.

**Fallout** - The intermittent release of fibers which occurs as a result of weakened bonds in the material, or because of deterioration.

**f/cc** - Fibers per cubic centimeter; reporting units for PCM analyses.

**Fiber** - An observed structure that is, 5 micrometers or longer, with a length-to-width ratio of at least 3 to 1.

**Fiber Release** - The actual generation of airborne fibers from an asbestos-containing material, in the form of dust.

**Fiber Release Episode/Event** - Any uncontrolled or unintentional disturbance of ACBM resulting in visible emission.

**Fibrosis** - The development of excessive scar-like fibrous tissue. Punctures caused by asbestos fibers can lead to fibrous scar tissue build-up in the lungs.

**Fibrous** - Composed almost entirely of fibers.

**Final Clearance** - The process of conducting a visual inspection and final air clearance sample collection and the accompanying documentation.

**Final Clearance Air Sample Collection** - The process of collect final air samples to verify that the air within an asbestos work area meets or exceeds the specified and/or regulated clearance criteria for the project.

**Fireproofing** - Spray or trowel applied fire resistant materials.

**First Positive Stop (FPS) or Test Till Positive (TTP) Sample Analysis** - A bulk sample direction given to the laboratory by the asbestos surveyors to instruct the laboratory to stop analyzing multiple samples of the same material after the first sample comes back positive for asbestos. This is most typically utilized to minimize costs.

**Friable** - Any material that, when dry, may be crumbled, pulverized, or reduced to powder by hand pressure, and includes previously nonfriable material after such previously nonfriable material becomes damaged to the extent that when dry it may be crumbled, pulverized, or reduced to powder by hand pressure.

**Friable Asbestos** - Any material containing more than 1 percent asbestos as determined using Polarized Light Microscopy, that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure. If the asbestos content is less than 10 percent as determined by a method other than point counting by

polarized light microscopy (PLM), verify the asbestos content by point counting using PLM.

**Fugitive Source** - Any source of asbestos emissions not controlled by an air pollution control device.

**Full Facepiece Respirator** - A respirator which covers the wearer's entire face from the hairline to below the chin.

**Functional Space** - A room, group of rooms, or homogeneous area (including crawl spaces or the space between a dropped ceiling and the floor or roof deck above) designated by a person accredited to prepare management plans, design asbestos abatement projects, or conduct asbestos response actions.

**Furnishings** – Any removable furniture, draperies, floor coverings, and decorative items.

## -G-

**Glove bag** - A manufactured or fabricated device consisting of a bag constructed of a minimum thickness of 6 mil plastic or other impervious material, two inward-projecting long-sleeve gloves impervious to asbestos fibers, one inward-projecting water-wand sleeve, and an attached, labeled receptacle for asbestos waste. The glove bag is constructed and installed in such a manner that it surrounds the object or area to be decontaminated and contains the asbestos fibers released during the removal process. The glove bag may be modified to accommodate other tools and work practices as long as it remains sealed.

**Glove-box (bag)** - Plastic enclosure placed around a specific operation such as a valve to contain small areas of materials for asbestos removal.

**Grade D Breathing Air** - An air supply that contains 19 1/2 - 23 1/2% oxygen on a volumetric basis, not more than 10 volumes of carbon monoxide or 1,000 volumes of carbon dioxide per million volumes of air, not more than 5 milligrams of condensed hydrocarbons per cubic meter of air and no objectionable odors.

**Grinding** - To reduce to powder or small fragments and includes mechanical chipping or drilling.

**Ground Fault Circuit Interrupter** - A circuit breaker that is sensitive to very low levels of current leakage from a fault in an electrical system.

**Ground Fault Interrupter** - A device which automatically de-energizes any high voltage system component which has developed a fault in the ground line.

## -H-

**Half-Face Negative Pressure Respirator** - A respirator which covers one-half of the wearer's face and relies on a sweat seal and air control valves to create negative pressure and is typically equipped with filter capable of screening out 99.97% of all particles larger than 0.3 microns.

**HAZWOPER** - (Hazardous Waste Operations and Emergency Response) is a set of guidelines produced and maintained by the Occupational Safety and Health Administration which regulates hazardous waste operations and emergency services in the United States and its territories.

**HEPA** - High Efficiency Particulate Air (Air Filter). A filter capable of trapping and retaining at least 99.97 percent of all monodispersed particles of 0.3 micrometers in diameter or larger.

**HEPA Filtered Vacuum** - A high efficiency particulate air (HEPA) filtered vacuum capable of trapping and retaining 99.97% of all particulates larger than 0.3 microns.

**HID** - (High-Intensity Discharge) are a type of electrical gas-discharge lamp which produces light, This tube is filled with both gas and metal salts.

**Homogeneous** - Evenly mixed and similar in appearance and texture throughout.

**Homogeneous Area** - An area of surfacing material, thermal system insulation material, or miscellaneous material that is uniform in color and texture.

**Homogeneous Material** - A material that consists of uniform composition throughout. It is a material that is characterized by its inability to be separated mechanically into different materials.

**HVAC System** - Heating, Ventilation, and Air Conditioning system usually found in large business and industry facilities.

-|-

**In Poor Condition** - The binding of the asbestos containing material is losing its integrity as indicated by peeling, cracking, or crumbling of the material.

**Inactive Waste Disposal Site** - Any disposal site or portion of it where additional asbestos-containing waste material has not been deposited within the past year.

**Incident** - Any unanticipated event which causes, or is immediately likely to cause, an exposure of an employee, unprotected by an appropriate respirator, to asbestos fibers in excess of the PEL and/or excursion limit.

**Industrial Hygienist** - A professional qualified by education, training, and experience to recognize, evaluate, and develop controls for occupational health hazards.

**Installation** - Any building or structure or any group of buildings or structures at a single demolition or renovation site that are under the control of the same owner or operator (or owner or operator under common control).

**Infarction** - Death of tissue from loss of blood supply.

**Inspector** - An individual who is trained and licensed by the appropriate local, state or federal Department to identify and assess the condition of ACM. Inspectors shall perform their duties in accordance with the techniques, knowledge, training and responsibilities outlined in the appropriate OSHA and EPA regulations.

**Instructor** - An individual who is approved by the department to teach an asbestos-related training course.

**Intact** - ACM that has not been crumbled, pulverized, or otherwise deteriorated.

## **-J, K, L-**

**Latency period** - The time elapsed from exposure to a carcinogen to the onset of disease. The latency period between exposure to asbestos to development of mesothelioma can last from 10 to 40 years.

**Leak-tight** - Solids or liquids cannot escape or spill out. It also means dust-tight.

**License** - An authorization issued by the appropriate local, state or federal Department permitting a business entity to engage in an asbestos project.

**Lobes** - Divisions of the lung, there being three lobes on the right and two on the left.

**Local Education Agency (LEA)** - (1) Any local educational agency as defined in section 198 of the Elementary and Secondary Education Act of 1965 (20 U.S.C. 3381). (2) The owner of any nonpublic, nonprofit elementary, or secondary school building. (3) The governing authority of any school operated under the defense dependents' education system provided for under the Defense Dependents' Education Act of 1978 (20 U.S.C. 921, et seq.).

**Local Exhaust Ventilation** - The mechanical removal of air contaminants from a point of operation.

**Logbook** - An official record of all activities which occurred during a removal project.

**Lung cancer** - Lung cancer is a malignant tumour or tumours that obstruct the airways. Although the relationship between lung cancer and asbestos is uncertain, it is widely accepted that lung tumours are seen in those who were heavily exposed to asbestos and who were also smokers.

## -M-

**Make-up Air** - Supplied or recirculated air to offset the air that has already been exhausted from an area.

**Malfunction** - Any sudden and unavoidable failure of air pollution control equipment or process equipment or of a process to operate in a normal or usual manner so that emissions of asbestos are increased. Failures of equipment shall not be considered malfunctions if they are caused in any way by poor maintenance, careless operation, or any other preventable upset conditions, equipment breakdown, or process failure.

**Management Planner** - An individual who is trained and licensed in and by the State where the work is taking place to assess the hazard of materials containing asbestos, to determine the appropriate response actions and to write management plans.

**Manometer** – An instrument used to measure the pressure of gas.

**Manufacturing** - The combining of commercial asbestos, or in the case of woven friction products, the combining of textiles containing commercial asbestos-with any other material(s), including commercial asbestos, and the processing of this combination into a product. Chlorine production is considered a part of manufacturing.

**Medical Examinations** - An evaluation of a person's health status conducted by a medical doctor.

**Medical History** - A record of a person's past health record, including all the hazardous materials that they have been exposed to and also any injuries or illnesses which might dictate their future health status.

**MCE** - Mixed Cellulose Ester. One of several different types of materials used as collection media to collect asbestos air samples.

**MDLEG** – The Michigan Department of Labor and Economic Growth.

**Mesothelial Cells** - Cells of the pleura. These produce the fluid that usually fills the gap between the parietal and visceral layers of pleura. These cells sometimes become cancerous producing the condition 'Mesothelioma'

**Mesothelioma** - A rare cancer, usually found in those exposed to asbestos, in the form of a malignant tumor in the mesothelium of the lungs and or abdomen. Symptoms of this incurable disease are persistent coughing or coughing of blood, chest or abdomen pain, fatigue, and weight loss. The time between exposure to asbestos and onset of the disease is between 15 and 60 years.

**Mesothelium** - The tissue that forms a lining around the chest, abdominal cavity and other organs. This tissue produces a lubricant fluid that protects organs and allows them to move.

**Metaplasia** - Abnormal cell structure not quite reaching the level required to allow classification of the cell as malignant.

**Method Statement** - The method by which the Licensed Removal Contractor will remove and dispose of the ACMs.

**MDEQ** - (Michigan Department of Environmental Quality) is the agency of the U.S. state of Michigan.

**Micron** - One millionth of a meter.

**Mil** - Prefix meaning one-thousandth.

**Millimeter** - One-thousandth of a meter.

**Mineral Wool** - A commonly used substitute for asbestos.

**MIOSHA** - (Michigan Occupational Safety and Health Administration) is a state government agency that regulates workplace safety and health in the U.S. state of Michigan.

**Miscellaneous ACM** - Miscellaneous material that is an 'asbestos containing material' in a building.

**Miscellaneous Material** - Interior building material on structural components, structural members or fixtures, such as floor and ceiling tiles, and does not include surfacing material or thermal system insulation.

**Modification** - A changed or altered procedure, material or component of a system, which replaces a procedure, material or component of a required system. Omitting a procedure or component, or reducing or diminishing the strength of a material or component of the system is not a modification.

**MSDS** - Material Safety Data Sheet

**Mucosa** - The inner lining of a hollow organ, for example the inner lining of the bronchus

## -N-

**Negative Initial Exposure Assessment** - A demonstration by the employer, that employee exposure during an operation is expected to be consistently below the PELs.

**Negative Pressure** - An atmosphere created in a work area enclosure such that airborne fibers will tend to be drawn through the filtration system rather than leak out into the surrounding areas. The air pressure inside the work area is less than that outside the work area.

**Negative Pressure Enclosure** – A containment system (enclosure) erected to maintain an atmosphere where the air pressure inside the work areas is less than that outside the work area as measured by a manometer. The EPA requires a constant negative pressure of 0.02 inches as measured on the water column (of a manometer).

**NESHAP** – The National Emission Standard for Hazardous Air Pollutants; 40 CFR 61, Subpart M-National Emission Standard for Asbestos.

**NIOSH** – The National Institute for Occupational Safety and Health.

**NIOSH 7400 Method** – The analytical method utilized by onsite industrial hygienists conducting air monitoring/air sample collection/analysis, and fiber counting.

**NIOSH/MSHA** - The official approving agencies for respiratory protective equipment.

**NIST** - (National Institute of Standards and Technology) a unit of the U.S. Commerce Department and promotes and maintains measurement standards.

**Non-Friable** - Material which when dry may not be crumbled, pulverized, or reduced to powder by hand pressure.

**Non-Friable Asbestos Containing Material (Non Friable ACM)** - Any material containing more than 1 percent asbestos as determined using Polarized Light Microscopy, that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.

**Non-scheduled Renovation Operation** - A renovation operation necessitated by the routine failure of equipment, which is expected to occur within a given period based on past operating experience, but for which an exact date cannot be predicted.

**Notification Period** – State and federal requirements identify a ten working day notification period prior to the initiation of any abatement work on asbestos in regulated amounts.

**NREPA** - (Natural Resources and Environmental Protection Act) an act protect the environment and natural resources of the state.

**Numerical Value** - Refers to the types and percentages of asbestos present in a given sample.

**NVLAP** - (National Voluntary Laboratory Accreditation Program) a federal program run by the National Institute of Standards and Technology that provides third-party accreditation to laboratories in the U.S.

**-O-**

**Operations and Maintenance Program** - A program of work practices to maintain friable ACM in good condition, ensure clean up of asbestos fibers previously released, and prevent further release by minimizing and controlling friable ACM disturbance or damage.

**OSHA** – The Occupational Health and Safety Administration.

**Outside Air** - The air outside a building and/or structure.

**Owner or Operator of a Demolition or Renovation Activity** - Any person who owns, leases, operates, controls, or supervises the facility being demolished or renovated or any person who owns, leases, operates, controls, or supervises the demolition or renovation operation, or both.

## -P-

**Particulate Asbestos Material** - Finely divided particles of asbestos or material containing asbestos.

**PAT Samples** - Proficiency Analytical Testing of asbestos samples conducted through NIOSH for laboratories involved with the analysis of asbestos samples.

**PACM (presumed asbestos containing material)** - Thermal system insulation and surfacing material found in buildings constructed before 1980.

**PCB** - (Polychlorinated Biphenyl) PCBs may be present in older fluorescent light fixtures installed in any building before 1975.

**PCM** – Polarized Light Microscopy; typically utilized in onsite asbestos air monitoring projects as specified by the NIOSH 7400 method.

**PEL** – Permissible Exposure Limit (as set by OSHA); the asbestos PEL is 0.1 f/cc as an eight (8) hour time weighted average.

**Penetrating Encapsulant** - Liquid material applied to asbestos-containing material to control airborne fiber release by penetrating into the material and binding its components together.

**Peritoneal Mesothelioma** - Cancer caused by inhaled asbestos fibers that affects the membrane lining the abdomen.

**Peritoneum** - The lining between your bowel and the abdominal and pelvic cavity

**Permissible Exposure Limit (PEL)** - OSHA –mandated limits for employee exposure: 0.1 fibers/cc over 8-hour time weighted average (TWA) and no greater than 1.0 fibers/cc over any 30-minute period (excursion limit).

**Personal Protection** - Notification and instruction of all workers prior to the beginning of a project as to the hazards associated with the job and what they can do to protect themselves from these hazards.

**Personal Protective Equipment (PPE)** - Equipment worn to protect a worker from exposure to, or contact with, any harmful material or force. Such as overalls, masks, gloves, safety glasses, steel-toed boots, hearing protection, cool collars, etc.

**Personal Sample** - An air sample taken in the breathing zone of a person. Typically required by OSHA with the sampling pump directly attached to the worker with the collecting filter placed in the worker's breathing zone.

**Physician** - Means a person authorized to practice medicine and surgery or osteopathic medicine and surgery in the jurisdiction where a physical examination is required in accordance with the appropriate regulatory requirements of the State and/or the Federal Regulations governing these requirements.

**Plan of Works** - The plan by which the licensed asbestos removal contractor will set out the transit routes, location of skip, enclosure, location of Negative Pressure Unit etc.

**Planned Renovation Operations** - A renovation operation, or a number of such operations, in which some RACM will be removed or stripped within a given period of time and that can be predicted. Individual nonscheduled operations are included if a number of such operations can be predicted to occur during a given period of time based on operating experience.

**Pleura** - A thin, transparent double membrane that covers the lungs and lines the inside of the chest walls. There are two layers of this membrane. The inner (visceral) layer of the pleura is attached to the lungs and the outer (parietal) layer is attached to the chest wall. The pleural membranes prevent the lung from making direct contact with the chest wall and the diaphragm. Also referred to as the "serous coat"

**Pleural Cavity** - The closed space within the chest walls that houses the lungs.

**Pleural Effusion** - Abnormal collection of fluid in the pleural space between the lung and the chest wall.

**Pleural Mesothelioma** - Cancer caused by inhaled asbestos fibers that affects the membrane lining the lungs and chest cavity.

**Pleural Plaques** - Even superficial contact with asbestos can cause Pleural plaques, which are inflamed and scarred areas of the lung lining. Sometimes this will be asymptomatic, although in severe cases, they will cause pain, difficulty in breathing and anxiety.

**Polarized Light Microscopy (PLM)** - An optical microscopic technique used to distinguish between different types of asbestos fibers by their shape and unique optical properties.

**Polyethylene** - Plastic sheeting which is often used to seal off an area in which asbestos removal is taking place for the purpose of preventing contamination of other areas.

**Posting** - Refers to caution or warning signs which should be posted in any area in which asbestos removal is taking place, or where airborne fiber levels may present a health hazard.

**Potential Damage** - Circumstances under which friable Asbestos Containing Building Materials (ACBM) is in an area regularly used by building occupants, including maintenance personnel, in the course of their normal activities. Or where there are indications that there is a reasonable likelihood that the material or its covering will become damaged, deteriorated, or delaminated due to factors such as changes in building use, changes in operations and maintenance practices, changes in occupancy, or recurrent damage.

**Potential Significant Damage** - A potential damage scenario in which the asbestos is subject to major or continuing disturbance, due to factors including,

but not limited to accessibility or, under certain circumstances, vibration or air erosion.

**P.P.E.** - Personal Protective Equipment worn to protect a worker from exposure to, or contact with, any harmful material or force. Such as overalls, masks, gloves, safety glasses, steel-toed boots, hearing protection, cool collars, etc.

**Pre-Construction Conference** - A meeting held before any work begins between the contractor and the building owner at which time the job specifications are discussed and final details of the work are clarified.

**Pre-Employment Physical** - Complete medical examination of an employee before the job begins to determine whether or not he/she is fit to perform the functions of their employment.

**Preventive Measures** - Actions taken to reduce disturbance of ACM or otherwise eliminate the reasonable likelihood of the asbestos material becoming damaged or significantly damaged.

**Project Designer** - An individual who is certified by the Department to formulate plans and write specifications for conducting asbestos projects.; a person who has successfully completed the training requirements for an abatement project designer established by 40 U.S.C. Sec. 763.90(g).

**Project Monitor** - An individual who is certified by the department to observe abatement activities performed by contractors, to represent the building owner to ensure work is completed according to specifications and in compliance with statutes and regulations, and to perform air monitoring to determine final clearance.

**Project Review** - Review of a licensed business entity's proposed asbestos project.

**Properly Trained/Protected Personnel** - Individuals who possess a valid State of Michigan Asbestos Worker or, Contractor/Supervisor License, are under a suitable (per OSHA requirements) medical surveillance program, utilize appropriate PPE per all applicable state and federal standards and have met current training requirements.

**Protection factor** - Degree of protection from asbestos fiber inhalation provided by the respirator, determined by dividing the airborne fiber concentration outside of the mask by the concentration inside the mask

**Protective Clothing** - Protective, lightweight garments worn by workers performing asbestos abatement to keep gross contamination off the body.

**Public Entity** - A state agency, political or taxing subdivision, municipality or any other independent body created by law.

**Pulmonary Function Tests** - A part of the medical examination required to determine the health status of a person's lungs.

**-Q-**

**QAQC** – Quality Assurance, Quality Control

**Qualitative Fit Test** - A method of testing a respirator's face-to-facepiece seal by covering the inhalation or exhalation valves and either breathing in or out to determine the presence of any leaks.

**Quantitative Fit Test** - A method of testing a respirator's face-to-facepiece which yields the actual protection factor provided by the respirator.

**Quantity** – All quantities should be considered as estimates.

## -R-

**Radiotherapy** - The use of irradiation to destroy malignant tumour cells.

**Random Sample** - An asbestos sample drawn in such a way that there is no set pattern and is designed to give a true representation of the entire area.

**RCRA** - (Resource Conservation and Recovery Act) is the principal federal law in the United States governing the disposal of solid waste and hazardous waste.

**Record Keeping** - Detailed documentation of all program activities, decisions, analyses, and any other pertinent information to a project.

**Regulated Area** - An area established by the employer to mark areas where Class I, II, and III asbestos work is conducted, and any adjoining area where debris and waste may accumulate; and a work area where airborne levels of asbestos may exceed the permissible exposure limit.

**Regulated Asbestos-Containing Material (RACM)** - (a) Friable asbestos material, (b) Category I nonfriable ACM that has become friable, (c) Category I nonfriable ACM that will be or has been subjected to sanding, grinding, cutting, or abrading, or (d) Category II nonfriable ACM that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder by the forces expected to act on the material in the course of demolition or renovation operations regulated by this subpart.

**Reintrainment** - The disturbance of asbestos fibers already separated from the main body so that they re-suspend into the atmosphere after having initially settled.

**Removal** - All operations where ACM and/or PACM is taken out or stripped from structures or substrates, including demolition operations.

**Remove (Asbestos)** - To take out RACM or facility components that contain or are covered with RACM from any facility.

**Removal Encapsulant** - A penetrating encapsulant specifically designed for removal of ACM rather than for encapsulation of ACM in place.

**Renovation** - The altering of a structure, one or more structural items, or one or more equipment items in any way, including any asbestos project performed on a structure, structural item, or equipment item.

**Repair**- Overhauling, rebuilding, reconstructing, or reconditioning of structures or substrates, including encapsulation or other repair of ACM or PACM attached to structures or substrates.

**Resilient Floor Covering** - Asbestos-containing floor tile, including asphalt and vinyl floor tile, and sheet vinyl floor covering containing more than 1 percent asbestos as determined using polarized light microscopy according to the method specified in appendix A, subpart F, 40 CFR part 763, Section 1,

**Resolution** - The ability to distinguish between individual objects, as with a microscope.

**Respirable** - Breathable.

**Respiratory Protection Program** - An OSHA mandated written program established by an employer, which provides for the safe use of respirators on their job sites.

**Response Action** - A method, including removal, encapsulation, enclosure, repair, operations and maintenance, that protects human health and the environment from friable Asbestos Containing Material.

**Rip-Out** - The actual removal of asbestos-containing materials from a building.

**Routine Maintenance Area** - An area, such as a boiler room or mechanical room that is not normally frequented by students and in which maintenance employees or contract workers regularly conduct maintenance activities.

**-S-**

**School** - Any elementary or secondary school (K - 12).

**School Building** - (1) Any structure suitable for use as a classroom, including a school facility such as a laboratory, library, school eating facility, or facility used for the preparation of food. (2) Any gymnasium or other facility which is specially designed for athletic or recreational activities for an academic course in physical education. (3) Any other facility used for the instruction or housing of students or for the administration of educational or research programs. (4) Any maintenance, storage, or utility facility, including any hallway, essential to the operation of any facility described in this definition of "school building" under paragraphs (1), (2), or (3). (5) Any portico or covered exterior hallway or walkway. (6) Any exterior portion of a mechanical system used to condition interior space.

**Sealing Material** - An asbestos-free material used to cover a surface to prevent any asbestos fibers remaining after ACM removal from being dispersed into the air. This term includes sprayed or brushed on decorative and fireproofing materials as well as penetrating or bridging encapsulants.

**Serpentine Asbestos** - Asbestos characterized by curly fibers with a layered or tiered structure. Chrysotile, or white asbestos, is a member of the serpentine group and is also the most common form of asbestos.

**Shower Room** - A room between the clean room and the equipment room in a worker decontamination system in which workers take showers when leaving the work area.

**Significantly Damaged Friable Miscellaneous ACM** - Damaged friable miscellaneous Asbestos Containing Material where the damage is extensive and severe.

**Significantly Damaged Friable Surfacing Asbestos Containing Material** - Damaged friable surfacing Asbestos Containing Material in a functional space where the damage is extensive and severe.

**Site Surveillance Technician** - Any person who acts as an independent on-site representative of an asbestos consultant. The site surveillance technician monitors the asbestos abatement activities of others, provides asbestos air monitoring services for area and personal samples, and performs building surveys and contract administration at the direction of an asbestos consultant.

**Small-Scale, Short-Duration Activities** - Operations for which a negative pressure enclosure is infeasible, impractical, or unsafe due to the small size of the task. Examples of these are tasks such as, but not limited to: removal of asbestos-containing insulation from short sections of pipes; removal of small quantities of asbestos-containing insulation on beams or above ceilings; replacement of an asbestos-containing gasket on a valve; installation or removal of small sections of drywall; roofing; other general building maintenance; and installation of electrical conduits through or proximate to asbestos-containing materials.

**Spirometer** - An instrument which measures the volume of air being expired from the lungs.

**State-of-the-Art** - State-of-the-art asbestos abatement and control work procedures are those procedures currently in use which have been demonstrated to be the most effective, reliable, and protective of workers' health. As new procedures are developed which demonstrate greater effectiveness, reliability, and worker protection and thereby come into use, they become the state-of-the-art.

**Strip** - To take off Regulated Asbestos Containing Material from any part of a facility or facility components.

**Strip Chart** – The paper recording of a automatically registered entry on a piece of equipment (e.g., a manometer).

**Structure or Structural Item** - Roofs, walls, ceilings, floors, structural supports, pipes, ducts, fittings and fixtures that have been installed as an integral part of any structure.

**Substrate** - The materials or existing surface located under or behind the asbestos-containing material.

**Supervisor** - An individual who is trained and licensed to supervise and direct an asbestos project in accordance with the appropriate regulatory requirements of the State and/or the Federal Regulations governing these requirements.

**Surfacing material** - Material that is sprayed, troweled-on or applied to surfaces (such as acoustical plaster on ceilings and fireproofing materials on structural members).

**Surfacing ACM** - Surfacing material which contains more than 1% asbestos.

**Surfactant** - A chemical wetting agent added to water to improve its penetration abilities into asbestos-containing materials.

**Suspect Material** - Material with the potential for being asbestos containing; synonymous with “presumed asbestos-containing material” (PACM).

## -T-

**Thermal System Insulation** - Material applied to pipes, fittings, boilers, breeching, tanks, ducts, or other interior structural components to prevent heat loss or gain, or water condensation, or for other purposes.

**Thermal System Insulation ACM** - Thermal system insulation that is an Asbestos Containing Material.

**Time Weighted Average (TWA)** – Measure of the varying exposure concentrations encountered in a given period of time.

**Transmission Electron Microscopy (TEM)** - A method of microscopic analysis which utilizes an electron beam that is focused onto a thin sample. As the beam penetrates (transmits) through the sample, the difference in densities produces an image on a fluorescent screen from which samples can be identified and counted.

**TSCA** - (Toxic Substances Control Act) a United States law, passed by the United States Congress in 1976 and administered by the United States Environmental Protection Agency, that regulates the introduction of new or already existing chemicals.

**Tumor** - A swelling or growth of cells and tissues in the body.

**TWA** - Time Weighted Average, as in asbestos air sampling.

**Type-C Respirator System** - An airline respirator designed for atmospheres not immediately dangerous to life or health. It consists of a source of respirable breathing air, an air hose with a detachable coupling, flow control fittings and a facepiece, helmet or hood.

## **-U, V-**

**USEPA (EPA)** - United States Environmental Protection Agency

**Vermiculite** - A micaceous mineral that is sometimes used as a substitute for asbestos which is lightweight and highly water-absorbent.

**Vibration** - The periodic motion of friable asbestos containing building material (ACBM) which may result in the release of asbestos fibers.

**Visible Emissions** - Any emissions, which are visually detectable without the aid of instruments, coming from RACM or asbestos-containing waste material, or from any asbestos milling, manufacturing, or fabricating operation. This does not include condensed, uncombined water vapor.

**Visual Inspection** - An inspection of the enclosure by the Analyst and the Abatement Contractor Supervisor to verify that all the ACMs specified have been removed before carrying out Final Clearance Air Sample Collection within a given area.

## **-W, X, Y, Z-**

**Washroom** - A room between the asbestos work area and the clean room in the equipment decontamination enclosure system where workers shower.

**Waste Generator (asbestos)** - Any owner or operator of a source whose act or process produces asbestos-containing waste material.

**Waste Shipment Record** - The shipping document, required to be originated and signed by the waste generator, used to track and substantiated the disposition of asbestos-containing waste material.

**Water Damage** - Deterioration or delamination of ceiling or wall materials due to leaks from plumbing or cracks in the roof.

**Wet Cleaning** - The process of using amended water or a removal encapsulant and a wet brush, mop, cloth, sponge or similar wet cleaning device to remove completely any visible ACM residue from surfaces. This definition does not include the use of a non-HEPA filter-equipped wet vacuum cleaner to pick up wet ACM debris or contaminated wastewater.

**Wetting Agent** - A surfactant or chemical that is added to water to decrease its surface tension and allow it to spread more easily over or penetrate into a surface that is covered with ACM.

**White Asbestos** - Otherwise known as Chrysotile. The only asbestiform mineral of the serpentine group which contains approximately 40% each of silica and magnesium oxide. It is the most common form of asbestos used in buildings.

**Work Area** - A specific room or physically isolated portion of a room in which ACM is required to be handled in accordance with the requirements of the applicable regulations. These areas are designated as work areas from the time that the room, or portion of it, is being prepared in order to perform the asbestos project until the time the area has been cleaned free of all visible residue in accordance with applicable regulations.

**Worker** - An individual who is certified by the Department in a non-supervisory capacity to clean, handle, repair, remove, encapsulate, haul, dispose of or otherwise work with ACM in activities involving more than three square feet or three linear feet of ACM.

**Worker's Compensation** - A system of insurance required in some states by law, financed by employers, which provides payments to employees or their families for occupational injuries, illnesses, or fatalities resulting in loss of wage or income incurred while at work.

**APPENDIX F – OSHA ABATEMENT PROCEDURE**

## Excerpt of 29 CFR 1926.1011 Asbestos Construction Standard – asbestos removal methods

### Subpart Z—Toxic and Hazardous Substances

AUTHORITY: Sec. 107, Contract Work Hours and Safety Standards Act (40 U.S.C. 333); Secs. 4, 6, 8, Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Order Nos. 12-71 (36 FR 8754), 8-76 (41 FR 25059), 9-83 (48 FR 35736), 1-90 (55 FR 9033), or 6-96 (62 FR 111), as applicable; 29 CFR part 1911. Section 1926.1102 not issued under 29 U.S.C. 655 or 29 CFR part 1911; also issued under 5 U.S.C. 553.

SOURCE: 58 FR 35190, June 30, 1993, unless otherwise noted.

#### § 1926.1100 [Reserved] § 1926.1101 Asbestos.

(5) *Specific control methods for Class I work.* In addition, Class I asbestos work shall be performed using one or more of the following control methods pursuant to the limitations stated below:

(i) Negative Pressure Enclosure (NPE) systems: NPE systems may be used where the configuration of the work area does not make the erection of the enclosure infeasible, with the following specifications and work practices.

(A) *Specifications:*

- (1) The negative pressure enclosure (NPE) may be of any configuration,
- (2) At least 4 air changes per hour shall be maintained in the NPE,
- (3) A minimum of 0.02 column inches of water pressure differential, relative to outside pressure, shall be maintained within the NPE as evidenced by manometric measurements,
- (4) The NPE shall be kept under negative pressure throughout the period of its use, and
- (5) Air movement shall be directed away from employees performing asbestos work within the enclosure, and toward a HEPA filtration or a collection device.

(B) *Work Practices:*

- (1) Before beginning work within the enclosure and at the beginning of each shift, the NPE shall be inspected for breaches and smoke-tested for leaks, and any leaks sealed.
- (2) Electrical circuits in the enclosure shall be deactivated, unless equipped with ground-fault circuit interrupters.
- (ii) Glove bag systems may be used to remove PACM and/or ACM from straight runs of piping and elbows and other connections with the following specifications and work practices:

(A) *Specifications:*

- (1) Glovebags shall be made of 6 mil

thick plastic and shall be seamless at the bottom.

(2) Glovebags used on elbows and other connections must be designed for that purpose and used without modifications.

(B) *Work Practices:*

- (1) Each glovebag shall be installed so that it completely covers the circumference of pipe or other structure where the work is to be done.
- (2) Glovebags shall be smoke-tested for leaks and any leaks sealed prior to use.
- (3) Glovebags may be used only once and may not be moved.
- (4) Glovebags shall not be used on surfaces whose temperature exceeds 150 °F.
- (5) Prior to disposal, glovebags shall be collapsed by removing air within them using a HEPA vacuum.
- (6) Before beginning the operation, loose and friable material adjacent to the glovebag/box operation shall be wrapped and sealed in two layers of six mil plastic or otherwise rendered intact,
- (7) Where system uses attached waste bag, such bag shall be connected to collection bag using hose or other material which shall withstand pressure of ACM waste and water without losing its integrity:
- (8) Sliding valve or other device shall separate waste bag from hose to ensure no exposure when waste bag is disconnected:
- (9) At least two persons shall perform Class I glovebag removal operations.
- (iii) *Negative Pressure Glove Bag Systems.* Negative pressure glove bag systems may be used to remove ACM or PACM from piping.
- (A) *Specifications:* In addition to specifications for glove bag systems above, negative pressure glove bag systems shall attach HEPA vacuum systems or other devices to bag to prevent collapse during removal.
- (B) *Work Practices:* (1) The employer shall comply with the work practices for glove bag systems in paragraph (g)(5)(ii)(B)(4) of this section.
- (2) The HEPA vacuum cleaner or other device used to prevent collapse of bag during removal shall run continually during the operation until it is completed at which time the bag shall be collapsed prior to removal of the bag from the pipe.
- (3) Where a separate waste bag is used along with a collection bag and discarded after one use, the collection bag may be reused if rinsed clean with amended water before reuse.
- (iv) *Negative Pressure Glove Box*

Systems: Negative pressure glove boxes may be used to remove ACM or PACM from pipe runs with the following specifications and work practices.

(A) *Specifications:*

- (1) Glove boxes shall be constructed with rigid sides and made from metal or other material which can withstand the weight of the ACM and PACM and water used during removal:
- (2) A negative pressure generator shall be used to create negative pressure in the system:
- (3) An air filtration unit shall be attached to the box:
- (4) The box shall be fitted with gloved apertures:
- (5) An aperture at the base of the box shall serve as a bagging outlet for waste ACM and water:
- (6) A back-up generator shall be present on site:
- (7) Waste bags shall consist of 6 mil thick plastic double-bagged before they are filled or plastic thicker than 6 mil.
- (B) *Work practices:*
- (1) At least two persons shall perform the removal:
- (2) The box shall be smoke-tested for leaks and any leaks sealed prior to each use.
- (3) Loose or damaged ACM adjacent to the box shall be wrapped and sealed in two layers of 6 mil plastic prior to the job, or otherwise made intact prior to the job.
- (4) A HEPA filtration system shall be used to maintain pressure barrier in box.
- (v) *Water Spray Process System.* A water spray process system may be used for removal of ACM and PACM from cold line piping if, employees carrying out such process have completed a 40-hour separate training course in its use, in addition to training required for employees performing Class I work. The system shall meet the following specifications and shall be performed by employees using the following work practices.
- (A) *Specifications:*
- (1) Piping shall be surrounded on 3 sides by rigid framing,
- (2) A 360 degree water spray, delivered through nozzles supplied by a high pressure separate water line, shall be formed around the piping.
- (3) The spray shall collide to form a fine aerosol which provides a liquid barrier between workers and the ACM and PACM.
- (B) *Work Practices:*
- (1) The system shall be run for at least 10 minutes before removal begins.
- (2) All removal shall take place within the water barrier.
- (3) The system shall be operated by

## Excerpt of 29 CFR 1926.1011 Asbestos Construction Standard – asbestos removal methods

at least three persons, one of whom shall not perform removal, but shall check equipment, and ensure proper operation of the system.

(4) After removal, the ACM and PACM shall be bagged while still inside the water barrier.

(vi) A small walk-in enclosure which accommodates no more than two persons

(mini-enclosure) may be used if the disturbance or removal can be completely contained by the enclosure with the following specifications and work practices.

(A) *Specifications:*

(1) The fabricated or job-made enclosure shall be constructed of 6 mil plastic or equivalent:

(2) The enclosure shall be placed under negative pressure by means of a HEPA filtered vacuum or similar ventilation unit:

(B) *Work practices:*

(1) Before use, the mini-enclosure shall be inspected for leaks and smoketested to detect breaches, and any breaches sealed.

(2) Before reuse, the interior shall be completely washed with amended water and HEPA-vacuumed..

(3) During use, air movement shall be directed away from the employee's breathing zone within the mini-enclosure.

(6) *Alternative control methods for Class I work.* Class I work may be performed using a control method which is not referenced in paragraph (g)(5) of this section, or which modifies a control method referenced in paragraph (g)(5) of this section, if the following provisions are complied with:

(i) The control method shall enclose, contain or isolate the processes or source of airborne asbestos dust, or otherwise capture or redirect such dust before it enters the breathing zone of employees.

(ii) A certified industrial hygienist or licensed professional engineer who is also qualified as a project designer as defined in paragraph (b) of this section, shall evaluate the work area, the projected work practices and the engineering controls and shall certify in writing that the planned control method is adequate to reduce direct and indirect employee exposure to below the PELs under worst-case conditions of use, and that the planned control method will prevent asbestos contamination outside the regulated area, as measured by clearance sampling which meets the requirements of EPA's Asbestos in

Schools rule issued under AHERA, or perimeter monitoring which meets the criteria in paragraph (g)(4)(ii)(B) of this section.

(A) Where the TSI or surfacing material to be removed is 25 linear or 10 square feet or less, the evaluation required

in paragraph (g)(6) of this section may be performed by a "competent person", and may omit consideration of perimeter or clearance monitoring otherwise required.

(B) The evaluation of employee exposure required in paragraph (g)(6) of this section, shall include and be based on sampling and analytical data representing

employee exposure during the use of such method under worstcase conditions and by employees whose training and experience are equivalent to employees who are to perform the current job.

(iii) Before work which involves the removal of more than 25 linear or 10 square feet of thermal system insulation or surfacing material is begun using an alternative method which has been the subject of a paragraph (g)(6) of this section required evaluation and certification, the employer shall send a copy of such evaluation and certification to the national office of OSHA, Office of Technical Support, Room N3653, 200 Constitution Avenue, NW, Washington, DC 20210. The submission shall not constitute approval by OSHA.

(7) *Work Practices and Engineering Controls for Class II work.*

(i) All Class II work shall be supervised by a competent person as defined in paragraph (b) of this section.

(ii) For all indoor Class II jobs, where the employer has not produced a negative exposure assessment pursuant to paragraph (f)(2)(iii) of this section, or where during the job, changed conditions

indicate there may be exposure above the PEL or where the employer does not remove the ACM in a substantially intact state, the employer shall use one of the following methods to ensure

that airborne asbestos does not migrate from the regulated area;

(A) Critical barriers shall be placed over all openings to the regulated area; or,

(B) The employer shall use another barrier or isolation method which prevents the migration of airborne asbestos from the regulated area, as verified by perimeter area monitoring or clearance

monitoring which meets the criteria set out in paragraph (g)(4)(ii)(B) of this section.

(C) Impermeable dropcloths shall be placed on surfaces beneath all removal activity;

(iii) [Reserved]

(iv) All Class II asbestos work shall be performed using the work practices and requirements set out above in paragraph (g)(1) (i) through (g)(1)(iii) of this section.

(8) *Additional Controls for Class II work.* Class II asbestos work shall also be performed by complying with the work practices and controls designated for each type of asbestos work to be performed, set out in this paragraph. Where more than one control method may be used for a type of asbestos work, the employer may choose one or a combination of designated control methods. Class II work also may be performed using a method allowed for Class I work, except that glove bags and glove boxes are allowed if they fully enclose the Class II material to be removed.

(i) For removing vinyl and asphalt flooring materials which contain ACM or for which in buildings constructed no later than 1980, the employer has not verified the absence of ACM pursuant to paragraph (g)(8)(i)(I) of this section. The employer shall ensure that employees comply with the following work practices and that employees are trained in these practices pursuant to paragraph (k)(9):

(A) Flooring or its backing shall not be sanded.

(B) Vacuums equipped with HEPA filter, disposable dust bag, and metal floor tool (no brush) shall be used to clean floors.

(C) Resilient sheeting shall be removed by cutting with wetting of the snip point and wetting during delamination. Rip-up of resilient sheet floor material is prohibited.

(D) All scraping of residual adhesive and/or backing shall be performed using wet methods.

(E) Dry sweeping is prohibited.

(F) Mechanical chipping is prohibited unless performed in a negative pressure enclosure which meets the requirements of paragraph (g)(5)(i) of this section.

(G) Tiles shall be removed intact, unless the employer demonstrates that intact removal is not possible.

(H) When tiles are heated and can be removed intact, wetting may be omitted.

(I) Resilient flooring material including associated mastic and backing shall be assumed to be asbestos-containing unless an industrial hygienist

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determines that it is asbestos-free using recognized analytical techniques.

(ii) For removing roofing material which contains ACM the employer shall ensure that the following work practices are followed:

(A) Roofing material shall be removed in an intact state to the extent feasible.

(B) Wet methods shall be used to remove roofing materials that are not intact, or that will be rendered not intact during removal, unless such wet methods are not feasible or will create safety hazards.

(C) Cutting machines shall be continuously misted during use, unless a competent person determines that misting substantially decreases worker safety.

(D) When removing built-up roofs with asbestos-containing roofing felts and an aggregate surface using a power roof cutter, all dust resulting from the cutting operation shall be collected by a HEPA dust collector, or shall be HEPA vacuumed by vacuuming along the cut line. When removing built-up roofs with asbestos-containing roofing felts and a smooth surface using a power roof cutter, the dust resulting from the cutting operation shall be collected either by a HEPA dust collector or HEPA vacuuming along the cut line, or by gently sweeping and then carefully and completely wiping up the still-wet dust and debris left along the cut line. The dust and debris shall be immediately bagged or placed in covered containers.

(E) Asbestos-containing material that has been removed from a roof shall not be dropped or thrown to the ground. Unless the material is carried or passed to the ground by hand, it shall be lowered to the ground via covered, dust-tight chute, crane or hoist:

(1) Any ACM that is not intact shall be lowered to the ground as soon as is practicable, but in any event no later than the end of the work shift. While the material remains on the roof it shall either be kept wet, placed in an impermeable waste bag, or wrapped in plastic sheeting.

(2) Intact ACM shall be lowered to the ground as soon as is practicable, but in any event no later than the end of the work shift.

(F) Upon being lowered, unwrapped material shall be transferred to a closed receptacle in such manner so as to preclude the dispersion of dust.

(G) Roof level heating and ventilation air intake sources shall be isolated

or the ventilation system shall be shut down.

(H) Notwithstanding any other provision of this section, removal or repair of sections of intact roofing less than 25 square feet in area does not require use of wet methods or HEPA vacuuming as long as manual methods which do not render the material nonintact

are used to remove the material and no visible dust is created by the removal

method used. In determining whether a job involves less than 25 square feet, the employer shall include all removal and repair work performed on the same roof on the same day.

(iii) When removing cementitious asbestos-containing siding and shingles or transite panels containing ACM on building exteriors (other than roofs, where paragraph (g)(8)(ii) of this section applies) the employer shall ensure that the following work practices are followed:

(A) Cutting, abrading or breaking siding, shingles, or transite panels, shall be prohibited unless the employer can demonstrate that methods less likely to result in asbestos fiber release cannot be used.

(B) Each panel or shingle shall be sprayed with amended water prior to removal.

(C) Unwrapped or unbagged panels or shingles shall be immediately lowered to the ground via covered dust-tight chute, crane or hoist, or placed in an impervious waste bag or wrapped in plastic sheeting and lowered to the ground no later than the end of the work shift.

(D) Nails shall be cut with flat, sharp instruments.

(iv) When removing gaskets containing ACM, the employer shall ensure that the following work practices are followed:

(A) If a gasket is visibly deteriorated and unlikely to be removed intact, removal shall be undertaken within a glovebag as described in paragraph (g)(5)(ii) of this section.

(B) [Reserved]

(C) The gasket shall be immediately placed in a disposal container.

(D) Any scraping to remove residue must be performed wet.

(v) When performing any other Class II removal of asbestos containing material

for which specific controls have not been listed in paragraph (g)(8)(iv)

(A) through (D) of this section, the employer shall ensure that the following work practices are complied with.

(A) The material shall be thoroughly wetted with amended water prior to and during its removal.

(B) The material shall be removed in an intact state unless the employer demonstrates that intact removal is not possible.

(C) Cutting, abrading or breaking the material shall be prohibited unless the employer can demonstrate that methods less likely to result in asbestos fiber release are not feasible.

(D) Asbestos-containing material removed, shall be immediately bagged or wrapped, or kept wetted until transferred to a closed receptacle, no later than the end of the work shift.

(vi) *Alternative Work Practices and Controls*. Instead of the work practices and controls listed in paragraph (g)(8)

(i) through (v) of this section, the employer may use different or modified engineering and work practice controls if the following provisions are complied with.

(A) The employer shall demonstrate by data representing employee exposure during the use of such method under conditions which closely resemble the conditions under which the method is to be used, that employee exposure will not exceed the PELs under any anticipated circumstances.

(B) A competent person shall evaluate the work area, the projected work practices and the engineering controls, and shall certify in writing, that the different or modified controls are adequate

to reduce direct and indirect employee exposure to below the PELs under all expected conditions of use and that the method meets the requirements

of this standard. The evaluation shall include and be based on data representing

employee exposure during the use of such method under conditions which closely resemble the conditions under which the method is to be used for the current job, and by employees

whose training and experience are equivalent to employees who are to perform the current job.

(9) *Work Practices and Engineering Controls for Class III asbestos work*. Class

III asbestos work shall be conducted using engineering and work practice controls which minimize the exposure to employees performing the asbestos work and to bystander employees.

(i) The work shall be performed using wet methods.

(ii) To the extent feasible, the work

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shall be performed using local exhaust ventilation.

(iii) Where the disturbance involves drilling, cutting, abrading, sanding, chipping, breaking, or sawing of thermal system insulation or surfacing material, the employer shall use impermeable dropcloths, and shall isolate the operation using mini-enclosures or glove bag systems pursuant to paragraph (g)(5) of this section or another isolation method.

(iv) Where the employer does not produce a “negative exposure assessment” for a job, or where monitoring results show the PEL has been exceeded, the employer shall contain the area using impermeable dropcloths and plastic barriers or their equivalent, or shall isolate the operation using a control system listed in and in compliance with paragraph (g)(5) of this section.

(v) Employees performing Class III jobs, which involve the disturbance of thermal system insulation or surfacing material, or where the employer does not produce a “negative exposure assessment”

or where monitoring results show a PEL has been exceeded, shall wear respirators which are selected, used and fitted pursuant to provisions of paragraph (h) of this section.

(10) *Class IV asbestos work.* Class IV asbestos jobs shall be conducted by employees trained pursuant to the asbestos awareness training program set out in paragraph (k)(9) of this section. In addition, all Class IV jobs shall be conducted

in conformity with the requirements set out in paragraph (g)(1) of this section, mandating wet methods, HEPA vacuums, and prompt clean up of debris containing ACM or PACM.

(i) Employees cleaning up debris and waste in a regulated area where respirators

are required shall wear respirators which are selected, used and fitted pursuant to provisions of paragraph (h) of this section.

(ii) Employers of employees who clean up waste and debris in, and employers in control of, areas where friable thermal system insulation or surfacing material is accessible, shall assume that such waste and debris contain asbestos.

(11) *Alternative methods of compliance for installation, removal, repair, and maintenance of certain roofing and pipeline*

*coating materials.* Notwithstanding any other provision of this section, an

employer who complies with all provisions of this paragraph (g)(11) when installing, removing, repairing, or maintaining intact pipeline asphaltic wrap, or roof flashings which contain asbestos fibers encapsulated or coated by bituminous

or resinous compounds shall be deemed to be in compliance with this section. If an employer does not comply with all provisions of this paragraph (g)(11) or if during the course of the job the material does not remain intact, the provisions of paragraph (g)(8) of this section apply instead of this paragraph (g)(11).

(i) Before work begins and as needed during the job, a competent person who is capable of identifying asbestos hazards

in the workplace and selecting the appropriate control strategy for asbestos exposure, and who has the authority to take prompt corrective measures to eliminate such hazards, shall conduct an inspection of the worksite and determine that the roofing material is intact and will likely remain intact.

(ii) All employees performing work covered by this paragraph (g)(11) shall be trained in a training program that meets the requirements of paragraph (k)(9)(viii) of this section.

(iii) The material shall not be sanded, abraded, or ground. Manual methods which do not render the material non-intact shall be used.

(iv) Material that has been removed from a roof shall not be dropped or thrown to the ground. Unless the material

is carried or passed to the ground by hand, it shall be lowered to the ground via covered, dust-tight chute, crane or hoist. All such material shall be removed from the roof as soon as is practicable, but in any event no later than the end of the work shift.

(v) Where roofing products which have been labeled as containing asbestos pursuant to paragraph (k)(8) of this section are installed on non-residential roofs during operations covered by this paragraph (g)(11), the employer shall notify the building owner of the presence and location of such materials no later than the end of the job.

(vi) All removal or disturbance of pipeline asphaltic wrap shall be performed using wet methods.

(h) *Respiratory protection.* (1) *General.* For employees who use respirators required

by this section, the employer must provide respirators that comply with the requirements of this paragraph. Respirators must be used during:

(i) Class I asbestos work.

(ii) Class II asbestos work when ACM is not removed in a substantially intact state.