NVLAP LAB NO. 1896

AIHA LAB I.D. 10768

ASBESTOS - TEM, PCM, PLM, SEM
METALS - AA, FLAME/FURNACE
AIRBORNE PARTICULATES
SPECIAL PARTICLE ANALYSIS

RESERVOIRS ENVIRONMENTAL
SERVICES, INC.

1827 GRANT STREET DENVER, COLORADO 80203 (800) 678-7374 (303) 830-1986 FAX (303) 863-9196

January 13, 1997

Mr. Tony Nocito
ABCOV, Inc.
214 Sullivan Street
Suite 3A
New York, NY 10012

RE: RES # 38207, ABCOV Method Laboratory Test at Reservoirs

Dear Mr. Nocito:

On September 24, 1996, Reservoirs Environmental Services, Inc. was contracted to conduct a bench scale test of the ABCOV method of asbestos disposal. Reservoirs provided the asbestos containing material for the experiment and ABCOV provided all chemicals and solutions.

Attached are the laboratory notes, procedures, conclusions, micrographs and EDX spectra collected during the test. Please call me if you any questions or need further information in regard to this experiment.

Sincerely,

Jeanne Orr
Vice President

jso
enclosures

Laboratory Notes

Date: September 24, 1996
Procedure: ABCOV Method
Experimenter: Jeanne Orr
Persons in attendance: Tony Nocito - ABCOV, Inc.
Dana Santi - MSC
Noel Wood - BNFL

Experimental Procedure and Observations

Starting Material: Approximately 25 grams of asbestos containing material comprised of two types of transite, amosite insulation and chrysotile mud. The transite and insulation were crushed with a hammer and combined with the mud in a zip lock bag to create a relatively uniform sample mixture. The starting material was sampled for TEM and PLM analysis.

This experiment was run in a fume hood and samples were dried in HEPA filtered hoods. Field tests for this procedure should be run under proper engineering controls as described in Appendix C, The ABCOV Method.

ABCOV T was added via a squirt bottle to the sample in a zip lock bag to a total weight of about 40 grams. The sample foamed in an exothermic reaction. Sample #1 was taken from the wet sample.

About 500 ml of ABCOV C solution was placed in a plastic blender jar. The ABCOV C was decanted from a saturated solution.

8:50 am: The wetted sample was added carefully to the blender jar containing ABCOV C. Care was taken to pulse the blender motor on chop to control foaming. The sample foamed and gave off heat but did not foam over. As the foaming subsided, the blender motor was set on chop and allowed to run. Within a few minutes (8:55am), the mixture was a uniform, foamy gray solution.

9:18 am: Sample #2 was taken without turning the blender off and placed on a glass slide to dry. The glass pipette used to take the sample was visibly etched by the solution in the blender. The sample solution reacted with the glass slide and rendered this sample unusable.

9:35 am: Sample #3 was taken while the blender was running and placed in a plastic weigh boat. The sample was then allowed to dry under the heat lamp.

9:55 am: Sample #4 was taken and placed in a plastic container to dry under the heat lamp. The blender jar was very warm and steam was visible when the sample was taken.

10:10 am: The blender was turned off. The solution had an even light gray appearance with a dark gray flock near the surface. The solution was steaming. Sample #5 was taken for PLM and TEM analysis.

The solution in the blender was agitated then poured into a Buchner vacuum funnel with a Whatman filter. The particulate trapped on the filter paper was not measured or weighed but was noticeably less volume than the starting sample.

200ml of ABCOV W were added to the blender jar after the sample was filtered. The blades in the blender jar had changed from shinny to black during the test run. The blender was pulsed to neutralize any residual material and prevent the blender blades from seizing.

The residue was scraped from the filter paper and placed in a plastic beaker. This was inefficient and messy and the chemicals were caustic to the skin. Sample #6 was taken for PLM and TEM analysis. Due to a miscommunication, about 50ml of ABCOV W was added to the residue in the plastic beaker. Only enough ABCOV W to wet the residue and stop the foaming should have been added. Agricultural Lime was added to the mixture. Sand was added to the mixture. The lime and sand were added by Mr. Nocito and were not measured. As a result of the additional ABCOV W, the final neutralized sand residue mixture had a larger volume than would have been required for the amount of residue.

The filtrate from the Buchner funnel was added slowly to the ABCOV W in the blender jar. The solution was very reactive and bubbled as it was added. More ABCOV W was added, alternated with more filtrate until there was no more bubbling and the final volume was about 500ml. About 50ml dry lime was added to the solution. The pH was tested with litmus paper and determined to be neutral. The neutralized solution was disposed down the drain after a sample was taken for Los Alamos Laboratories.

Analytical Results

The original starting material was analyzed by polarized light microscopy (PLM) and transmission electron microscopy (TEM). By PLM, the original sample mixture contained approximately 40% chrysotile, 15% amosite, and 15% glass fibers and other non fibrous components. Micrographs and energy dispersive X-ray (EDX) confirm and illustrate the presence of these fibers in the material in the appendix of this report. Electron micrographs and EDX spectra of the starting material are contained in Appendixes A and B.

Sample #1 was taken of the material wetted with ABCOV T. When examined by TEM, slight erosion of some of the chrysotile fibers was visible. There was no visible change in the amosite fibers. Electron micrographs of this sample are contained in Appendix A.

Sample #2 was not examined due to the reaction with the glass slide. Sample # 3 was examined by PLM and TEM. Small fragments of chrysotile and some amosite fibers were visible in this sample by PLM. The asbestos was much reduced in size and abundance. TEM examination did not detect chrysotile fibers but did detect some amosite fibers. No micrographs were taken of Sample #3.

Sample #4, taken at 9:35, am was examined by PLM. No chrysotile was observed in the sample, but a few fibrous amosite fragments were still visible by PLM. TEM examination of sample #4 did not detect any fibers remaining. No micrographs were taken of this sample.

Sample #5, taken at 9:55 am, was examined by PLM. Crystals and amorphous material were observed. No fibrous material of any kind was detected. TEM analysis of this sample confirmed this observation. No micrographs were taken of this sample.

The final sample, Sample #6, was taken from the particulate trapped on the Whatman filter paper. The particulate was examined by PLM. Again, no fibrous material of any kind was detected. TEM analysis confirmed that the asbestos fibers in the original material were no longer present. Electron micrographs and EDX spectra were used to characterize the particulate remaining and are attached in the appendixes A and B.

Conclusion

The ABCOV method followed in this bench scale experiment successfully destroyed the asbestos fibers in the original material within two hours. Visually, there was a volume reduction in the final material but this was not measured before the ABCOV W, lime and sand were added.

The procedure was not difficult. The amount of solutions added at different points in the experiment were based on visual observations and not ratios or weights. No analysis was performed on the gasses emitted when the experiment was in process or of the effluent discarded down the drain. This laboratory experiment does not indicate endorsement of the ABCOV Method by Reservoirs Environmental Services and may or may not relate to full scale field operations.

APPENDIX A

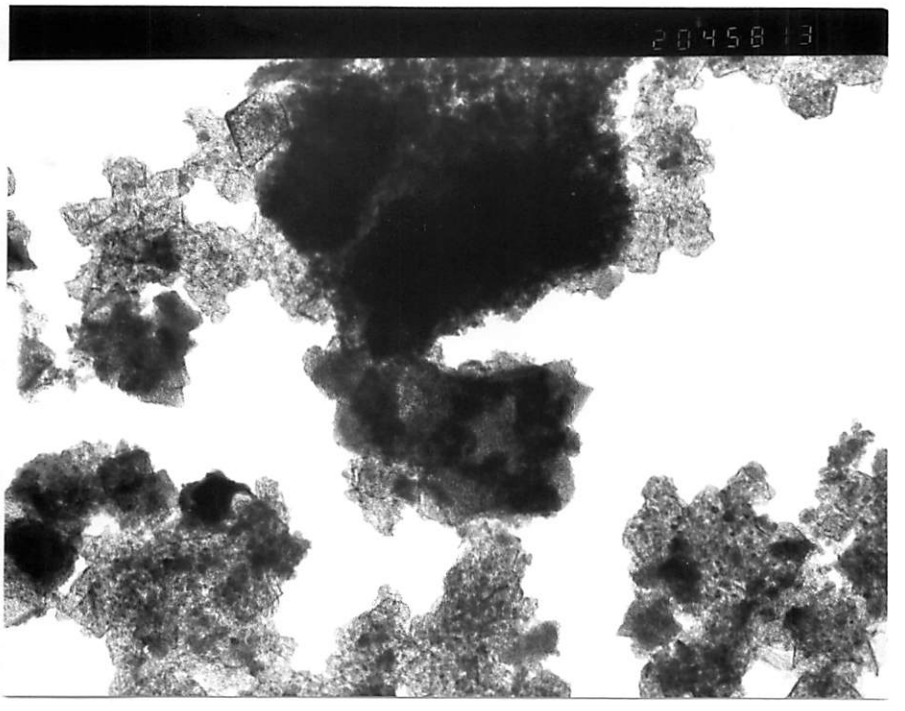
Electron Micrographs

Transmission Electron Micrograph of the starting material with chrysotile asbestos fibers and non-fibrous debris. Magnification 8300X

Transmission Electron Micrograph of the starting material showing chrysotile and amosite asbestos fibers and non-fibrous debris. Magnification 8300X

Sample #1. Transmission Electron Micrograph of chrysotile asbestos fibers damaged by the ABCOV T solution. Magnification 50,000X.

Sample #1. Transmission Electron Micrograph of damaged chrysotile fibers and an undamaged amosite fiber after treatment with the ABCOV T solution. Magnification 20,000X



Sample #6. Transmission Electron Micrograph of the particulate residue at the completion of the experiment. No fibers of any kind were visible in the final sample. Magnification 20,000X.

APPENDIX B

Energy Dispersive X-Ray Spectra

QUALITATIVE ELEMENT IDENTIFICATION

SAMPLE ID:CHRYSOTILE ASBESTOS IN STARTING MATERIAL

POSSIBLE IDENTIFICATION
SI KA OR RB LA?
MG KA OR AS LA?
CU KA
FE KA

PEAK LISTING

	ENERGY	AREA	EL. AND LINE
1	1.258	1347	MG KA OR AS LA?
2	1.745	1516	SI KA OR RB LA?
3	6.384	77	FE KA
4	8.043	654	CU KA

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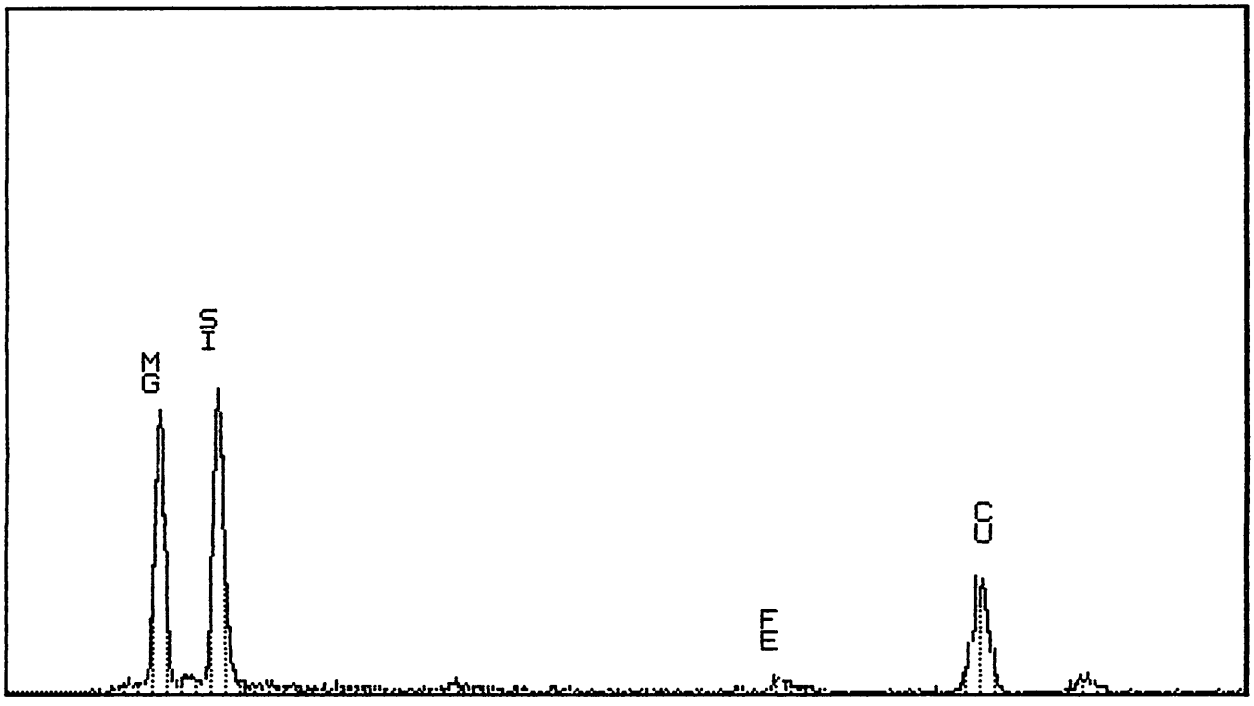

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60 CHRYSOTILE ASBESTOS IN STARTING MATERIAL

QUALITATIVE ELEMENT IDENTIFICATION

SAMPLE ID:CHRYSOTILE ASBESTOS IN STARTING MATERIAL

POSSIBLE IDENTIFICATION
SI KA OR RB LA?
MG KA OR AS LA?
CU KA
FE KA

PEAK LISTING

	ENERGY	AREA	EL. AND LINE
1	1.256	1347	MG KA OR AS LA?
2	1.745	1516	SI KA OR RB LA?
3	6.384	77	FE KA
4	8.043	654	CU KA

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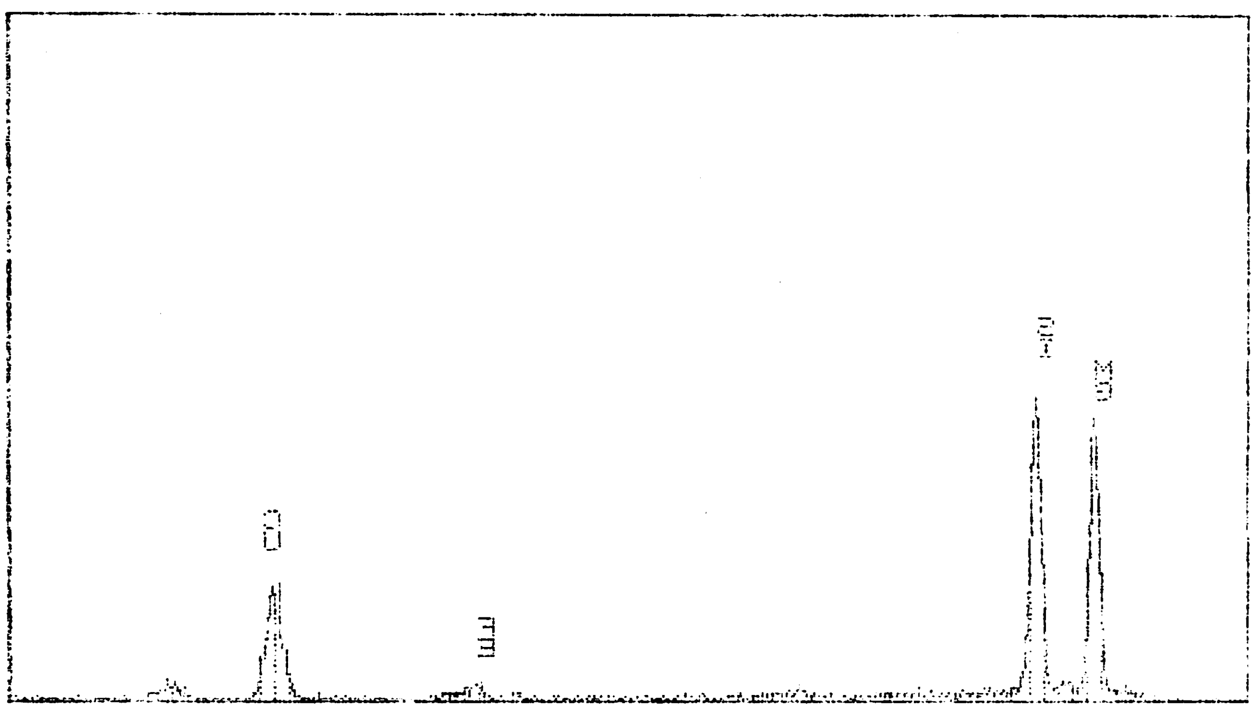

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QUALITATIVE ELEMENT IDENTIFICATION

SAMPLE ID:AMOSITE ASBESTOS

POSSIBLE IDENTIFICATION
SI KA OR RB LA?
FE KA KB
CU KA KB
MG KA OR AS LA?
MN KA

PEAK LISTING

	ENERGY	AREA	EL. AND LINE
1	1.252	1467	MG KA OR AS LA?
2	1.745	5687	SI KA OR RB LA?
3	5.902	142	MN KA
4	6.406	3115	FE KA
5	7.049	389	FE KB
6	8.046	2575	CU KA
7	8.907	392	CU KB

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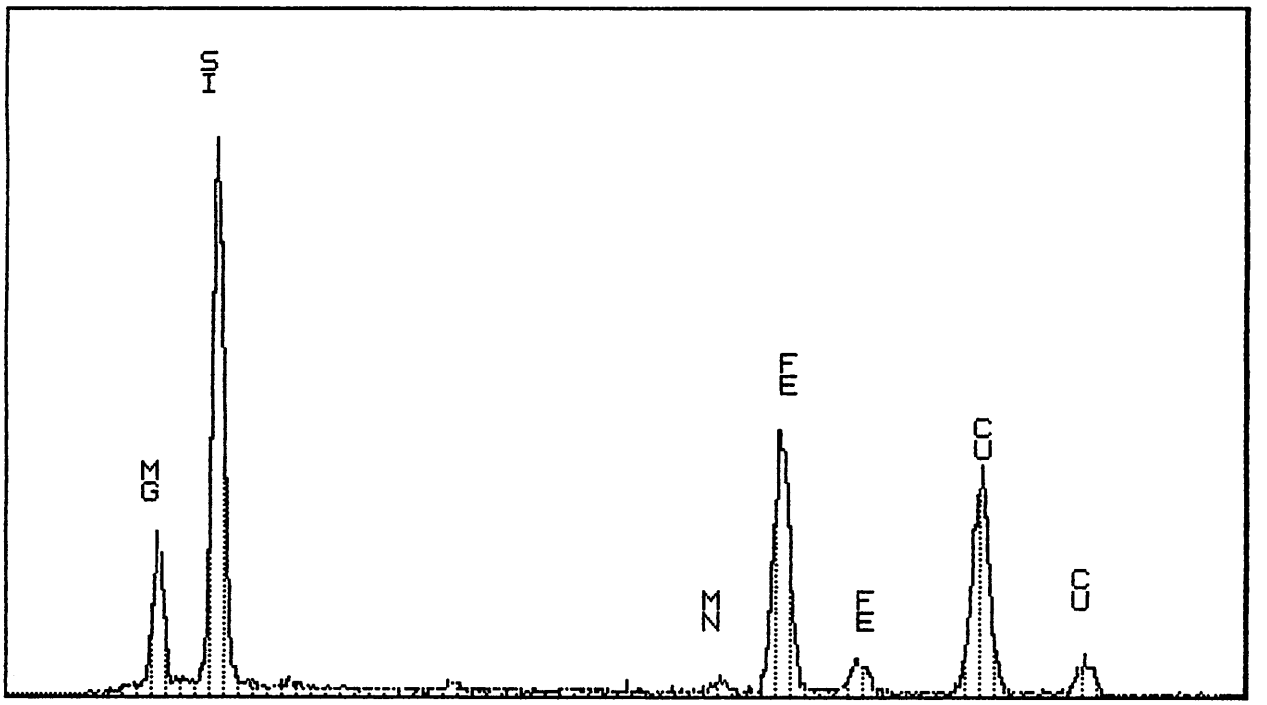

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60 AMOSITE ASBESTOS

QUALITATIVE ELEMENT IDENTIFICATION

SAMPLE ID:AMOSITE ASBESTOS

POSSIBLE IDENTIFICATION

SI KA OR RB LA?
FE KA KB
CU KA KB
MG KA OR AS LA?
MN KA

PEAK LISTING

	ENERGY	AREA	EL. AND LINE
1	1.252	1467	MG KA OR AS LA?
2	1.745	5687	SI KA OR RB LA?
3	5.902	142	MN KA
4	6.406	3115	FE KA
5	7.049	389	FE KB
6	8.046	2575	CU KA
7	8.907	392	CU KB

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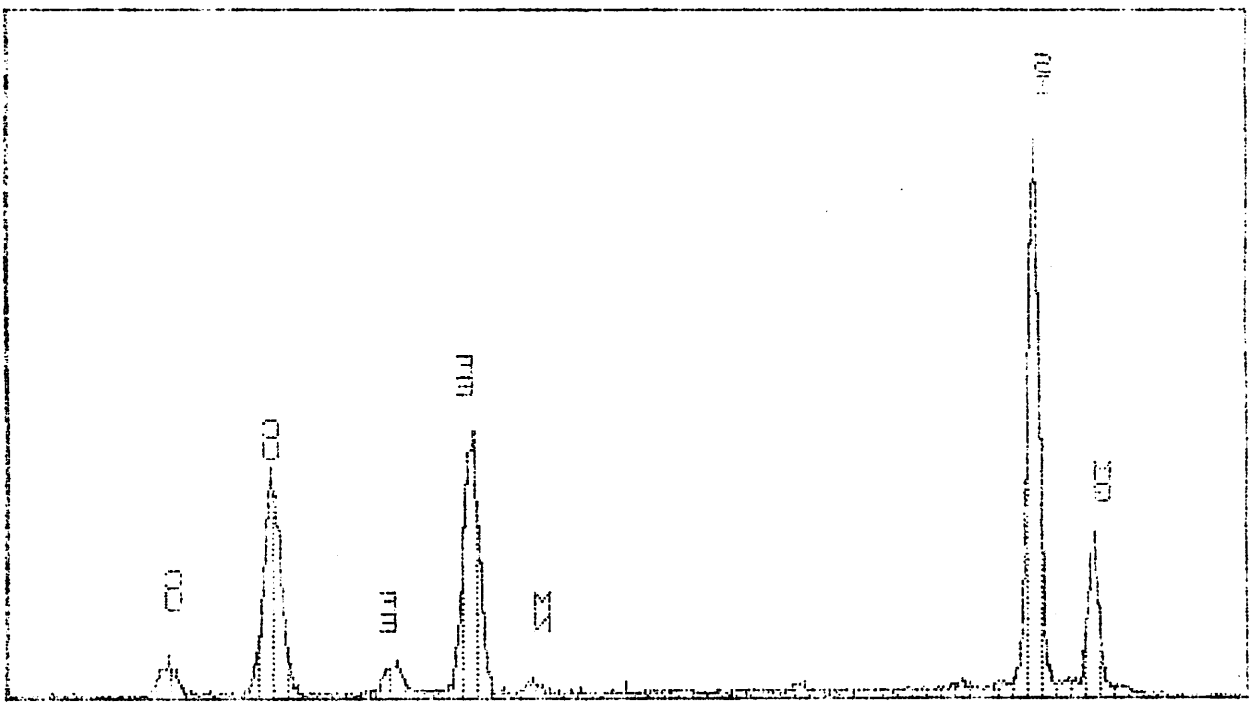

0.000 25-99 VFS = 1024 10.240

.60 AMOSITE ASBESTOS

QUALITATIVE ELEMENT IDENTIFICATION

SAMPLE ID:AMOSITE ASBESTOS IN STARTING MATERIAL

POSSIBLE IDENTIFICATION
SI KA OR RB LA?
FE KA KB
CU KA KB
MG KA OR AS LA?
MN KA

PEAK LISTING

	ENERGY	AREA	EL. AND LINE
1	1.255	3027	MG KA OR AS LA?
2	1.745	18096	SI KA OR RB LA?
3	5.907	686	MN KA
4	6.406	13015	FE KA
5	7.060	1599	FE KB
6	8.046	5741	CU KA
7	8.902	839	CU KB

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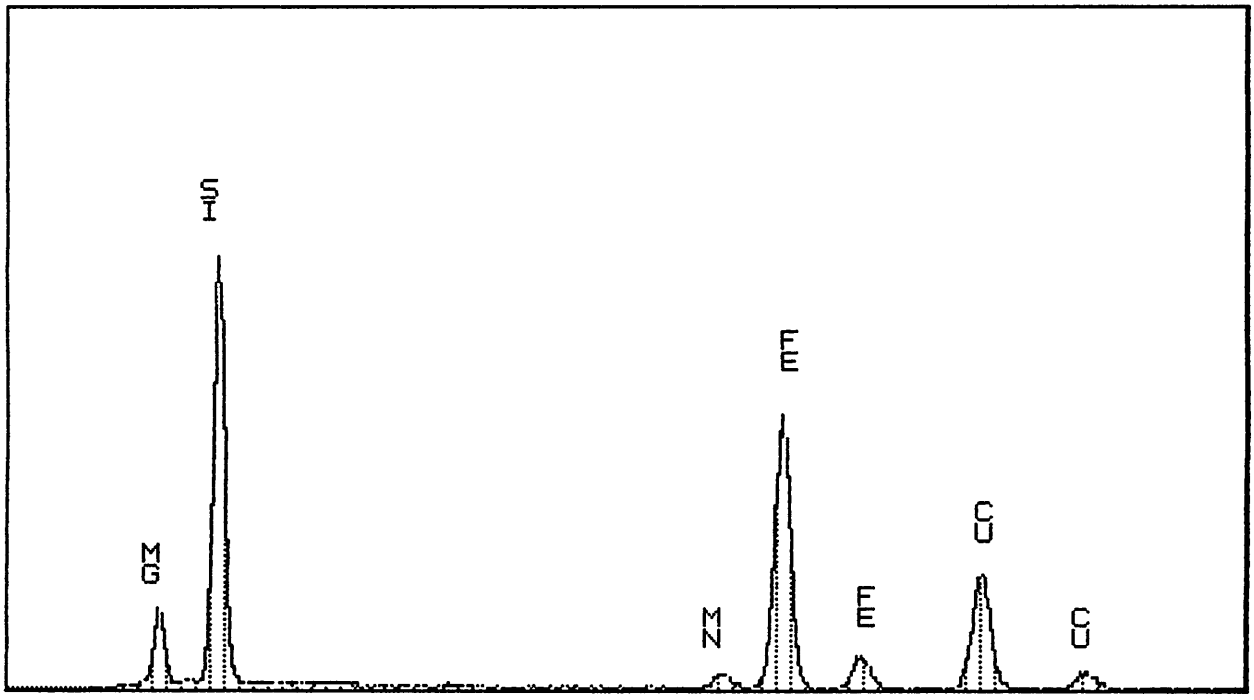

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60 AMOSITE ASBESTOS IN STARTING MATERIAL

QUALITATIVE ELEMENT IDENTIFICATION

SAMPLE ID:AMOSITE ASBESTOS IN STARTING MATERIAL

POSSIBLE IDENTIFICATION
SI KA OR RB LA?
FE KA KB
CU KA KB
MG KA OR AS LA?
MN KA

PEAK LISTING

	ENERGY	AREA	EL. AND LINE
1	1.255	3027	MG KA OR AS LA?
2	1.745	18096	SI KA OR RB LA?
3	5.907	686	MN KA
4	6.406	13015	FE KA
5	7.060	1599	FE KB
6	8.046	5741	CU KA
7	8.902	839	CU KB

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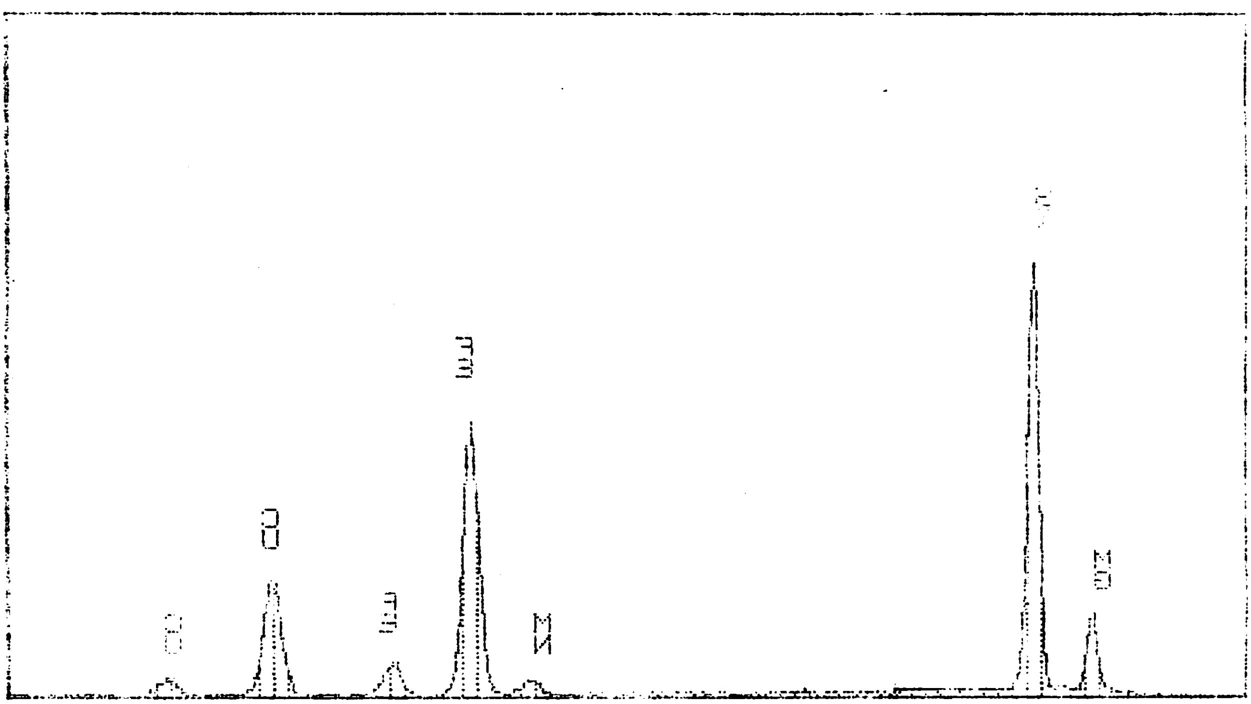

0.000   ES-99   VFS = 4096   10.240

60   AMOSITE ASBESTOS IN STARTING MATERIAL

QUALITATIVE ELEMENT IDENTIFICATION

SAMPLE ID:GLASS

POSSIBLE IDENTIFICATION
SI KA
CA KA KB
CU KA KB
MG KA OR AS LA?
AL KA OR BR LA?
K KA OR IN LA?
TI KA OR BA LA

PEAK LISTING

	ENERGY	AREA	EL. AND LINE
1	1.252	2907	MG KA OR AS LA?
2	1.489	1005	AL KA OR BR LA?
3	1.746	9750	SI KA
4	3.321	262	K KA OR IN LA?
5	3.700	5271	CA KA
6	4.024	604	CA KB
7	4.521	151	TI KA
8	8.044	4885	CU KA
9	8.909	667	CU KB

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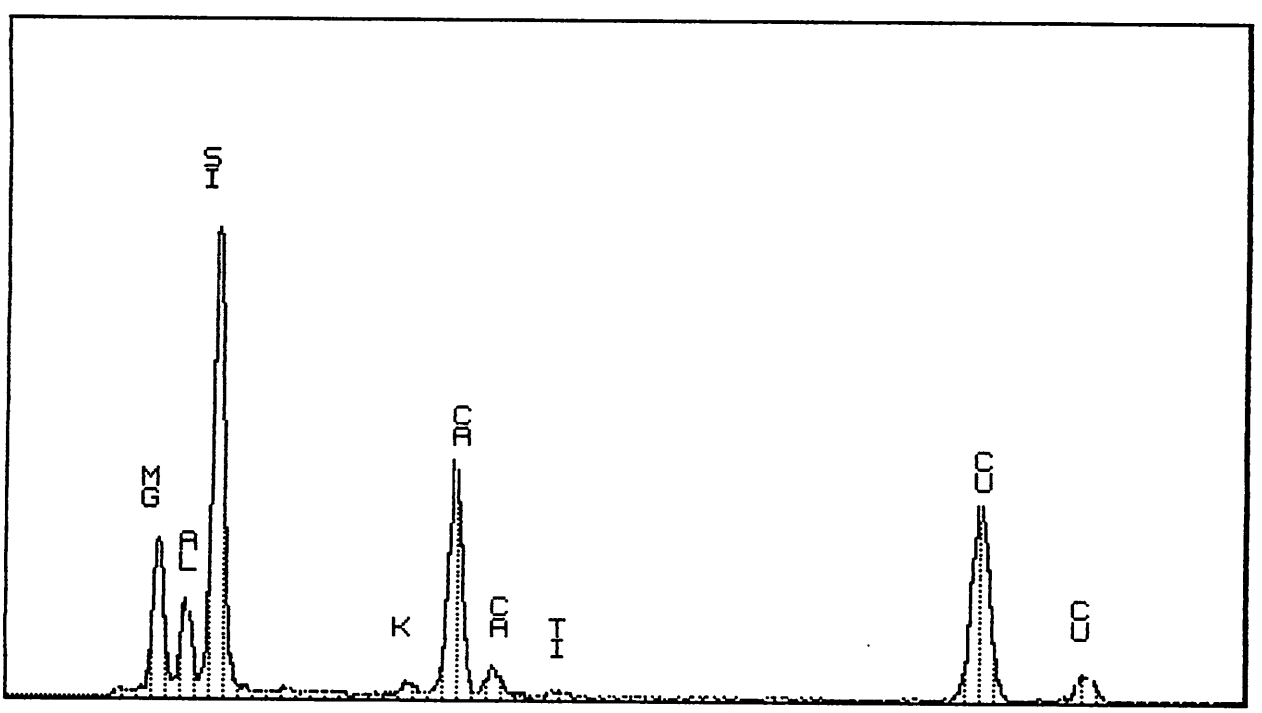

0.000 ES-99 VFS = 2048 10.240

60 GLASS IN STARTING MATERIAL

QUALITATIVE ELEMENT IDENTIFICATION

SAMPLE ID:GLASS

POSSIBLE IDENTIFICATION
SI KA
CA KA KB
CU KA KB
MG KA OR AS LA?
AL KA OR BR LA?
K KA OR IN LA?
TI KA OR BA LA

PEAK LISTING

	ENERGY	AREA	EL. AND LINE
1	1.252	2907	MG KA OR AS LA?
2	1.487	1005	AL KA OR BR LA?
3	1.746	7750	SI KA
4	3.321	262	K KA OR IN LA?
5	3.700	5271	CA KA
6	4.024	604	CA KB
7	4.521	151	TI KA
8	8.044	4885	CU KA
9	8.909	457	CU KB

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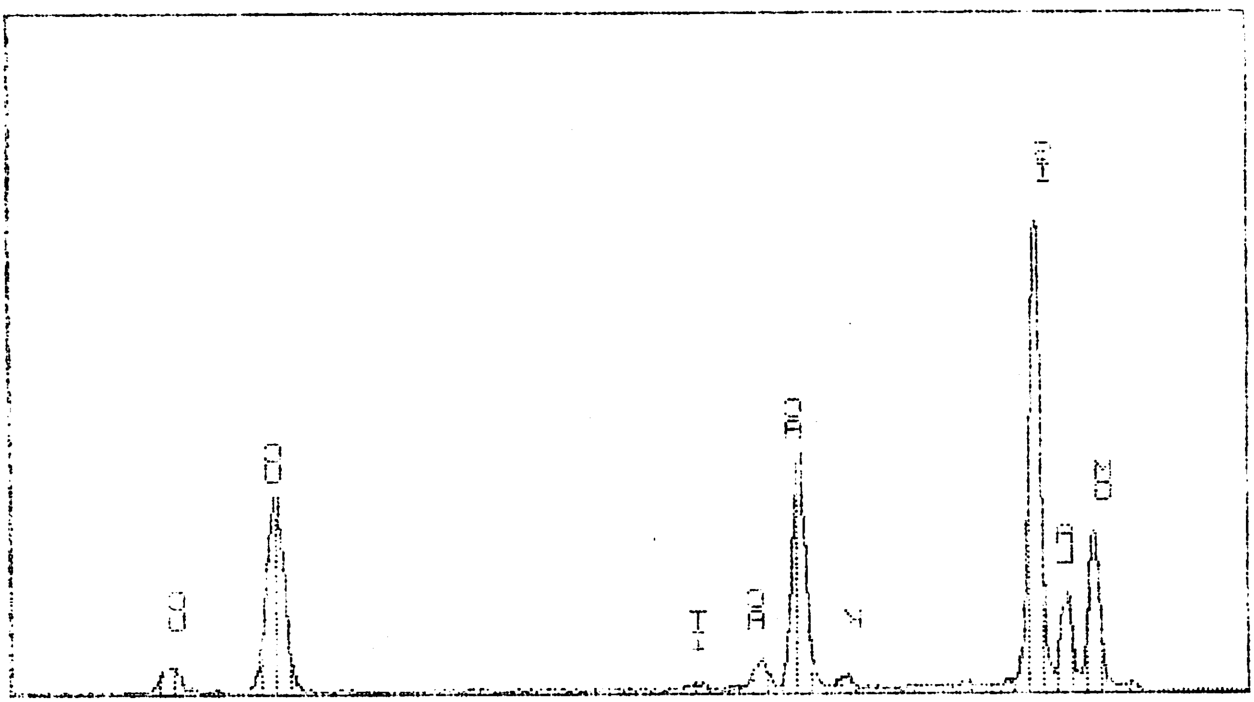

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40   GLASS IN STARTING MATERIAL

APPENDIX C

ABCOV Brochure

APPENDIX C

ABCOV Brochure

"No More Cradle to Grave Liability"

ABCOV Method Destroys Asbestos

The ABCOV Method will destroy Asbestos *At Your Site!*

No More Toxic Waste Handling!

No More Toxic Waste Hauling!

Cost Effective

For Further Information Please Contact:

ABCOV, Inc.

214 Sullivan Street, Suite 3A, New York, NY 10012

Phone (212) 505-5558 FAX (212) 505-5666

THE ABCOV METHOD

INTRODUCTION

ABCOV, Inc. is proud to offer the ABCOV Method of asbestos abatement and conversion to a non-toxic material (the ABCOV Method).

The ABCOV Method is a non-thermal, Federal Environmental Protection Agency approved, simple, economical, proprietary, physical chemical treatment of asbestos and/or asbestos-containing material (ACM) that renders it harmless in a period of two hours or less, reducing the volume by 60% to 90%, and leaving a sludge of amorphous silica.

This non-thermal, completely portable and mobile system can be built as small or as large as needed.

BENEFITS OF THE ABCOV METHOD

1. 60% to 90% waste reduction after conversion of ACM.
2. Converted material can be recycled.
3. Cleaner removal of ACM the first time.
4. ACM conversion to a non-toxic end-product can be done on site.
5. 25% labor savings during the removal of ACM.
6. Approximately 20% overall savings on the job cost for removal of ACM.
7. Owner regains use of abated area 20% sooner.
8. All materials can be reused after cleaning with ABCOV-T and neutralizing with ABCOV-W or rinsing in ABCOV-C and neutralizing with ABCOV-W.
9. **No toxic waste transportation.**
10. **No toxic waste dumping.**
11. **No more owners' "CRADLE-TO-GRAVE LIABILITY."**

ABCOV CONVERSION PRODUCTS

1. **ABCOV-T** is a surfactant used for the initial wetting and removal of ACM from beams and decking, boiler and pipe lagging, etc.; to speed up abatement of the ACM; to provide an asbestos-free surface after final clean up eliminating the need for encapsulants on most surfaces – most importantly, it starts the conversion process.
2. **ABCOV-C** is used in a mixing vat with a high-speed, emulsifier mixer for the final conversion of the removed ACM.
3. **ABCOV-R** (solid) and **ABCOV-R1** (liquid) are used to regenerate the ABCOV-C solution for reuse and for additional savings.
4. **ABCOV-W** is used to neutralize the surface where ACM has been removed with ABCOV-T, to neutralize the surface of tools, plastics, uniforms, etc. that have been washed with ABCOV-T or ABCOV-C; to neutralize spent ABCOV-C; and to neutralize spills of ABCOV-T, ABCOV-C and ABCOV-R1.

ABCOV MIXING EQUIPMENT

The ABCOV mixing unit can be built to any size.

All equipment and parts are off the shelf and are swiftly and easily replaced or repaired.

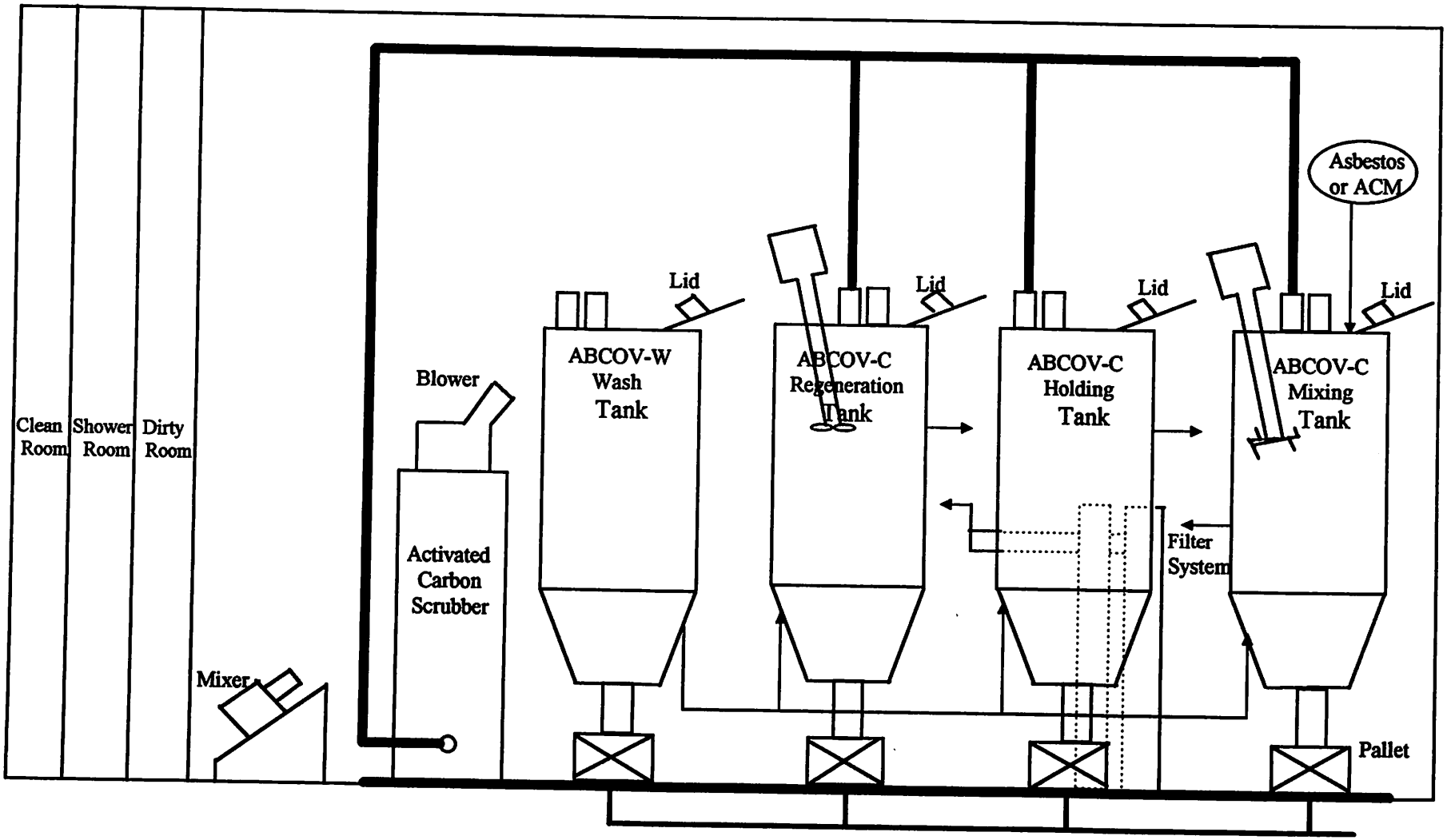
The simplicity of this system allows its owner minimum downtime.

Diagram 1 - Pallet, Tanks, Mixers, Pumps, Filtering System and Activated Carbon Scrubber.

Diagram 2 - Flowchart and sample set-up of Process Area.

ABCOV CONVERSION SYSTEM

Diagram 1 - Side View

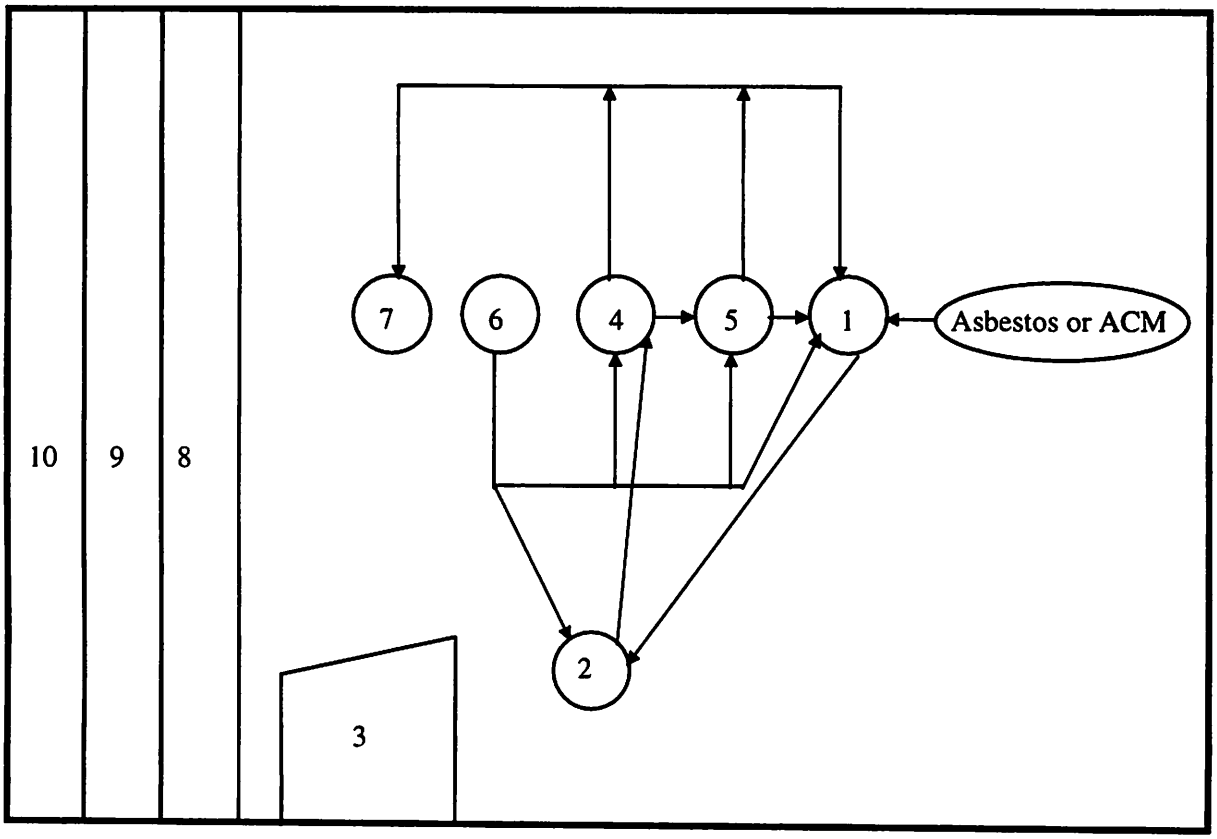


ACM - Asbestos-Containing Material

ABCOV CONVERSION SYSTEM

Diagram 2 - Top View

CONTAINMENT



(1) Conversion Mixing Tank with ABCOV-C and high-speed emulsifier-type mixer

(2) Vacuum Filter System

(3) Solids Mixer (Cement)

(4) Regeneration Tank for ABCOV-C with mixer with a propeller-type blade

(5) Holding Tank for ABCOV-C

(6) Wash and Neutralizing Tank with ABCOV-W

(7) Activated Carbon Scrubber System with blower

(8) Dirty Room

(9) Shower Room

(10) Clean Room

PROCEDURES FOR ASBESTOS ABATEMENT USING THE ABCOV METHOD

All enclosures for asbestos removal using the ABCOV Method are set up the same as a standard asbestos abatement project, as well as monitoring procedures for asbestos release, except for:

1. The use of ABCOV-T for initial wetting and removal of ACM. Besides speeding up the removal process, ABCOV-T is necessary to start the conversion of the ACM.

2. Negative air changes should be at least 6 per hour.

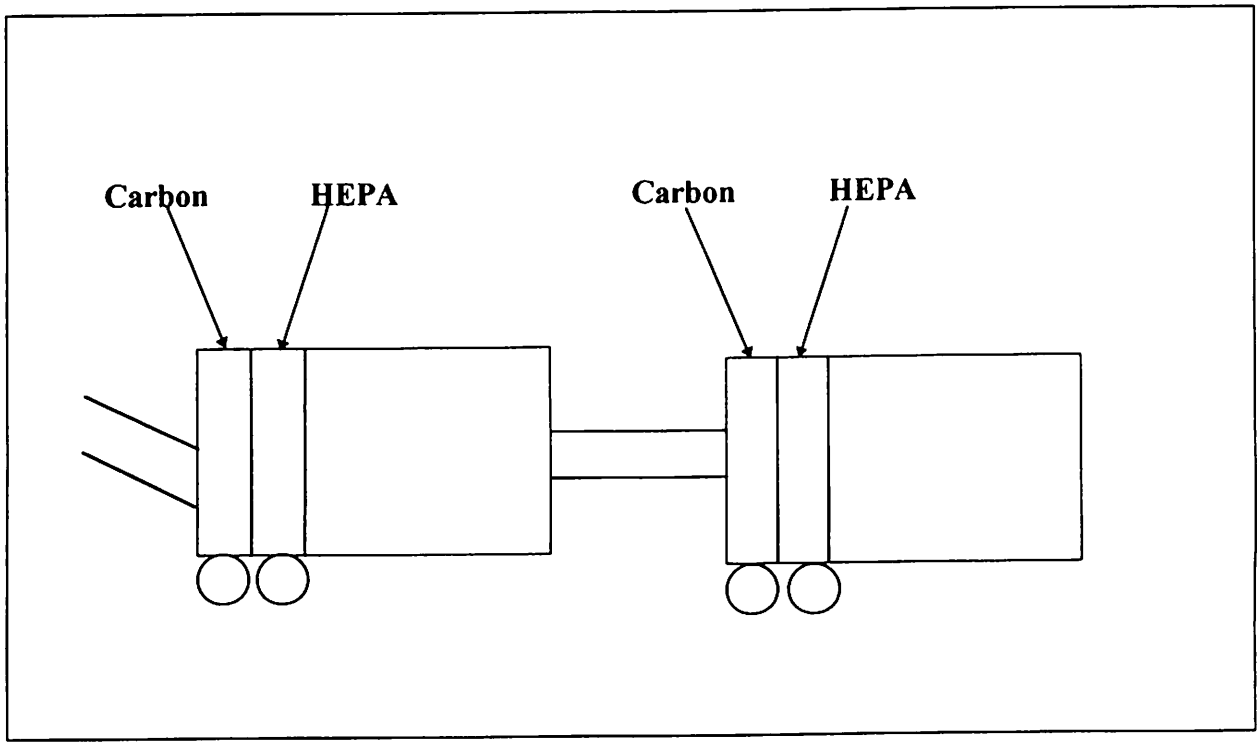
3. Negative air machines should be piggy-backed as such: the first and second negative air machines should have activated carbon filters and high efficiency particulate air (HEPA) filters. (See Diagram 3.)

4. The workers should wear two double cartridge organic vapors/acid gases/HEPA cartridges on a half-face respirator, with proper eye protection, or no a full-face respirator.

5. No rubber products should be used for protection or in airless sprayers.

NOTE: ABCOV chemicals should not be used on any rubber products or on any glass products unless they are part of the abatement.

Diagram 3 - Negative Air Setup



THE FLEXIBILITY OF THE ABCOV MIXING SYSTEM

1. A permanent ABCOV mixing facility can be built on a site where asbestos abatement is to be performed on a daily basis.

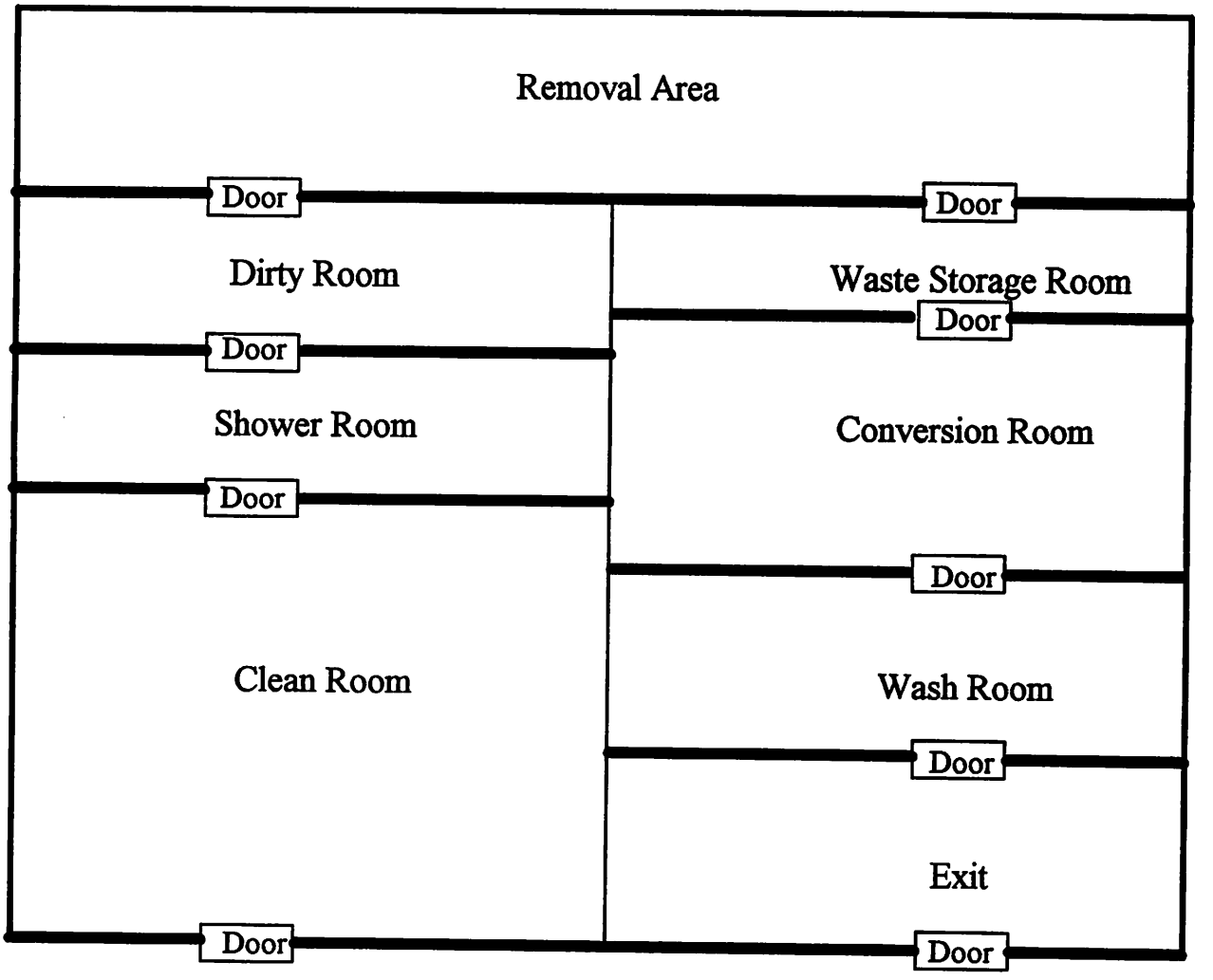
   Examples of this would be a military facility, a power company, a large industrial complex, etc.

2. A portable mixing facility can be mounted in a closed trailer with negative air and moved from site to site.

3. A temporary unit which can be assembled next to an asbestos abatement area. When finished, the ABCOV equipment can be disassembled to be transported for use on the next asbestos abatement and conversion process site.

4. The ABCOV mixing system can be as small as the users' needs (i.e. a Waring-type blender for destruction of asbestos in the lab or a 55-gallon drum for small abatement projects) or as large as the users' needs.

Diagram 4 - Conversion Room



Notes:

1. The conversion room should be built out of plywood; then cover the plywood with six mil. plastic. The floor should be covered with three layers of six mil. plastic; then lay plywood on top of the plastic to support the ABCOV mixing equipment. (Chemical spill protection will be needed.)
2. The complete containment should have at least six air changes per hour.
3. All doors should be louvered to pull negative air.
4. The negative air machines should be set up as described on Page 4, Procedure 3.

Important:

The purpose of using extra filtration for workers and extra air changes and activated carbon filters for the containment is to control acid gas odor or H_2S odor, if it occurs.

TRAINING REQUIRED FOR LICENSING AND CERTIFICATION TO USE THE ABCOV METHOD

In order to safely and effectively use the ABCOV Method, all personnel working on an asbestos abatement project must fully understand the parameters involved to properly expedite the ABCOV Method.

1. The designer of the project must be licensed in order to understand the design and setup of a project which is going to use the ABCOV Method.

2. The Industrial Hygienist monitoring the project will receive an ABCOV license.

   a) The Industrial Hygienist's project manager must be certified to understand all aspects of the use of the ABCOV Method.

   b) The Industrial Hygienist's field technician must be certified in order to ensure the proper set up of a project and the proper use of the ABCOV Method.

   c) The Industrial Hygienist's lab technician must be certified to understand all aspects of the conversion process.

3. The Contractor using the ABCOV Method must be licensed so that he can ensure proper implementation of the removal and conversion process.

   a) The Contractor's supervisors must be certified so he or she understands how to work with the ABCOV Method for both mixing and removal.

   b) The Contractor's mixer or mixers must be certified in order to understand how to set up the mixing room and properly mix and neutralize ACM using the ABCOV Method.

For further information about training, please contact:

Mr. Ernest R. Drew, President
Industrial Training Company
10821 Trade Road
Richmond, Virginia 23236

Tel: (804) 378-9033
Fax: (804) 378-9039

APPLICATIONS OF THE ABCOV METHOD

1. To convert ACM in buildings: sprayed-on fireproofing, pipe lagging, boiler lagging, and transite board, etc. to a non-toxic material.

2. To convert ACM in power plants: magnesium blocks, rope used for insulation, pipe lagging and boiler lagging, gaskets contaminated with ACM, and wire wrapped or packed with ACM, to a non-toxic material.

3. Laboratories can dispose of ACM after TEM or PLM and bulk analysis in a simple Waring-type blender.

4. To convert ACM in gaskets.

5. To convert ACM found in railroad cars, ships, etc.

6. To convert ACM in cables being replaced in streets, buildings, power plants, etc., by stripping the wires and then washing the wires in ABCOV-T to free them of any ACM residue, which will allow the wires to be reused or recycled; by washing the outer covers with ABCOV-T to free them of any ACM, which will allow the covers to be disposed of as regular waste; using ABCOV-C to convert the excess ACM to a non-toxic material.

The ABCOV Method will convert any asbestos-containing material to a non-toxic end-product leaving the owner of the ACM with **NO CRADLE-TO-GRAVE LIABILITY.**

Remember: Using the ABCOV Method is like buying insurance against future asbestos liability.

For further information, please contact:

TONY NOCITO
ABCOV, INC.
214 SULLIVAN STREET
SUITE 3A
NEW YORK, NY 10012

TEL: (212) 505-5558
FAX: (212) 505-5666