PLAINTIFF'S
EXHIBIT
AL-897

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Amendment to Article XX, Rules and Regulations of the Allegheny County Health Department Air Pollution Control

Passed by Allegheny County Board of Commissioners

October 9, 1986

Effective April 1, 1987

Chapter X - TOXIC OR HAZARDOUS AIR POLLUTANTS

Section 1001. ASBESTOS ABATEMENT

1001.01. Incorporation by Reference - Federal Regulations

A. Any person subject to the requirements of Section 1001 of this Article shall also comply with Title 40, Code of Federal Regulations, Part 61, Subpart M, National Emission Standards for Hazardous Air Pollutants (NESHAPS), U.S. Environmental Protection Agency (EPA).

1001.02. Definitions

A. Whenever used in this Section 1001, or in any action taken pursuant to this Section, the following words and phrases shall have the meanings stated, unless the context clearly indicates otherwise.

1. "Abatement" means procedures designed to reduce the potential for fiber release from asbestos-containing materials. These include removal and encapsulation of asbestos-containing materials in any facility.

2. "Adequately Wetted" means sufficiently sprayed or coated with amended water so as to remain wet in order to prevent fiber release during removal, containerization and transportation.

3. "Aggressive Sampling" means a method of sampling by which the person collecting the air sample creates activity during the sampling period to stir up settled dust and to simulate a degree of activity typical of that area of the facility, in accordance with the procedures set forth in Appendix M, in EPA

Guidance Document 560/5-85-024, Guidance for Controlling Asbestos-Containing Materials in Buildings. (Hereinafter EPA Guidance Document).

4. "Airlock" means a system for permitting entrance and exit with minimum air movement between areas consisting of three curtained doorways separated by a distance of at least three (3) feet, such that a person passes through the first doorway into the airlock and allows the doorway sheeting to overlap and close off the opening before proceeding through the second doorway, thereby preventing the flow-through of air.

5. "Air Sampling" means the process of measuring the fiber content of a known volume of air collected during a specific period of time. The procedures utilized shall be the NIOSH Standard Analytical Method for Asbestos in Air P&CAM 239 or Method 7400, as described in EPA Guidance Document. In addition, transmission electron microscopy methods may be required when the Director determines that lower detectability or specific fiber identification are necessary.

6. "Amended Water" means water to which a chemical wetting agent has been added in accordance with the recommendations of the manufacturer in order to improve the penetration of the water into the asbestos-containing material.

7. "Approved Landfill" means a landfill which is licensed or permitted by the appropriate regulatory authority to accept

asbestos-containing waste materials and which is operated in accordance with the requirements set forth in 40 CFR Part 61, Subpart M.

8. "Asbestiform fibers" means fibers at least five (5) micrometers in length, with a length-to-diameter ratio of at least 3 to 1, and with a maximum diameter of 3 micrometers.

9. "Asbestos" means a group of naturally occurring minerals that readily separate into fibers, including Chrysotile, Amosite, Crocidolite, Anthophyllite, Tremolite, and Actinolite.

10. "Asbestos-Containing Waste Material" means asbestos containing material or asbestos contaminated objects requiring disposal.

11. "Clean Room" means an uncontaminated area or room in the decontamination enclosure system which has provisions for the storage of workers' non-work clothing and clean protective equipment.

12. "Clearance Air Sampling" means the employment of aggressive sampling techniques during air monitoring to determine the airborne concentration of residual fibers at the conclusion of an asbestos abatement project.

13. "Containment barrier" means a temporary, air-tight barrier consisting of minimum 6 mil plastic sheeting used to seal off all openings into the work area, including but not limited to windows, doorways, corridors, skylights, ducts and grilles.

14. "Decontamination Enclosure System" means a series of connected chambers, separated from the work area and from each other by

airlocks, which is for the decontamination of workers, materials and equipment (See Appendix 2, Figure 1).

15. "Demolition" means the wrecking or taking out of any load-supporting structural member of a facility together with any related handling operations.

16. "Encapsulant" means a liquid material which can be applied to asbestos-containing material to temporarily control the potential release of asbestos fibers from the material either by creating a membrane over the surface (bridging encapsulant) or by penetrating into the material and binding its components together (penetrating encapsulant).

17. "Encapsulation" means the coating or spraying of friable asbestos-containing material with an encapsulant in order to temporarily control the potential release of asbestos fibers from said material.

18. "Equipment Room" means a contaminated area or room in the decontamination enclosure system which has provisions for the storage of contaminated clothing and equipment.

19. "Facility," when used in this Section, means any institutional, commercial, or industrial structure, installation or building, including apartment buildings consisting of more than four (4) units.

20. "Facility Component" means any pipe, duct, boiler, tank reactor, turbine or furnace at or in a facility, or any structural member of a facility.

21. "Friable Asbestos-Containing Material" (hereinafter FACM) means any material that contains more than 1 percent asbestos by weight and that, when dry, can be crumbled, pulverized or reduced to powder by hand pressure.

22. "Glovebag Technique" means a method for removing FACM from heating, ventilation, and air conditioning (HVAC) ducts, short pipe runs, valves, joints, elbows, and other nonplanar surfaces in a noncontained work area. The glovebag assembly is a manufactured device consisting of a bag (constructed of 10-mil transparent plastic), two inward-projecting longsleeve rubber gloves, one inward-projecting waterwand sleeve, an internal tool pouch, and an attached, labeled receptacle for asbestos waste. The glovebag is constructed and installed in such a manner that it surrounds the object or area from which FACM is to be removed and contains all asbestos fibers released during the removal process.

23. "HEPA Filter" means a high efficiency particulate absolute air filter capable of trapping and retaining 99.97 percent of fibers greater than 0.3 micrometers in mass median aerodynamic diameter equivalent.

24. "HEPA Vacuum Equipment" means vacuuming equipment equipped with a HEPA filter system.

25. "Independent Consulting Company" means a company which has no business, financial or personal association with the facility owner or operator, or with the asbestos abatement contractor or subcontractor.

26. "Independent Laboratory" means a laboratory which has no business, financial or personal association with the facility owner or operator, or with the asbestos abatement contractor or subcontractor.

27. "Leak-tight container" means, at a minimum, double 6 mil polyethylene bags inside a fiber or steel drum capable of being sealed at the top with an adjustable seal ring, labeled in accordance with the requirements of 40 CFR Section 61.152(b)(1)(iv).

28. "Negative Air Pressure Equipment" means a portable exhaust system equipped with HEPA filters. The system shall be capable of maintaining a constant, low velocity, clean air flow out of contaminated areas, creating a negative pressure differential between the outside and inside of the contaminated work area.

29. "NESHAPS" (National Emission Standards for Hazardous Air Pollutants 40 CFR Part 61, Subpart M), means any emission limitation now or hereafter established by the United States Environmental Protection Agency pursuant to Section 112 of the Clean Air Act.

30. "NIOSH" means the National Institute for Occupational Safety and Health CDC - NIOSH, Building J. N.E., Room 3007, Atlanta, GA 30333.

31. "Occupied Facility" means any facility which has not been evacuated for the duration of the asbestos abatement activity of all persons other than those directly involved with said abatement activity.

32. "Outside Air" means the air outside the work area.

33. "Planned renovation/maintenance" means a number of renovation/maintenance operations in which the amount of FACM that will be removed or encapsulated within one year can reasonably be predicted to exceed at least 40 linear meters (131 linear feet) on pipes or 7.5 square meters (81 square feet) on other facility components.

34. "Removal" means the stripping or taking off of any FACM from surfaces or facility components.

35. "Shower Room" means a room between the clean room and the equipment room in the worker decontamination enclosure system with hot and cold running water controllable at the tap and suitably arranged for complete showering during decontamination.

36. "Structural Member" means any load-supporting or non-load-supporting member of a facility, such as beams, walls and ceilings.

37. "Wet Cleaning" means the process of eliminating asbestos contamination from building surfaces and objects by using cloths, mops, or other cleaning tools which have been dampened with water.

38. "Work Area" means designated rooms, spaces, or areas in which asbestos abatement actions are to be undertaken or which may become contaminated as a result of such abatement actions.

39. "Worker Decontamination Enclosure System" means that portion of a decontamination enclosure system designed for controlled passage of workers, and other authorized persons, consisting of a cleanroom, a shower room, and an equipment room separated from each other and from the work area by airlocks.

1001.03. Applicability.

A. The provisions of this Section shall only apply to the following:

1. The removal or encapsulation of at least 40 linear meters (131 linear feet) of FACM on pipes or 7.5 square meters (81 square feet) of FACM on other facility components.

2. The demolition of any facility containing at least 40 linear meters (131 linear feet) of FACM on pipes or 7.5 square meters (81 square feet) of FACM on other facility components. All applicable provisions of this Section must be complied with prior to the wrecking or taking out of any facility component.

B. The Notice provisions only of subsection 1001.08 shall also apply to the demolition of any facility containing less than 40 linear meters (131 linear feet) of FACM on pipes, or 7.5 square meters (81 square feet) of FACM on other facility components.

C. Planned renovation/maintenance activities shall be subject to the substantive procedures and standards set forth in 40 CFR, Part 61, Subpart M, (NESHAPS).

1001.04. Authority to Determine and Eliminate Public Health Hazard

A. In cases where the Bureau believes FACM is present in a facility in such a condition as to pose a potential public health hazard, the Director shall have the authority to issue an Order requiring the facility owner or operator to have bulk samples of the suspected FACM collected and analyzed in accordance with subsection 1001.05, and submit a copy of the laboratory results to the Bureau as expeditiously as possible.

B. If the Director determines, on the basis of any information available to him, that the presence and condition of FACM in a facility poses a public health hazard, the Director shall have the authority to issue an Order pursuant to Chapter III of this Article requiring the facility owner or operator to immediately take such action as is necessary to eliminate such public health hazard.

1001.05. Bulk Sampling and Analysis

A. Bulk samples shall be analyzed to determine asbestos content by using, at a minimum, polarized light microscopy (PLM), supplemented, where necessary, by x-ray diffraction.

B. Sample analysis by PLM shall be performed by independent laboratories participating in the U. S. Environmental Protection Agency's bulk asbestos sample quality assurance program.

1001.06. Asbestos Abatement Contractor License

A. General. No person may remove or encapsulate, or allow the removal or encapsulation of FACM in any facility unless the person engaged

in the removal or encapsulation is licensed by the Bureau under this subsection.

B. Application. To apply for an Asbestos Abatement Contractor License (hereinafter Asbestos License), a person shall:

1. Submit a completed Asbestos License application to the Bureau on application forms provided by the Bureau;

2. Submit to the Bureau with the application, a non-refundable Asbestos License application fee in the amount of $100.00, to cover the costs associated with processing, reviewing and taking action upon the application; and

3. Submit to the Bureau such other information as is necessary to enable the Bureau to determine that the applicant meets the criteria set forth in subsection 1001.06.C. below, including, but not limited to, the following:

   a. Verification that all employees to be engaged in asbestos abatement have successfully complied with the health and safety training procedures set forth in Section 1001.07.

   b. Written standard operating procedures and employee protection plans implemented by all employees engaged in asbestos abatement activity.

   c. Certification that employees engaged in asbestos abatement have been and will continue to be supplied with protective clothing and equipment, including but not limited to disposable whole body coveralls, hoods and boots, and respirators approved for asbestos protection.

d. Citations or notices of violation levied against the applicant by any federal, state or local government agency for violations during or related to asbestos abatement activity in any jurisdiction during the prior three years.

C. Action on an Asbestos License Application

1. General. Within 15 work days after receiving an Asbestos License application, the Bureau will acknowledge receipt of the application and notify the applicant of any deficiency in the application. Within 30 work days after receiving a full and complete application, including all additional information requested by the Bureau, the Director will act on the application.

2. Standards for Issuance. The Director shall not issue an Asbestos License unless he determines that the applicant has fully complied with or has, at a minimum, demonstrated the ability to fully comply with the applicable requirements, procedures and standards established by this Section and by 40 CFR Part 61, Subpart M.

D. Term and Renewal

1. Unless the Director revokes an Asbestos License pursuant to subsection 1001.06.E. below, said Asbestos License shall remain in effect for one (1) year from the date of issuance, or until the end of the calendar year, whichever occurs first.

2. The Director may renew an Asbestos License annually if the Asbestos License holder:

a. Submits to the Bureau a completed application for renewal, on forms provided by the Bureau, no later than thirty (30) calendar days before the Asbestos License expires;

b. Submits to the Bureau with the completed application, the non-refundable Asbestos License fee in the amount of $100.00; and

c. Has complied with all applicable requirements of any previously issued Asbestos License and of this Section.

E. Revocation. The Director may, at any time, revoke an Asbestos License if he finds that:

1. Any statement made in the Asbestos License application is not true, or that material information has not been disclosed in the application;

2. The Asbestos License holder has failed to comply with any requirement of this Section, any requirements of an Order issued under this Section or the terms and conditions of any previously issued Asbestos Abatement Project Permit.

3. He has been denied lawful access to any premises upon which the Asbestos License holder is engaged in asbestos abatement activity or to any records of the Asbestos License holder to which he is authorized by Section 201 of this Article.

F. Appeal. Any person who is aggrieved by the denial or revocation of an Asbestos License under this subsection shall be entitled to an administrative hearing in accordance with the provisions of Section 804.H of this Article.

1001.07. Asbestos Abatement Employee Health and Safety Training

A. General. No person shall engage in the removal or encapsulation of FACM unless said person has, within the previous twelve (12) months, successfully completed an asbestos health and safety training course conducted by the Director which meets, at a minimum, the requirements set forth in subsection 1001.07.B. below.

B. Minimum Health and Safety Training Requirements. The health and safety training course required in subsection 1001.07.A above shall consist of an initial course (at least five (5) hours in length) and an annual review course (at least three (3) hours in length) and shall contain at a minimum, the following elements:

1. The requirements, procedures and standards and any training required by:

   40 CFR Part 61, Subparts A and M; and

   29 CFR 1910.1001, 29 CFR 1910.126 and

   29 CFR 1910.134;

2. Recognition of asbestos, including its physical characteristics and uses;

3. Health hazards of exposure to asbestos fibers, including the relationship between asbestos exposure and diseases;

4. Employee protection, including respiratory protection, protective clothing, safety equipment, air monitoring, medical surveillance and personal hygiene;

5. State-of-the-art work practices for asbestos abatement activities including the proper construction and maintenance of barriers and decontamination enclosure systems, the posting of warning signs, the sealing off of building ventilation systems, the proper work techniques for minimizing fiber release, the use of wet methods and chemical wetting agents, the use of negative pressure ventilation equipment, the use of HEPA vacuums, and the proper clean-up and disposal procedures.

6. An examination at the completion of the health and safety training course which tests the trainee's understanding of those issues relevant to the safe performance of asbestos abatement activities, worker protection and proper work practice procedures.

C. Successful Completion and Certification. Successful completion of the required asbestos abatement health and safety training course shall be determined by the trainee's attendance at the course and by the trainee's score on the examination. Upon said successful completion, the trainee shall be issued an Asbestos Employee Health and Safety Training Certification, which the trainee shall be required to produce upon request by the Director.

1001.08. Asbestos Abatement Notice and Permit

A. General. No person shall conduct, or allow to be conducted, the demolition of any facility containing FACM, or the removal or encapsulation of FACM in any facility, unless that person has first

submitted to the Bureau the Notice required in subsection 1001.08.B. below, and, if an Asbestos Abatement Project Permit (hereinafter Asbestos Permit) is required pursuant to subsection 1001.08.C. below, has posted such Asbestos Permit in a conspicuous location immediately adjacent to the work area.

B. **Notice.** At least twenty (20) days prior to the beginning of removal or encapsulation of FACM in any facility, or any project involving the demolition of a facility containing FACM, a written Notice shall be submitted to the Bureau which includes, at a minimum, the following information:

1. Name, address and telephone number of the owner and/or operator of the facility;
2. Name, address, and telephone number of the person (e.g. contractor) to perform the demolition, removal or encapsulation;
3. Allegheny County Health Department Asbestos License I.D. Number for the person (e.g. contractor) to perform the demolition, removal or encapsulation;
4. Exact location (e.g. street name and number) of the facility;
5. Detailed description of the types, amounts and locations of all FACM to be removed or encapsulated, including maps, blueprints and sketches where necessary.
6. Starting and completion dates and times for the removal or encapsulation.

7. Specific work practices, procedures and equipment to be utilized on this project to comply with the requirements of this Section, including the proposed use of the "glovebag technique."

8. Name and address of the waste disposal site where the friable asbestos waste material will be deposited.

C. Asbestos Abatement Project Permit.

1. Application. At least twenty (20) days prior to the beginning of any asbestos abatement project involving the removal or encapsulation of FACM, the following shall be submitted:

a. A completed Asbestos Permit application, on application forms provided by the Bureau;

b. A non-refundable Asbestos Permit application fee in the amount of $100.00, for an asbestos abatement project involving the removal or encapsulation of less than 152 linear meters (500 linear feet) or 28 square meters (300 square feet) of FACM, and $250.00 for an asbestos abatement project involving the removal or encapsulation of equal to or greater than the above quantities of FACM, to help defray the cost of processing, reviewing and taking action upon the Asbestos Permit application and inspecting and monitoring the project for compliance with this Section; and

c. A detailed description of decontamination enclosure systems to be utilized, including floor plans.

2. Standards for Issuance. On the basis of the information submitted in the Asbestos Permit application, the Notice and any other information available to the Director, he will either issue an Asbestos Permit, issue an Asbestos Permit with conditions imposed therein, or deny the Asbestos Permit. The Director shall not issue an Asbestos Permit unless he determines that the applicant has demonstrated the ability to fully comply with the requirements of this Section.

3. Term. Unless the Director revokes an Asbestos Permit pursuant to subsection 1001.08.C.4. below, the Asbestos Permit shall remain in effect until the completion date shown on the Notice submitted pursuant to subsection 1001.08.B. above. The Director may, however, extend the term of an Asbestos Permit, in writing, for cause shown.

4. Revocation. The Director may, at any time, revoke an Asbestos Permit, if he finds that any requirement of this Section or any term or condition set forth in the Asbestos Permit is not being complied with.

5. Appeals. Any person who is aggrieved by the denial, revocation or conditions of an Asbestos Permit under this subsection, shall be entitled to an administrative hearing in accordance with the provisions of Section 804.H of this Article.

1001.09. Occupied Facility Protection. The following safeguards and precautions shall be required on an asbestos abatement project occurring in an occupied facility:

A. "Caution - Asbestos Hazard" signs meeting the specifications set forth in 29 CFR 1910.1001 shall be posted at all internal doorways in the facility which provide access to the work area in order to inform people that asbestos contamination may be present.

B. Negative air pressure shall be maintained in the work area at all times to ensure that the air outside the work area does not become contaminated with asbestos fibers. Negative air pressure equipment shall be utilized to provide, at a minimum, one air change in the work area every 15 minutes. Said equipment shall operate twenty-four (24) hours per day from the commencement of asbestos removal or encapsulation until the requirements of subsections 1001.15 and 1001.16 have been met.

C. Any area outside of the work area which becomes contaminated as a result of the asbestos abatement activity shall be decontaminated. Such decontamination shall, at a minimum, consist of wet cleaning and vacuuming using HEPA vacuum equipment.

1001.10. Work Area Preparation. Prior to commencing the actual removal or encapsulation of FACM, the following actions shall be taken to prepare the work area:

A. Post caution signs meeting the specifications set forth in 29 CFR 1910.1001(g)(1)(ii) at all approaches to the work area. Signs shall be posted a sufficient distance from the work area to permit a person to read the sign and take the necessary protective measures to avoid exposure.

B. Shut down and isolate heating, ventilation and air conditioning (HVAC) systems to prevent contamination and fiber dispersal to other areas of the facility.

C. Remove all movable objects from the work area.

D. Cover and enclose all remaining fixed objects in the work area with minimum 6 mil plastic sheeting sealed with tape.

E. Seal off all openings, including but not limited to windows, corridors, doorways, skylights, ducts and grilles with minimum 6 mil plastic sheeting sealed with tape.

F. Cover floor and wall surfaces with minimum 6 mil plastic sheeting sealed with tape. Use a minimum of two layers of 6 mil plastic on floors. Cover floors and walls so that plastic on floor overlaps the plastic on walls by a minimum of 12 inches.

1001.11. Worker Decontamination Enclosure Systems.

A. Worker decontamination enclosure systems shall be provided at all locations where workers will enter or exit the work area. These systems may consist of existing rooms outside of the work area, that can be enclosed in plastic sheeting and are accessible from the work area. When the layout of existing rooms is inappropriate, enclosure systems may be constructed out of metal, wood or plastic support as appropriate (See Appendix 2, Figure 1).

B. Entry to and exit from all airlocks and decontamination enclosure system chambers shall be through curtained doorways consisting of three sheets of overlapping polyethylene sheeting. One sheet shall

be secured at the top and left side, the second sheet at the top and right side, and the third sheet at the top and left side. All sheets shall have weights attached to the bottom to insure that the sheets hang straight and maintain a seal over the doorway when not in use. Doorway designs providing equivalent protection may be utilized upon approval by the Director under subsection 1001.18.

1001.12. Removal Procedures. The following work practices shall, at a minimum, be required during the removal of FACM; except when the glove-bag technique is utilized in accordance with subsection 1001.12.H below.

A. The work area shall be prepared in accordance with subsections 1001.09 through 1001.11.

B. All asbestos containing materials to be removed shall be wetted with an amended water solution, using low pressure equipment capable of providing a fine spray mist, in order to reduce airborne fiber concentrations when the material is disturbed. The material shall be saturated to the substrate. All removed material shall be kept wet enough to prevent fiber release until it can be containerized for disposal. When special circumstances (e.g. live electrical equipment, materials previously coated with an encapsulant) prohibit the adequate use of wet methods to reduce fiber concentrations, dry removal may be used with prior written approval of the Director.

C. Saturated FACM shall be removed in manageable sections capable of containerization in 6 mil polyethylene bags and drums. Removed FACM

shall be so containerized at least once per eight (8) hour work shift.

D. FACM removed from facility structures or components shall not be dropped or thrown to the floor. Such material shall be removed as intact sections or components whenever possible and carefully lowered to the floor. If this cannot be done for materials removed greater than fifty (50) feet above ground level, a dust-tight chute shall be constructed to transport the material to containers on ground level or the materials shall be containerized at elevated levels (e.g. on scaffolds) and carefully lowered to the ground.

E. Containers (as required in subsection 1001.17) shall be sealed prior to their removal from the work area. Double-bagging (two 6 mil polyethylene bags) of waste material is required. The bags shall not be overfilled and shall be securely sealed to prevent accidental opening and leakage. Bags shall be placed in drums for transportation to the landfill. Both the 6 mil polyethylene bags and the drums shall be labeled in accordance with the requirements of 40 CFR Section 61.152(b)(1)(iv). Leak-tight containers providing equivalent protection (in terms of preventing the release of asbestos fibers) may be utilized upon approval by the Director under subsection 1001.18.

F. Large components containing or covered with FACM may be removed intact, but shall be wrapped in at least 2 layers of 6 mil polyethylene sheeting and securely sealed for transport to the landfill.

G. After completion of the removal of FACM, surfaces from which the FACM has been removed shall be wet cleaned to remove all visible residue.

H. When the glovebag technique is to be utilized, the Director may approve alternative requirements which are proposed in the Permit Application for work area preparation, decontamination enclosure systems, removal procedures, clean-up procedures, and clearance air air sampling.

1001.13. Encapsulation Procedures. The following work practices shall be required during the encapsulation of FACM:

A. The work area shall be prepared in accordance with subsections 1001.09 through 1001.11.

B. Damaged areas of existing FACM shall be repaired with non-asbestos containing substitutes.

C. Loose or hanging asbestos-containing materials shall be removed in accordance with the requirements of subsection 1001.12.

D. Encapsulants shall be applied using airless spray equipment so as to reduce the potential fiber release from the asbestos-containing material being encapsulated.

E. Penetrating-type encapsulants shall be applied to penetrate existing asbestos materials uniformly to the substrate and to the depth specified by the manufacturer of the encapsulant.

F. Bridging-type encapsulants shall be applied to provide the manufacturer's specified number of inches of minimum dry film thickness over sprayed asbestos-containing surfaces.

G. Encapsulated asbestos-containing materials shall be clearly designated (e.g. labels, signs, floor plans or color codes) in order to warn of the presence of asbestos.

1001.14. Clean-up Procedures. The following clean-up procedures and standards shall be followed and achieved after every asbestos abatement project:

A. All visible accumulations of asbestos-containing material and asbestos contaminated debris shall be removed and containerized for disposal as required in subsection 1001.17.

B. All surfaces in the work area shall then be wet cleaned. All rags, mops and sponges used in the clean-up shall be disposed of as asbestos-containing waste material.

C. After all surfaces have dried, any remaining visible residue shall be vacuumed from all objects and surfaces in the work area using HEPA vacuum equipment.

D. At the completion of the wet/dry cleaning cycle required in subsections 1001.14.B. and C. above, the work area shall be closely inspected for visible residue, and the wet/dry cleaning cycle shall be repeated until no residue is visible. Any visible residue shall be presumed to contain asbestos.

E. When no visible residue remains on any surfaces or objects in the work area, Clearance Air Sampling pursuant to subsection 1001.15 shall commence and the Bureau shall be contacted to arrange for the Final Clearance Inspection pursuant to subsection 1001.16.

1001.15. Clearance Air Sampling. Following the completion of the clean-up operations required in subsection 1001.14, Clearance Air Sampling shall be performed as follows:

A. Clearance Standard. At least five (5) samples of air per the first 5000 square feet of work area plus one sample per each additional 5000 square feet of work area; or one (1) sample of air per room, whichever is greater, shall be collected and analyzed in accordance with the requirements of this subsection. The airborne concentrations of asbestiform fibers detected in each sample shall be less than 0.01 fibers per cubic centimeter of air.

B. Air Sampling and Analysis. The air sampling and analysis shall be conducted in accordance with the procedures set forth in Appendix M, in EPA Guidance Document. Aggressive Sampling shall be conducted in accordance with the procedures set forth in said Appendix M. A minimum volume of 1500 liters of air per sample shall be collected when utilizing Method 7400 and a minimum of 3000 liters of air per sample shall be collected when utilizing P&CAM 239.

C. The air sampling and analysis shall be conducted by an independent consulting company or laboratory which is trained and experienced in the appropriate procedures for collecting and analyzing such air samples and which is Proficient in the NIOSH Proficiency Analytical Testing (PAT) Program.

D. The Clearance Air Sampling laboratory analyses shall be retained on-site at the asbestos abatement project work area for review and a

copy provided to the Bureau at the time of its Final Clearance Inspection.

1001.16. Final Clearance Inspection.

A. General. A Final Clearance Inspection by the Bureau shall be required after the successful completion of the clean-up and Clearance Air Sampling requirements in subsections 1001.14 and 1001.15.

B. Until the results of the Final Clearance Inspection are acceptable to the Bureau, the removal of the containment barriers, the removal of any negative air pressure equipment, and the reopening of the work area to the public shall be prohibited. Such inspection shall be deemed acceptable when no asbestos-containing waste material or visible residue remain on any surface or object in the work area.

C. If the results of this inspection are not acceptable to the Bureau, the Bureau will indicate the deficiencies which must be remedied before the removal of the containment barriers, the removal of any negative air pressure equipment, and the reopening of the work area to the public shall be permitted.

1001.17. Disposal Procedures.

A. All asbestos-containing materials, asbestos-containing waste materials, asbestos contaminated materials including, but not limited to, sealing tape and plastic, disposable clothing, respirator filters, mop heads, sponges and rags, shall prior to removal

from the work area be placed in leaktight containers and properly sealed and labeled, for transportation to and disposal at approved landfills.

B. All such leak-tight containers must be labeled in accordance with the requirements of 40 CFR Section 61.152(b)(1)(iv).

C. Alternative forms of containerization may be approved by the Director under subsection 1001.18 upon a satisfactory demonstration that they are equivalent in terms of asbestos containment.

D. Double-bagged material may be carefully removed from drums at the landfill site for disposal and the drums cleaned for re-use, provided the bags are intact.

E. Asbestos-containing waste materials with sharp-edged components (e.g. nails, screws, metal lath, tin sheeting) which may tear the double 6 mil polyethylene bags and sheeting, shall be placed into drums for disposal together with the drum.

F. Asbestos-containing waste materials which cannot be placed in leak-tight containers, shall be adequately wetted, wrapped in two (2) layers of 6 mil polyethylene, securely sealed and transported from the work site to the disposal site in an enclosed truck.

G. Asbestos-containing waste containers shall be placed on the ground at the disposal site, not pushed or thrown out of trucks.

H. All asbestos-containing waste materials shall be transported directly to the approved landfill. Temporary storage at a location other than the site of the asbestos abatement project shall not be permitted.

I. All disposal receipts, trip tickets, transportation manifests and/or other documentation of transportation and disposal of the asbestos-containing waste materials shall be maintained and shall be made available to the Bureau, upon request, for inspection and copying.

1001.18. Alternative Procedures.

A. The Director may, on a case-by-case basis, approve an alternative procedure to be followed on a specific asbestos abatement project in lieu of a requirement of this Section, provided that the requested alternative procedure is submitted, in writing, and demonstrates to the Director's satisfaction that: (a) the proposed alternative procedure is equivalent, in terms of asbestos control, to the requirements in this Section; or (b) that strict compliance with the requirements of this Section are unreasonable or impossible in the particular circumstances involved, and the proposed alternative procedure will minimize, to the maximum extent possible, the potential for the public's exposure to asbestos fibers.

B. Approval to institute an alternative procedure in lieu of a requirement of this Section must be received, in writing, from the Director prior to the use of such alternative procedure.

1001.19. Violations.

Failure to comply with any requirement of this Section shall be a violation of this Article giving rise to the remedies provided by Section 305 of this Article.

Appendix M. Detailed Specifications for Sampling and Analyzing Airborne Asbestos

The following specifications are summarized from "Measuring Airborne Asbestos Following an Abatement Action" (USEPA 1985).

M.1 Sampling

M.1.1 Sampling Equipment

Standard sampling equipment consists of a pump (operated at a 2 to 12 liter per minute flow rate), a filter in a cassette and associated tubing and supports. Three types of filters can be used:

PCM — cellulose ester with 0.8 to 1.2 μm pore size;

TEM — polycarbonate with 0.4 μm pore size (preferred); or cellulose ester with 0.8 μm pore size.

M.1.2 Number of Samples

M.1.2.1 TEM

A minimum of five samples inside and five outside the work site is recommended. When a negative air pressure ventilation system has been used during the abatement operation the "outside" samples should be collected outside the work site, but inside the building. This provides a comparison between the work site and the incoming air. If a negative air pressure ventilation system has not been used, the "outside" samples should be collected outdoors. These sample sizes are based on calculations of statistical reliability and on the following characteristics:

- The coefficient of variation for TEM measurements is between 100% and 150% based on data from EPA research studies.
- A false positive rate of .10 (i.e., based on the statistical test comparing inside and outside measurements, 10% of the "clean" work sites will fail and have to be recleaned).
- A false negative rate of at most .10 (i.e., the statistical test comparing inside and outside measurements will identify at least 90% of the sites that must be recleaned).

M.1.2.2 PCM

A minimum of five samples is recommended. A sample size of five controls the false negative error rate. At least 90% of the sites where the actual fiber concentration exceeds 0.01 f/cc will fail the test. If the actual concentration is 0.02 f/cc the probability of failure is 99%.

M.1.3 Location of Samplers

M.1.3.1 Indoors

Indoor samplers should be placed so they are not influenced by unusual air circulation patterns. Avoid corners of rooms and obstructions (like furniture). Within the above constraints, samplers should be placed at random around the work site. For example, if the site is a single room of 1000 or more sq. ft., the five samplers should be distributed in an approximately uniform manner. If the site includes more than five rooms, the rooms to be sampled may be selected randomly. The companion EPA document (USEPA 1985) describes this procedure in more detail.

When TEM is used for the air test and a negative air pressure ventilation system has been employed during the abatement operation, the five "outside" samplers should be placed outside the work site but inside the building, and the negative air system left running during sampling. These outside samplers should be located to avoid any air that might escape through the containment barriers. Minimum recommendations are at least 50 ft. from the entry portal to the work site, or 25 ft. from the plastic containment barriers.

M.1.3.2 Outdoors

If TEM is to be used for the air test and a negative air pressure ventilation system has not been used during abatement, then five samplers should be placed outdoors. These should be placed at ground level (about 2 meters high), if possible, and away from obstructions that may influence wind patterns. If access to electricity and concerns about security dictate a roof-top site, do not place samplers near vents or other structures on the roof.

M.1.4 Sampling Volumes

M.1.4.1 TEM

The required sampling volume for the TEM air test is calculated from the theoretical detection limit of the TEM analysis procedures, and from typical levels of asbestos against which measurements in the work site will be compared:

$$\text{Volume} = \frac{(1\ \text{f/10 grid squares})}{(0.005\ \text{f/cc})} \times \frac{(855\ \text{mm}^2)}{(0.0056\ \text{mm}^2)} \times \frac{(1\ \text{liter})}{(1000\ \text{cc})} = 3054\ \text{liters}$$

Where:

- 1 f/10 grid squares (the maximum recommended filter counting area) is the smallest number of fibers needed to make a non-zero measurement. (This is below the limit of reliable quantification.)
- 0.005 f/cc is a typical outdoor asbestos level in urban areas, as measured by TEM (Chatfield 1983).
- 855 mm^2 is the collection area of a 37 mm diameter filter.
- 0.0056 mm^2 is the area of each grid square (75 μm per side) in a 200 mesh electron microscope grid. This value will vary from 0.0056 to 0.0081 mm^2 for different grids. Larger grid squares will improve measurement accuracy for the same sampling volume.

This equation is appropriate for TEM analysis using a direct sample transfer technique (see Section M.2.1). If an indirect technique is used, the required sampling volume is increased in proportion to the dilution used. For example, if the sample is diluted by a factor of 10, the required volume is 10 times larger.

M.1.4.2 PCM

The equivalent PCM limit of reliable quantification for a sampling volume of 3000 liters is:

$$\text{Quantification Limit} = \frac{(10\ f/100\ \text{fields})}{(3000\ \text{liters})} \times \frac{(855\ mm^2)}{(0.003\ mm^2)} \times \frac{(1\ \text{liter})}{(1000\ cc)} = 0.01\ f/cc$$

Where:
- 10 f/100 fields is the limit of reliable quantification for the P&CAM 239 method.
- 855 mm^2 is the collection area of a 37 mm diameter filter.
- 0.003 mm^2 is the size of a typical field of view for a PCM microscope. This value will vary from 0.003 to 0.006 mm^2 for different microscopes. Larger fields of view will improve (decrease) the limit of reliable quantification.

By increasing the sampling volume, the PCM test criterion can be made proportionally more stringent:

Volume	Quantification Limit
3000 liters	0.01 f/cc
5000	0.006
7500	0.004

If the sampling scheme associated with the new NIOSH 7400 PCM method is used, the limit of reliable quantification will be lower for the same sampling volume.

M.1.5 Aggressive Sampling

Procedures for sampling aggressively are:

- Before starting the sampling pumps, direct the exhaust from forced air equipment (such as a 1 horsepower leaf blower) against all walls, ceilings, floors, ledges and other surfaces in the room. This should take at least 5 minutes per 1000 sq. ft. of floor.
- Place a 20-inch fan in the center of the room. (Use one fan per 10,000 cubic feet of room space.) Place the fan on slow speed and point it toward the ceiling.
- Start the sampling pumps and sample for the required time.
- Turn off the pump and then the fan(s) when sampling is complete.

M.2 Analysis

M.2.1 TEM

Use the update to the EPA provisional method (Yamate 1984). The sample should be transferred directly from the polycarbonate filter to the electron microscope grid. If high levels of organic materials are suspected or found, cellulose ester filters and indirect transfer (involving ashing, sonicating, and refiltering the fibers) is recommended. However, levels of airborne organic particles should be low in a cleaned work site.

M.2.2 PCM

Use the NIOSH P&CAM 239 method (NIOSH 1979). The newer NIOSH 7400 methods can also be used, although OSHA has yet to replace P&CAM 239 with 7400 for workplace compliance monitoring. NIOSH reports that 7400 is at least as accurate as P&CAM 239.

M.3 Interpretation of Results

M.3.1 TEM

Use student's "t" test to compare inside and outside levels.

- Compute the natural logarithm of fiber concentration for each sample.
- Compute means of the log transformed data for inside samples and outside samples.
- Form the ratio

$$T = \frac{\bar{y}_1 - \bar{y}_2}{S\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

Where:

$\bar{y}_1$ = average of log concentrations inside the work site

$\bar{y}_2$ = average of log concentrations outside the work site

$S = [(\Sigma(y_{1i}-\bar{y}_1)^2 + \Sigma(y_{2i}-\bar{y}_2)^2)/(n_1+n_2-2)]^{1/2}$

n_1 = number of samples collected inside the work site

n_2 = number of samples collected outside the work site

Then compare T to the 95 percentile point of a "t" distribution with $n_1 + n_2 - 2$ degrees of freedom. (When 5 samples are collected inside and outside the 95 percentile point is 1.86.) If T exceeds the 95 percentile point, reclean. Otherwise, release the contractor.

The following two examples illustrate the method:

Example 1

Measurements inside the work site (f/cc)	Measurements outside the work site (f/cc)
0.002	0.001
0.007	0.010
0.030	0.008
0.028	0.001
0.001	0.025
$\bar{y}_1 = -5.03$	$\bar{y}_2 = -5.39$
S = 1.49	
T = 0.38	

T is less than 1.86. The contractor is released.

Example 2

Measurements inside the work site (f/cc)	Measurements outside the work site (f/cc)
0.052	0.001
0.130	0.010
0.005	0.008
0.240	0.001
0.375	0.025
$\bar{y}_1 = -2.\omega 4$	$\bar{y}_2$ 5.39
S = 1.59	
T = 2.84	

T is greater than 1.86. The site must be recleaned.

The test is based on the assumption that a homogenous work site has been selected. If one sample has a much higher concentration than the others it is possible that the site is not homogenous. Common sense should prevail in this case. Irrespective of the result of the "t" test, the high value should be investigated. The sample should be reanalyzed, additional samples collected, or the site recleaned and tested before the contractor is released.

M.3.2 PCM

The measured level of each sample is compared with the PCM limit of reliable quantification for the volume of air sampled (approximately 0.01 f/cc for 3000 liters). If any of the samples exceeds 0.01 f/cc, the work site must be re-cleaned.

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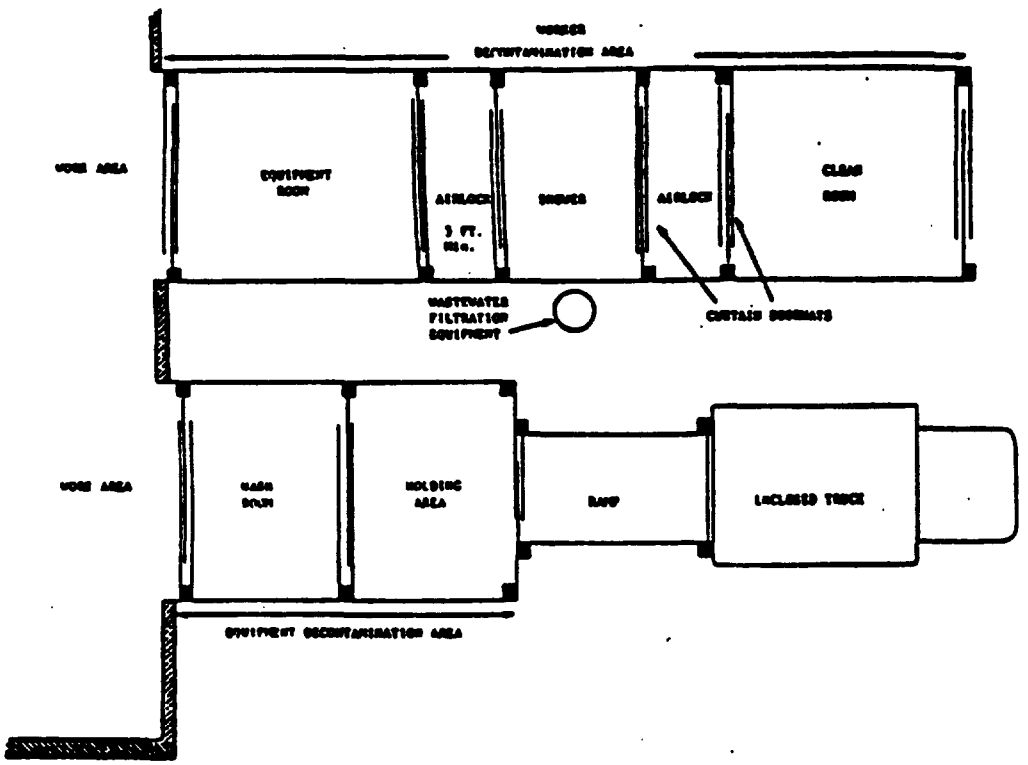

Typical Worker and Equipment Decontamination Enclosure Systems

Appendix 2, Figure 1