The Environmental Protection Agency (EPA) has issued a final rule under the Toxic Substance Control Act (TSCA) to require all local education agencies (LEAs) to identify asbestos-containing materials in their school buildings and take appropriate action to control release of asbestos fibers. The LEAs are required to describe their activities in management plans which must be made available to all concerned persons. This document contains the rules and regulations regarding this ruling including: (1) background information; (2) provisions of the final rule; (3) response to public comments; (4) economic impact; (5) rulemaking record; (6) assessment requirements; and (7) Section 763, subpart E--asbestos containing materials in schools. Subpart E discusses scope and purpose, definitions, LEA responsibilities, inspection, sampling, analysis, assessment, response actions, operation and maintenance, training and surveillance, management plans, recordkeeping, warning labels, compliance and enforcement, and waiver. An appendix describes mandatory and nonmandatory transmission electron microscopy analytical methods. (CW)
Part III

Environmental Protection Agency

40 CFR Part 763
Asbestos-Containing Materials in Schools; Final Rule and Notice
ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 763

[OPTS-62046E; FRL-3265-8]

Asbestos-Containing Materials in Schools

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule.

SUMMARY: EPA is issuing a final rule under section 203 of Title II of the Toxic Substances Control Act (TSCA), 15 U.S.C. 2643, to require all local education agencies (LEAs) to identify asbestos-containing materials (ACM) in their school buildings and take appropriate action to control release of asbestos fibers. The LEAs are required to describe their activities in management plans, which must be made available to all concerned persons and submitted to State Governors. This final rule requires LEAs to use specially-trained persons to conduct inspections for asbestos, develop the management plans, and design or conduct major actions to control asbestos. Exclusions are provided for LEAs which have previously conducted inspections and for LEAs subject to any state requirement at least as stringent as the comparable requirement in this final rule.

DATES: In accordance with 40 CFR 23.5, this rule shall be promulgated for purposes of judicial review at 1 p.m. Eastern Standard Time on November 13, 1987. This rule shall be effective on December 14, 1987. The incorporation by reference in the rule is approved by the Director of the Federal Register as of December 14, 1987.


SUPPLEMENTARY INFORMATION:

I. Background

A. Description of the Enabling Legislation

On October 22, 1986, President Reagan signed into law the Asbestos Hazard Emergency Response Act (AHERA) which enacted, among other provisions, Title II of the Toxic Substances Control Act (TSCA) 15 U.S.C. sections 2641 through 2654. Section 203 of Title II, 15 U.S.C. 2643, requires EPA to propose rules by April 20, 1987 (180 days after enactment), and to promulgate final rules by October 17, 1987 (360 days after enactment), regarding: (1) The inspection of all public and private school buildings for ACM; (2) the identification of circumstances requiring response actions; (3) description of the appropriate response actions; (4) the implementation of response actions; (5) the establishment of a reinspection and periodic surveillance program for ACM; (6) the establishment of an operations and maintenance program for friable ACM; (7) the preparation and implementation of asbestos management plans by LEAs and the submission of the management plans to State Governors, who may review the plans and approve or disapprove them; and (8) the transportation and disposal of waste ACM from schools. This final rule implements the Title II requirements to issue the section 203 rules (except for transportation and disposal, as discussed further below).

Section 206 of TSCA Title II, 15 U.S.C. 2646, also requires EPA to issue by April 20, 1987, a final model accreditation plan for persons who inspect for asbestos, develop management plans, and design or conduct response actions. States are required to adopt an accreditation program at least as stringent as the EPA model within 180 days after the beginning of their next legislative session. Accreditation of laboratories which analyze asbestos bulk samples and asbestos air samples is also required by TSCA Title II. The National Bureau of Standards (NBS), U.S. Department of Commerce, is required to establish the bulk sampling accreditation program by October 17, 1987, and the air sampling accreditation program by October 12, 1988.

States were required to notify LEAs by October 17, 1987, regarding where to submit management plans. LEAs must submit those plans to their State no later than October 12, 1988. The plans must include the results of school building inspections and a description of all response actions planned, completed, or in progress. After receiving a management plan, States are allowed 90 days to disapprove the plan. If the plan is disapproved, the State must provide a written explanation of the disapproval and the LEA must revise the plan within 30 days to conform with the State's suggested changes. The 30-day period can be extended to 90 days by the State. LEAs are required to begin implementation of their management plans by July 9, 1988, and to complete implementation in a timely fashion.

Transport and disposal rules under TSCA section 203(h) have not yet been proposed. In accordance with TSCA section 204(f), therefore, LEAs shall provide for transportation and disposal of asbestos in accordance with the most recent version of EPA's "Asbestos Waste Management Guidance." Applicable provisions of that document are included as Appendix D of this rule. Regulations governing transport of asbestos-containing waste, including school waste already regulated by the National Emission Standard for Hazardous Air Pollutants (NESHAP) (40 CFR Part 61, Subpart M) under the Clean Air Act (42 U.S.C. section 7401, et seq.), were promulgated by the Department of Transportation (DOT) (40 CFR Part 173 Subpart I). The NESHAP and DOT rules must be followed, according to the "Asbestos Waste Management Guidance." These rules will be sufficient to ensure the proper loading and unloading of vehicles and to ensure the physical integrity of containers.

Since this rule has been signed by the EPA Administrator by October 17, 1987, the rule has been promulgated within the statutory time frame required by section 203 of TSCA Title II. In accordance with 40 CFR 23.5, however, solely for purposes of judicial review deadlines under section 19 of TSCA Title I, the rule is considered "promulgated" at 1 p.m. eastern time, 14 days after publication in the Federal Register. Thus, the period in which petitions for review of this rule may be filed under section 19 commences 14 days after publication.

B. Previous EPA Asbestos Activities

EPA has undertaken a variety of technical assistance and regulatory activities designed to control ACMs in buildings and minimize inhalation of asbestos fibers.

1. Technical Assistance Program.

Since 1979, EPA staff have assisted schools and other building owners in identifying and controlling ACM in their buildings. Through a cooperative agreement with the American Association of Retired Persons (AARP), EPA has hired architects, engineers, and
other professionals to provide on-site assistance to school officials and other building owners. With AARP assistance, many school officials and building owners have effectively and safely dealt with ACM in ways that are appropriate for the particular situation in their building.

In addition, EPA has published state-of-the-art guidance to help identify and control asbestos in buildings. EPA's principal asbestos guidance document, "Guidance for Controlling Asbestos-Containing Materials in Buildings," (EPA 560/5-85-024, also known as the "Purple Book") was expanded and updated in June 1985, based on recommendations from recognized national experts. The document provides criteria for building owners to use in deciding which abatement method is most appropriate for each particular situation.

An important EPA goal has been to provide training for people involved in all aspects of the identification and control of asbestos. EPA established five Asbestos Information and Training Centers to provide information concerning the identification and abatement of asbestos hazards and to train people in proper asbestos abatement techniques. The five centers are located at the Georgia Institute of Technology in Atlanta, the University of Kansas in Kansas City, Tufts University in Medford, Massachusetts, the University of Illinois in Chicago, and the University of California at Berkeley. Courses attended by more than 8,000 building managers, maintenance personnel, school officials, architects, consultants, and abatement contractors have been taught at the centers since December 1984.

Finally, because of the large number of asbestos abatement projects and the short-term nature of many of them, EPA believes that contractors should be State-certified and that States should oversee projects to ensure that they are properly performed. EPA has provided models for State certification legislation and start-up funding for the initiation of 38 State oversight programs.

2. EPA's regulatory program. In the Federal Register of May 27, 1982 (47 FR 23333), EPA issued a school identification and notification rule (hereinafter called the 1982 Asbestos-in-Schools Rule). This rule required school officials by June 28, 1983, to inspect all school buildings for friable materials, take a minimum of three samples of each type of friable material found, analyze samples using polarized light microscopy (PLM) to determine if asbestos is present, and keep records of the findings. (40 CFR Part 763, Subpart F)

School district officials who found friable ACM were required to notify employees of the location of the materials, post a notification form in the primary administrative and custodial offices and faculty common rooms, provide maintenance and custodial employees with a guide for reducing asbestos enthalpy, and notify parent-teacher associations or parents directly of the inspection results.

EPA also issued a rule to protect public employees who perform asbestos abatement work in those States not covered by the current asbestos standard issued by the Occupational Safety and Health Administration (OSHA) U.S. Department of Labor. This rule (40 CFR Part 763, Subpart G) complements the OSHA asbestos regulations that protect private sector workers and public employees in States with OSHA-approved State plans, from exposure to asbestos in occupational settings. The rule requires specified work practices, personal protective equipment, environmental monitoring, medical exams, and other provisions. The EPA rule also includes a provision not in the OSHA rule, i.e., notification to EPA generally 10 days before an asbestos abatement project is begun when public employees are doing the work. OSHA issued revised regulations regarding occupational asbestos exposure published in the Federal Register of June 20, 1986 (51 FR 22612). EPA issued in the Federal Register of February 5, 1987 (52 FR 5616), a revision of its worker protection rule to make it consistent with the new OSHA regulations.

3. Recent developments. EPA issued an Advance Notice of Proposed Rulemaking (ANPR) on August 12, 1986 (51 FR 28914), entitled "Asbestos-Containing Materials in Schools: Inspection, Notification, Management Plans and Technical Assistance." The purpose of this ANPR was to solicit comments on the future direction of EPA's program to reduce risks from asbestos in schools and to solicit information about a variety of technical and policy issues.

Prior to enactment of TSCA Title II, EPA had also initiated development of two new guidance documents on asbestos control. One document was being developed to provide more detailed guidance about assessing ACM in buildings and selecting abatement actions. A second document was being developed to provide more detailed guidance about practices and procedures which should be included in an operations and maintenance program. Both documents had been developed with the assistance of panels of national experts who convened in Washington, DC to discuss technical and operational issues associated with these subjects. The work done in these two guidance documents has been valuable in developing provisions of this rule.

Also, in 1986, EPA, in cooperation with the National Institute for Occupational Safety and Health (NIOSH), U.S. Department of Health and Human Services, published "A Guide to Respiratory Protection for the Asbestos Abatement Industry" to provide practical guidance in the selection and use of respiratory protection to persons who work in asbestos abatement. The "Guide" also provides information relevant to other work activities, such as maintenance or repair, where the exposure to asbestos or the potential for exposure exists. The "Guide" was updated in September 1988 to include the text of the OSHA June 1988 revision of its asbestos standard.

C. Development of the Rule

The April 1987 proposed rule was developed through the process of regulatory negotiation, an alternative process for developing regulations in which individuals and groups with negotiable interests directly affected by the rulemaking work together with EPA in a cooperative venture to develop a proposed rule by committee agreement. The negotiation group was established as a Federal Advisory Committee and consisted of representatives of national educational organizations, labor unions, asbestos product manufacturers, the environmental community, asbestos abatement contractors, professional associations of architects, consulting engineers, industrial hygienists, States, and EPA.

After an organizational meeting in Washington, DC on January 23, 1987 (announced in the Federal Register of January 13, 1987, 52 FR 1377), the committee was established with 23 interested participants. Meetings were scheduled on February 5 and 6, February 17 and 18, March 9 and 10, March 26 and 27, and April 1 thru 3. During the March 10, 1987, meeting, the plenary session of the Committee accepted two more parties on the committee: one representing State attorneys general, the other (representing big city schools) sharing a seat with a previously seated member representing big city schools.
Members of Negotiating Committee

The members of the negotiating committee and their interest represented are as follows:

2. Bill Borwegen, Service Employees International Union/Jordan Barab, American Federation of State, County, and Municipal Employees (school service employees).
3. Dr. William Brown, Baltimore City Schools/Michael Young, New York City Law Department (big city schools).
4. Brian Christopher, Committee on Occupational Safety and Health.
7. Steve Hays, asbestos abatement engineer.
8. Jesse Hill, manufacturers of asbestos pipe and block insulation products.
10. Lloyd A. Kelley, Jr., Superintendent of Schools Rutland S.W. Vermont, Supervisory Union (rural schools).
12. Lynn MacDonald, Sheet Metal Workers International Association.
14. Roger Morse, American Institute of Architects.
15. David Oulmette, Colorado Department of Health (States with developing asbestos programs).
18. Miritain Rosenberg, National PTA.
22. Susan Vogt, U.S. E.P.A.
23. John Welch, Safe Buildings Alliance (former manufacturers of asbestos products).
24. Margaret Zaleski, National Association of State Attorneys General.

Facilitation Team and Executive Secretary

Kathy Tyson, U.S. E.P.A. (Executive Secretary)
Leah Haygood, The Conservation Foundation
Dan Dozier, Federal Mediation & Conciliation Services
John Wagner, Federal Mediation & Conciliation Services

The committee met in plenary sessions as well as in four work groups. Each work group focused on a cluster of related issues and reported to the plenary on options and recommendations. The plenary retained all decision-making power of the committee and often gave guidance to work groups. Generally, for each day of a plenary session, work groups convened the day before to prepare reports for the plenary. Neutral facilitators were present at all work group and plenary meetings to assist the negotiations in moving forward.

At the end of the 2-month negotiating process on April 3, 1987, and after extensive efforts, the committee was in general agreement on the vast majority of issues before it for the purposes of the proposal. Agreement to solicit further comment about alternatives was often important in developing provisions to be included as proposals. At the close of the negotiations, some items remained at issue and were not subject to universal agreement. These consisted of the following: definitions and response actions for damaged and significantly damaged thermal system insulation ACM (relates to being deemed nonfriable in the inspection section) and damaged and significantly damaged friable surfacing and miscellaneous ACM. Also, the definition of asbestos debris and the nature of cleaning practices (initial and routine) for friable ACM or damaged or significantly damaged thermal insulation under the operations and maintenance section were still at issue. While extending negotiations beyond April 3, 1987, may well have enabled the committee to resolve these issues, the Congressional April 23, 1987, deadline for issuing a proposed rule precluded this possibility. Although Federal Register practices precluded the Agency from highlighting these issues in the text of the proposed rule, the public dockets contained a copy of the proposed rule which clearly identifies the sections which contain these unresolved issues.

On April 3, 1987, the facilitators prepared, for members' signatures, statements supporting the use of the agreed-on portions of the regulatory language as a basis for a Notice of Proposed Rulemaking. Members representing 20 of the 24 interests signed these statements. Members representing 4 of the interests seated on the committee did not sign the statements, due to the status of the unresolved issues described above. Mr. Paul Schur, a representative of states with an implemented asbestos program (an interest that did not sign), signed in an individual capacity. All committee members, signatories and non-signatories alike, retained for themselves and for their constituencies all rights which bear on the rulemaking, including the right to comment fully during the public comment period.

Notably, signatories supporting the agreed-on regulatory language as a basis for a Notice of Proposed Rulemaking did so in considering that language as a whole. The proposed rule's agreed-on language was not necessarily ideal from any one party's perspective.

On April 17, 1987, the EPA Administrator signed the proposed rule developed through the negotiated rulemaking process. The proposed rule and the final Model Accreditation Plan were published in the Federal Register of April 30, 1987. EPA's decision to use the results of the negotiated rulemaking process as a basis for a proposed rule was explained in the April 30 document (52 FR 15833).

The 60-day public comment period ended on June 29. During this time period, EPA staff conducted 10 Regional briefings on the proposed rule for State officials and a number of additional briefings for interested parties. These parties included school administrators, school board officials and building owners. At the conclusion of the public comment period, the Agency had received over 170 comments on the proposed rule.

Several comments received by EPA requested the Agency to hold a public hearing on the proposed rule. As a result of these comments, EPA conducted public hearings on August 25 and 26. Over 25 individuals representing a variety of groups testified before EPA. The testimony and transcript from the public hearing were included in the rulemaking's docket.

D. Basis for EPA's Decision

After consideration of the proposed rule and all the evidence in the rulemaking record, including public comments on the proposed rule, EPA has decided to promulgate a final rule which is like the proposal in most respects. A relatively small number of changes have been made from the proposal to reflect public comments. In a number of cases EPA decided not to
make changes suggested by public comments. The Agency discusses its response either in this preamble or elsewhere in the rulemaking docket.

EPA has determined that the regulations being announced in this edition of the Federal Register use the least burdensome methods which protect human health and the environment. This determination is supported by the discussion in this preamble and the entire rulemaking record. EPA adopts as the reasoning in the preamble to the proposed rule (52 FR 15833). The provisions of this rule represent a reasonable way to carry out the statutory responsibilities of TSCA Title II.

EPA's analysis of risk placed in the rulemaking record when the proposed rule was issued shows that asbestos in schools could present a risk of concern and that the measures required by this rule are necessary to protect public health and the environment. EPA, as discussed later in this preamble, continues to rely on that risk analysis for support of the final rule. While there may be a wide divergence of opinion as to the actual health effects from asbestos exposure in schools, EPA believes there is little doubt that the decisionmaking process established by this rule needs to be implemented. This process is based on the responsibility of local officials, with input from the local community and with assistance from specially-trained experts, to develop management plans to implement appropriate measures that will abate the risk of asbestos in particular schools depending upon local circumstances.

This decisionmaking process ensures that the costs associated with this rule will be reasonable while protecting health and the environment. EPA has revised its costs somewhat from the rule's language by providing more specific guidance on the physical characteristics that may constitute asbestos-containing building material (ACBM)" encompasses surfacing ACM, thermal system insulation ACM, and miscellaneous ACM in or on interior parts of the school building. These include specified exterior portions of school buildings that, for the purposes of this rule, may fairly be considered interior parts. EPA focused upon interior building materials because, in the Agency's experience, such materials represent a very large percentage of ACM in schools and appear to pose the greatest hazards to occupants.

The definition of "school building," in the rule however, makes it clear that exterior hallways connecting buildings, porticos, and mechanical system insulation are considered to be in a building and are subject to jurisdiction under TSCA Title II. The Agency believes that these exterior areas, by virtue of the accessibility of the ACM found there, warrant inclusion under the rule. Often, these exterior areas are connected to interior areas and could be considered to be a single homogeneous area in terms of a removal project design.

"Asbestos debris" is defined as pieces of ACM that can be identified by color, texture, or composition. The definition also includes dust, if the dust is determined by the accredited inspector to be asbestos-containing. The Agency included dust in the definition based on public comments.

"Damaged or significantly damaged thermal system insulation ACM" is defined as ACM on pipes, boilers, and other similar components and 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 further be 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 adjacent ACBM may also indicate damage. This definition allows that, even though the insulation is marred, scratched or otherwise marked, it may not be, in the judgment of the accredited expert, damaged so as to release fibers. This definition, varies from the proposed rule's language by providing more specific guidance on the physical characteristics that may constitute
damage. An accredited inspector shall classify this material based upon a determination of damage or significant damage (§§ 763.85 and 763.88) and an accredited management planner shall recommend in writing appropriate response actions (§ 763.93).

"Damaged friable surfacing ACM" is defined as ACM which has deteriorated or sustained physical injury such that the cohesion of the material or its adhesion to the substrate 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; separating of ACM from the fiber cohesion or adhesion qualities, or which, for any other reason, lacks the cohesion of the material or its response actions (§ 763.93).

Recommend in writing appropriate accredited management planner shall determine of damage or significant damage (§§ 763.85 and 763.88) and an accredited expert, always demonstrating a lack of fiber cohesion or adhesion.

This definition varies from the proposed rule's language by providing more specific guidance on the physical characteristics that may constitute damage. Accredited experts will classify material based upon a determination of damage and recommend appropriate response actions (§§ 763.85, 763.88, and 763.93).

"Miscellaneous ACM" includes a wide variety of materials in buildings, such as vinyl flooring, fire-resistant gaskets and seals, and asbestos cement. Damage to these materials is defined by the same cohesion and adhesion (if appropriate) properties as surfacing materials. The Agency believes this definition is sufficiently general to provide a reasonable approach to assessing damage to so wide a range of materials.

"Significantly damaged friable surfacing ACM" is defined as material in a functional space where the damage is extensive and severe. (The definition of significantly damaged friable miscellaneous ACM closely parallels the definition for significantly damaged surfacing ACM.) Again, this determination of significant damage will be made by accredited experts (§§ 763.85, 763.88, and 763.83).

This definition is a function of two major factors. The first factor deals with extent, or scope, of damage across a functional space. The Agency, in draft guidance, suggested that damage evenly distributed across one-tenth of a functional space or localized over one-quarter represented significant damage (See Seventh Draft Report, "Guidance for Assessing and Managing Exposure to Asbestos in Buildings," November 7, 1996, p. 9). This means a level of damage which a panel of experts, convened by the Agency, believed was generally, although perhaps not always, unreasonable to repair or restore.

The second factor involves the degree or severity of the damage itself. A major delamination of asbestos material, for instance, constitutes damage which is more severe than slight marks or mars. ACM, in the accredited expert's judgment, may be so severely damaged that there is no feasible means of restoring it to an undamaged condition.

Material has potential for significant damage as opposed to only potential for damage if it is subject to major or continuing disturbance, due to factors such as accessibility (i.e., subject to disturbance by school building occupants or workers in the course of the normal activities), or, under certain circumstances, vibration or air erosion. For example, material within reach of students above an entrance is clearly accessible. Thermal system insulation running along the base of a wall in a boiler room is not accessible. Material on the ceiling of a school auditorium, beyond the reach of students, is not.

ACM on a high school gymnasium ceiling, which might be reached with basketballs or other objects, is subject to either classification, although an LEA might be well advised in this instance to implement a preventive measure to avoid disturbance.

EPA believes a wide range of "preventive measures" exist. One example is the installation of a stop to prevent a door from striking (and damaging) thermal system insulation ACM behind it. Another might involve restricting access of a corridor with surfacing ACM on a low ceiling, where students continually marred and vandalized the material. The problem of high school students hitting the gym ceiling with basketballs may be eliminated by a policy prohibiting such activities, if it can be effectively implemented. LEAs, in consultation with maintenance staff and, if desired, accredited experts, will identify a variety of effective and creative means of eliminating potential damage or significant damage to ACM. If, however, such preventive measures cannot be effectively implemented, other response actions, including removal, will be required. The Act is clear that EPA, as part of its rulemaking, direct LEAs to mitigate those circumstances which involve potential for significant damage.

Based on public comments, the Agency added the terms "air erosion" and "vibration" to increase the specificity of the "periodic significant damage" definition in the rule.

The "enclosure" definition requiring an airtight, impermeable, permanent barrier around ACBM to prevent the release of asbestos fibers into the air does not contemplate a vacuum-sealed area which is impossible to access. Instead, this definition, based on the National Institute of Building Sciences' (NIBS) "Model Guide Specifications, Asbestos Abatement in Buildings," July 18, 1986, is associated with the engineering specifications, found in section 09251 and elsewhere in the NIBS' Model Guide, to construct enclosures sufficient to prevent fiber release. Also, this term, from the standpoint of permanence, is not intended to apply to mini-enclosures described in the EPA worker protection rule or Appendix B of the regulation, as these enclosures are used temporarily for repair or abatement activities.

"Functional space" is a term of art used by the accredited expert to appropriately characterize an area as containing "significantly damaged friable surfacing ACM" or "significantly damaged friable miscellaneous ACM." The "functional space" may be a room, group of rooms, or a homogeneous area, as determined appropriate by the accredited expert. Not that the functional space includes the area above a dropped ceiling as well as crawl spaces.

C. LEA General Responsibilities

The final rule requires LEAs to designate a person to carry out certain duties and ensure that such person receives training adequate to perform the duties.

Section 763.84 requires LEAs to ensure that: (1) Inspections, reinspections, periodic surveillance and response action activities are carried out in accordance with the final rule; (2) custodial and maintenance employees are properly trained as required by this final rule; (3) workers and building occupants are informed annually about inspections, response actions, and post-response action activities including reinspections and periodic surveillance; (4) short-term workers (e.g., telephone repair workers) who may come in contact with asbestos in a school are provided information about locations of asbestos-containing building material (ACBM); (5) warning labels are posted as required by this final rule; and (6) management plans are available for review and that parent, teacher, and...
employee organizations are notified of the availability of the plan. Lastly, LEAs shall consider whether and how any delays may arise from the interrelationship among accredited personnel (e.g., the management planner and abatement contractor) used by the LEAs and whether that should influence the LEA’s selection of accredited personnel. EPA added this revision after reviewing public comments.

D. Inspections and Reinspections

1. Inspections. Section 763.85 requires LEAs to have an accredited inspector visually inspect all areas of each school building to identify locations of all friable and nonfriable suspected ACBM, determine friability by touching, and either sample the suspected ACBM or assume that suspected materials contain asbestos. The inspector must then develop an inventory of areas where samples are taken or material is assumed to contain asbestos. Finally, the accredited inspector is required to assess the physical condition of friable known or assumed ACBM as required under § 763.88.

2. Exclusions. Section 763.99 defines conditions that would exclude an LEA from all or part of the initial inspection. The accredited inspector is a key element in the exclusion process. For all inspection exclusions, areas previously identified as having friable ACM or nonfriable ACM that has become friable have to be assessed as required under § 763.88. All information regarding inspection exclusions shall be placed in the management plan.

Five types of exclusions for LEAs are provided in the final rule. First, LEAs do not need to have an initial inspection conducted in specific areas of a school where ACM has already been identified. Second, if previous sampling of a specific area of the school indicated that no ACM was present, and the sampling was done in substantial compliance with the final rule, the LEA does not have to perform an initial inspection of that area. Third, LEAs do not have to inspect specific areas of schools where records indicate that all ACM was removed. Fourth, LEAs can receive an inspection exclusion for schools built after October 12, 1986 (the date when management plans are to be submitted to Governors), if no ACM was specified for use in the school. Fifth, States that received a waiver from the inspection requirements of the rule can grant exclusions to schools that had performed inspections in substantial compliance with the rule.

3. Reinspections. Section 763.85(b) requires LEAs to have accredited inspectors conduct reinspections at least once every 3 years. The inspector must reinspect all known or assumed ACM, and shall determine by touching whether nonfriable material has become friable since the last inspection. The inspector may sample any newly friable materials or continue to assume the material to be ACM. The inspector shall record changes in the material’s conditions, sample locations, and the inspection date for inclusion in the management plan. In addition, the inspector must assess newly friable known or assumed ACBM, reassess the condition of friable known or assumed ACBM, and include assessment and reassessment information in the management plan.

Section 763.85(c) states that thermal system insulation that has retained its structural integrity and that has an undamaged protective jacket or wrap is treated as nonfriable. Based on public comments, EPA changed the wording in this section from “deemed” nonfriable to “treated as” nonfriable.

E. Sampling and Analysis

1. Sampling. Section 763.96 permits the LEA to assume that suspected ACBM is ACM. If the LEA does not assume suspected ACBM to be ACM, the LEA shall use an accredited inspector to collect bulk samples for analysis.

EPA expects that a school is likely to sample only friable suspected ACBM. For nonfriable suspected ACBM, EPA anticipates most schools will assume this material contains asbestos. However, the final rule does not preclude a school from sampling all of its suspected ACBM, both friable and nonfriable. Sampling of friable surfacing materials should follow the guidance provided in the EPA publication “Simplified Sampling Scheme for Friable Surfacing Materials” (EPA 560/5-85-030a). To determine whether an area of surfacing material contains asbestos, sufficient samples shall be taken in a statistically random manner to provide data representative of each homogeneous area being sampled.

In most cases, sampling of thermal system insulation requires an accredited inspector to take at least three randomly distributed samples per homogeneous area. The final rule includes three exceptions to this requirement for sampling of thermal system insulation. First, an accredited inspector can determine through visual inspection that the material is non-ACM (e.g., fiberglass). Second, only one sample is required for patched homogeneous areas of thermal system insulation. Third, an accredited inspector needs to collect an appropriate number of samples to determine whether cement or plaster sheets are ACM.

For friable miscellaneous material or nonfriable suspected ACBM, an accredited inspector must collect bulk samples in an appropriate manner.

2. Analysis. Section 763.87 requires analysis of bulk samples by laboratories accredited by NBS. In the period before NBS has developed its accreditation program, laboratories which received interim accreditation from EPA may be used to analyze samples. The interim program is explained in a notice in the Federal Register (52 FR 33476, September 3, 1987). After receiving the sample results, the LEA must consider an area to contain asbestos if asbestos is present in any sample in a concentration greater than 1 percent. Compositing of samples (mixing several samples together) is prohibited.

The 1982 EPA rule “Asbestos in School: Identification and Notification”, 40 CFR 763, Subpart F, required analysis of bulk asbestos samples by PLM and provides a protocol for analysis in its Appendix A to Subpart F. EPA requires use of the same PLM method for this final rule. As it develops the accreditation process for laboratories performing analysis of bulk samples, NBS will consider whether to change the PLM protocol. If NBS recommends changes, EPA will amend this rule accordingly.

F. Assessment

Section 763.88 outlines a general assessment procedure to be conducted by an accredited inspector during each inspection or reinspection. The accredited inspector is required to classify ACBM and suspected ACBM assumed to be ACM in the school building into broad categories appropriate for response actions. In addition, after reviewing public comments, the Agency decided not to require the inspector to give reasons in the written assessment supporting his classification decisions. Assessment may include a variety of considerations, including the location and amount of material, its condition, accessibility, potential for disturbance, known or suspected causes of damage, or preventive measures which might eliminate the reasonable likelihood of damage. The LEA is directed to select an accredited management plan developer who, after a review of the results of the inspection and the assessment, shall recommend in writing appropriate response actions.
G. Management Plans

Section 763.93 requires LEAs to develop an asbestos management plan for each school under its administrative control or direction. The plan must be developed by an accredited asbestos management planner. Some of the major components required in the plan include: A description of inspections and response actions; an assurance that accredited persons were used to conduct inspections, develop management plans, and design or conduct response actions; and a plan for reinspection, periodic surveillance, and operations and maintenance.

Each LEA is required to maintain a copy of the management plan in its administrative office, and each school is required to maintain a copy of the school's management plan in the school's administrative office. These plans are to be made available for inspection by the public without cost or restriction. LEAs must notify in writing, parent, teacher, and employee organizations of the availability of management plans upon submission of the plan to the State and at least once each school year. The requirement for written notification was added after the Agency reviewed comments from the public. In addition, based on public comments received on the proposed rule, the Agency has included in the final rule a requirement that in the absence of any such organizations, the LEA shall provide written notice to that group (e.g., parents) of the availability of the management plan.

Section 763.93 requires LEAs to submit their management plans to their States on or before October 12, 1988. Each LEA must begin implementation of its plan on or before July 9, 1989, and complete implementation of the plan in a timely fashion.

H. Response Actions

The final rule identifies five major response actions—in § 763.91 operations and maintenance (O&M) and in § 763.90, repair, encapsulation, enclosure and removal—and describes appropriate conditions under which they may be selected by the LEA. The final rule also identifies the steps which shall be taken to properly conduct and complete the response actions.

The LEA is required to select and implement in a timely manner the appropriate response action. The response action selected shall be sufficient to protect human health and the environment. From among the response actions that protect human health, and the environment, the LEA may select the response action that is least burdensome.

LEAs are required to use accredited persons to design or conduct response actions. Section 763.90 specifically provides that nothing in the rule shall be construed to prohibit the removal of ACBM from a school building at any time, should removal be the preferred response action of the LEA.

Different response actions are required for each of the five major categories of damaged or potentially damaged ACBM. These categories are:

1. Damaged or significantly damaged thermal system insulation ACM.
2. Damaged friable surfacing or miscellaneous ACM.
3. Significantly damaged friable surfacing or miscellaneous ACM.
4. Friable surfacing or miscellaneous ACM, thermal system insulation ACM which has potential for damage.
5. Friable surfacing or miscellaneous ACM, thermal system insulation ACM which has potential for significant damage; and

In each of the categories above, procedures for appropriately controlling or abating the hazards posed by the ACBM are set forth. For damaged or significantly damaged thermal system insulation, the LEA must at least repair the damaged area. If it is not feasible, due to technological factors, to repair the damaged material, it must be removed. Further, the LEA must maintain all thermal system insulation in an intact state and undamaged condition. If damaged friable surfacing or miscellaneous ACM is present, the LEA shall encapsulate, enclose, remove, or repair the damaged area. After selecting the appropriate response actions that protect human health and the environment, the LEA may consider local circumstances, including occupance and use patterns within the school building and economic concerns, such as short- or long-term costs. When friable surfacing or miscellaneous ACBM is significantly damaged, the LEA must immediately isolate the functional space and then must remove the material in the functional space, unless enclosure or encapsulation would be sufficient to contain fibers.

Response actions for ACBM with potential for damage and potential for significant damage include O&M and preventive measures to eliminate the reasonable likelihood that damage will occur. When potential damage is possible, the LEA must at least implement an O&M program. If there is potential for significant damage and preventive measures cannot be effectively implemented, response actions other than O&M or area isolation may be required.

Section 763.91 requires the LEA to implement an operations, maintenance and repair (O&M) program for any school building in which friable ACBM is present or assumed to be present in the building. Any material identified as nonfriable ACBM or nonfriable assumed ACBM which is rendered or is about to be rendered friable as a result of activities performed in the school building shall be treated as friable. For example, if nonfriable ACBM wallboard was about to be sanded, operations and maintenance procedures would be required. The O&M program, which must be documented in the LEA management plan, consists of worker protection (summarized in Unit II.K.), cleaning, operations and maintenance activities (also in Unit II.K.), and fiber release episodes.

An initial cleaning is required, which employs wet methods and is conducted at least once after completion of the inspection and before the initiation of a response action other than an O&M activity. In addition, the rule also requires that an accredited management planner make a written recommendation to the LEA regarding whether additional cleaning is needed. The recommendation on additional cleaning was added to the rule based on public comments.

The final rule requires that O&M activities (other than small-scale, short-duration activities) which disturb asbestos shall be designed and conducted by persons accredited to do such work. (A discussion of what constitutes small-scale, short-duration projects is given in Appendix B to Subpart E.) Finally, procedures are provided for responding to fiber release episodes—the uncoordinated or unintentional disturbance of ACBM. For minor episodes (i.e., those involving 3 square feet or less of ACBM), basic cleaning and containment practices for O&M staff are listed. For larger amounts, accredited personnel are required to respond.

I. Training and Periodic Surveillance

The LEA shall ensure that all members of its maintenance and custodial staff receive at least 8 hours of awareness training. The LEA must also ensure that staff who conduct any activities which will disturb ACBM receive an additional 14 hours of training. Specific topics to be covered in the 2-hour and 14-hour training courses are listed in § 763.92(a).

Section 763.92(b) requires periodic surveillance to be performed at least
once every 6 months. The LEA may use unaccredited personnel such as custodians or maintenance workers to conduct surveillance activities. Periodic surveillance requires checking known or assumed ACBM to determine if the ACBM’s physical condition has changed since the last inspection or surveillance. The date of the surveillance and any changes in the condition of the ACBM must be added to the management plan.

J. Completion of Response Actions

After performing a thorough visual inspection, air testing is used to determine if a response action has been completed (§ 763.90(j)). Clearance air monitoring will not be required for small-scale, short-duration projects.

Phase Contrast Microscopy (PCM) is allowed for response actions involving 250 linear or 100 square feet or less, the amounts used to trigger removal requirements under EPA’s NESHAP (40 CFR Part 61, Subpart M).

Section 763.90 requires the use of transmission electron microscopy (TEM) for most removal, enclosure, and encapsulation response actions. Laboratories are to be accredited by the National Bureau of Standards (NBS). Until NBS develops its program, LEAs shall use laboratories that use the interim protocol described in Appendix A to this Subpart E. EPA continues to believe that TEM is the method of choice for air sample analysis because, unlike PCM, TEM analysis can distinguish asbestos from other fibers and detect the small thin fibers found at abatement sites. Therefore the use of TEM will significantly improve the adequacy and is recommended over PCM when available. However, due to limited availability of microscopes for air sample analysis and the cost and time associated with TEM analysis, the final rule allows a phase-in period for the TEM requirement. For 2 years after the rule becomes effective, LEAs may choose to use PCM for response actions comprising 3,000 square feet or less.

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The criterion for determining whether a response action is complete when using PCM will require multiple samples (minimum of five) with clearance allowed only if all of the individual samples are below the limit of reliable quantitation of the PCM method (0.01 fibers/cm²). The rule requires persons to use the NIOSH 7400 method for PCM clearance.

The rule has a three-step process for using TEM to determine successful completion of a removal response action. The first step is a careful visual inspection, as mentioned above. The two steps that follow involve a sequential evaluation of the five samples taken inside the worksite and five samples taken outside the worksite. Both sets of samples must be taken at the same time to ensure that atmospheric conditions are the same and that the comparisons are valid. The inside samples are analyzed first. If the average concentration of the inside samples does not exceed the filter background contamination level (discussed in detail in Appendix A to Subpart E), then the removal is considered complete.

Step three is taken if the average concentration of the samples taken inside the worksite is greater than the average of five samples taken outside the worksite. A statistical comparison using the Z-Test must be used to determine whether the two averages are significantly different. (A discussion on how to compare measured levels of airborne asbestos with the Z-Test is given in Appendix A to Subpart E.) If the concentrations are not significantly different, then the response action is considered complete. If the inside average concentration is significantly higher, recleaning is required and new air samples must be collected and evaluated after the worksite has been cleaned and reinspected.

K. Use of Accredited Persons

Section 206 of Title II of TSCA requires accreditation of persons who: 1. Inspect for ACM in school buildings. 2. Prepare management plans for such schools. 3. Design or conduct response actions with respect to friable ACM in such schools (other than O&M activities).

Section 206 of Title II of TSCA required EPA to develop a Model Contractor Accreditation Plan by April 20, 1987. The Agency met this deadline and the model plan was published in the Federal Register of April 30, 1987 (52 FR 15879). The plan appears as Appendix G to Subpart E. A notice listing the persons seeking accreditation appeared subsequently in this issue of the Federal Register. Persons can receive accreditation from a State that has instituted an accreditation program at least as stringent as the requirements of the Model Plan. In addition, persons in States that have not yet developed programs at least as stringent as the Model Plan can receive accreditation by passing an EPA-approved training course and exam that are consistent with the Model Plan. The Model Plan requires persons seeking accreditation to take an initial course, pass an examination, and participate in continuing education.

L. Worker and Occupant Protection

Worker protection requirements for removal, encapsulation and/or enclosure response actions are already in effect under the EPA worker protection rule (40 CFR Part 783, Subpart G) and the OSHA construction standard (29 CFR 1928.58). EPA’s NESHAP standard, although designed to protect outdoor air, also provides incidental protection to workers.

Essentially, under § 763.91, the regulation extends coverage of EPA’s worker protection rule at 40 CFR 783.121 to maintenance and custodial personnel in schools who perform O&M activities but are not covered by OSHA’s construction standard or an asbestos regulation under an OSHA approved State plan. The EPA worker protection rule itself extended the same protections as the OSHA construction standard to asbestos abatement workers who are employees of State and local governments and who are not otherwise covered by OSHA regulation or OSHA approved State plans. This final rule further extends these standards to O&M workers who are LEA employees. These regulations basically establish a Permissible Exposure Limit (PEL) of 0.2 fibers per cubic centimeter (f/cm³) over an 8-hour period for abatement project workers exposed to airborne asbestos and an action level of 0.1 f/cm³ which triggers a variety of worker protection practices. These practices include air monitoring, regulated work areas, engineering and work practice controls, respiratory protection and protective clothing, hygiene facilities and practices, worker training, medical surveillance, and recordkeeping requirements.

As an alternative, however, OSHA’s standard allows employers to institute the provisions of its Appendix G in the case of small-scale, short-duration projects rather than comply with the full requirements of Appendix G. Appendix B to Subpart E is an adaptation of OSHA’s Appendix G and, thus, allows more flexibility in dealing with minor (small-scale, short-duration) projects.
None of the requirements of the OSHA standard or the EPA worker protection rule would apply if asbestos concentrations are below the action level (0.1 f/cm³). There are, however, fairly stringent requirements established by OSHA and adopted by EPA for purposes of this rule to show that levels are below this action level for any activity, including small-scale, short-duration projects. These requirements are discussed in the following paragraphs.

Employers who have a workplace or work operation covered by the EPA worker protection rule must perform initial monitoring to determine the airborne concentrations of asbestos to which employees may be exposed. If employees can demonstrate that exposure levels are below the action level (0.1 f/cm³) by means of objective data, initial monitoring is not required. If initial monitoring indicates that employees exposures are below the PEL, then periodic monitoring is not required.

The exemption from monitoring in § 763.121(f)(2)(iii) of the worker protection rule for employers who have historical monitoring data is included in recognition of the fact that many employers have conducted or are currently conducting exposure monitoring. This exemption would prevent these employers from having to repeat monitoring activity for O&M activities that are substantially similar to previous jobs for which monitoring was conducted.

However, for purposes of this rule, EPA requires that such monitoring data must have been obtained from projects conducted by the employer that meet the following conditions:

1. The data upon which judgments are based are scientifically sound and collected using methods that are sufficiently accurate and precise.
2. The processes and work practices in use when the historical data were obtained are essentially the same as those to be used during the job for which initial monitoring will not be performed.
3. The characteristics of the ACM being handled when the historical data were obtained are the same as those on the job for which initial monitoring will not be performed.
4. Environmental conditions prevailing when the historical data were obtained are the same as for the job for which initial monitoring will not be performed. The final asbestos standard on June 20, 1986 (61 FR 22984), it published data from routine facility maintenance which "demonstrates a potential for exposure of maintenance personnel to concentrations exceeding 0.5 f/cm³ (fibers per cubic centimeter)."

OSHA further stated:

With the exception of wet handling, which is feasible in only very limited situations due to problems such as electrical wiring, and the use of HEPA vacuums for the clean-up of any asbestos generated during maintenance activities, OSHA believes that there do not appear to be any feasible engineering controls or work practices available to reduce these potential exposure to levels below the 0.2 f/cm³ PEL and that respirators will be required to comply with the 0.2 f/cm³ PEL.

LEAs are required, under the provisions of § 763.91 of this rule, to ascertain, through monitoring procedures or historic monitoring data, and to document that these levels have not been reached.

Under § 763.91, basic occupant protection requirements are established (regardless of air level) for any O&M activity in a school building which disturbs ACBM. Primarily, access must be restricted, signs posted, and air movement outside the area modified. Necessary work practices shall be implemented to contain fibers, the area shall be properly cleaned after the activity is completed, and asbestos debris must be disposed of in a proper manner.

Section 763.95 requires the LEA to attach warning labels immediately adjacent to any friable and nonfriable ACBM or suspected ACBM in routine maintenance areas, such as boiler rooms, until the material is removed. They shall read, in large size or bright colors, as follows: CAUTION: ASBESTOS, HAZARDOUS. DO NOT DISTURB WITHOUT PROPER TRAINING AND EQUIPMENT.

M. Waiver for State Programs

Section 763.98 provides a procedure to implement the statutory provision that a State can receive a waiver from some or all of the requirements of the final rule if the State has established and is implementing or intends to implement a program of asbestos inspection and management at least as stringent as the requirements of the final rule. The rule requests specific information to be included in the waiver request submitted to EPA, establishes a process for reviewing waiver requests, and sets forth procedures for oversight and rescission of waivers granted to States.

The final rule requires States seeking waivers to submit requests to the Regional Administrator for the EPA Region in which the State is located. Within 30 days of receiving a waiver request, EPA must determine whether the request is complete. Within 30 days after determining that a request is complete, EPA will issue in the Federal Register a notice that announces receipt of the request and solicit written comments from the public. Comments must be submitted within 60 days. If, during the comment period, EPA receives a written objection to the State's request or a written request for a public hearing, EPA will schedule a public hearing (as is required by TSCA Title II) to be held in the affected State after the close of the comment period. EPA will issue a notice in the Federal Register announcing its decision to grant or deny, in whole or in part, a request for waiver within 30 days after the close of the comment period or within 30 days following a public hearing.

N. Recordkeeping

Section 763.94 requires that LEAs collect and retain various records which are not part of the information submitted to the Governor in the management plan. Records required by the rule include those pertaining to certain events which occur after the submission of the management plan, including: Response actions and preventive measures; fiber release episodes; periodic surveillance; and various operations and maintenance activities. Records required must be maintained in a centralized location in the administrative office of the school and the local education agency.

For each homogenous area where all ACM has been removed, the LEA shall retain such records for 5 years after the next reinspection.

O. Enforcement

TSCA Title II, section 207(a) provides civil penalties of up to $5,000 per day for violations of Title II of TSCA when an LEA fails to conduct inspections in a manner consistent with the final rule, knowingly submits false information to the Governor, or fails to develop a management plan in a manner consistent with the final rule, knowingly submits false information to the Governor, or fails to develop a management plan in a manner consistent with this rule. TSCA Title II, section 16 provides civil penalties of up to $25,000 per day for violations of Title I of TSCA when a person other than an LEA violates the final rule. Criminal penalties may be assessed to any person who violates any provision of TSCA (including a LEA) is knowing or willful.

The rule provides a process for filing complaints by citizens and requires that such complaints be investigated and responded to within a reasonable period.
of time consistent with the nature of the violation alleged.

P. Transport and Disposal

Section 203(h) of TSCA Title II requires EPA to promulgate regulations which prescribe the standards for transportation and disposal of asbestos-containing waste material. The final rule on transport and disposal was to be issued by October 12, 1988, as part of the final regulations under TSCA Title II. EPA had planned to use revised NESHAP regulations on disposal of asbestos waste to satisfy the requirements of section 203(h) of Title II. However, completion of the NESHAP revision has been delayed.

Accordingly, under section 209(a) of Title II, LEAs shall carry out the requirements described in section 204(f). Section 204(f) states that "the local education agency shall provide for the transportation and disposal of asbestos in accordance with the most recent version of the Environmental Protection Agency's "Asbestos Waste Management Guidance" [or any successor to such document]." Under TSCA Title I, section 15(1)(D), as amended by AHERA section 3, EPA may enforce the provisions of section 204(f). The chapters of the waste management guidance document which pertain to transport and disposal have been printed in this Final Rule notice as Appendix D to Subpart E.

EPA intends to issue the revised asbestos NESHAP as a proposed rule under section 203(h) of TSCA Title II to govern transport and disposal of asbestos waste from schools. Section 204(f) will be in effect until a final rule under section 203(h) is promulgated. Further, EPA also intends that the NESHAP waste disposal rules will ultimately regulate asbestos emissions from waste disposal when they are promulgated.

III. Response to Public Comments

This unit discusses EPA's responses to the most significant issues raised in the comments received from the public. A more comprehensive version of EPA's response to comments received has been placed in the public record.

Comments and responses are organized in this unit according to the relevant section of the regulation.

A. Scope and Purpose

Comments were received regarding three aspects of the Scope and Purpose section of the proposed rule. Comments from a variety of technical conditioners, which included architects, engineers, and persons involved in asbestos control, noted that preschool nurseries, day care, and universities should be included in the schools covered by the regulation. A second issue raised in the comments recommended that nonfriable materials not be subject to the inspection and management plan requirements of the regulation. Third, many commenters expressed concerns that the October 12, 1988, deadline for submitting management plans to States could not be met.

On all three of these issues, the statutory language of Title II is clear and the regulation reflects the statute. Title II only gives EPA authority to regulate "local education agencies." The definition of "local education agency" in section 202(2) refers only to public and private elementary and secondary schools. Section 203 of Title II requires inspection for "asbestos-containing materials" which includes both friable and nonfriable asbestos (see section 202). Management plan provisions of Title II also refer to "asbestos-containing material." Finally, section 204(a) of Title II specifies that "720 days after enactment" of this title (i.e., October 12, 1988) local education agencies must submit management plans to the Governors of their States. Based on the comments received, EPA is concerned about the ability of the LEAs to complete and submit management plans by October 12, 1988. The deadline, however, is prescribed in the statute.

B. Definitions

1. Asbestos containing building material. In general, union groups and education groups urged the incorporation into the rule of all exterior ACM and other asbestos material such as asbestos gloves. Conversely, several school administration groups argued to limit the rule to areas only and not to include asbestos gloves and other such materials within the scope of the rule.

TSCA Title II was designed to provide school children and school employees with a safe environment while attending classes or working inside school buildings. The statute in several places specifically authorizes EPA to regulate asbestos "in" school buildings. Furthermore, an extension to all exterior areas would result in only small health benefits since most exterior ACM is enclosed in solid matrices such as cement, is nonfriable, and is not generally disturbed. Dealing with exterior materials would constitute an expensive undertaking for schools in terms of inspection and management plan development for such small health benefits. The Agency believes the proposed rule's coverage of all interior areas and a few specified exterior areas that function similar to interior areas protects the health of building occupants.

EPA also interprets TSCA Title II as not including nonbuilding asbestos products within the scope of the rule. The definition of friable ACM in the statute (section 202(6)) refers to ACM applied on ceilings, walls, structural members, piping, duct work, or any other part of a building. At no point does the statute cite examples nonbuilding materials such as asbestos gloves. If certain schools such as vocational schools have other types of asbestos products in their buildings (e.g., automobile brake linings) they may want to voluntarily address these issues in a fashion similar to the AHERA requirements.

2. Asbestos debris. A number of commenters have sought to have dust included in the definition of asbestos debris. Some other commenters favor expanding the definition of asbestos debris to include dust in the immediate vicinity of friable ACM. Other commenters representing former asbestos manufacturers and schools argued that dust should not be included as part of the definitions of asbestos debris or as evidence of damage.

The Agency believes that an accredited expert be allowed to exercise judgment in determining whether asbestos fibers or dust constitute damage. EPA believes that accredited experts can determine whether dust has originated from adjacent ACM. The Agency maintains, however, that not all dust in schools is ACM. An accredited person on-the-scene in a school building can make the determination of damage due to the presence of dust based on training and experience. As a result, EPA has included in the final rule's definitions of asbestos debris the flexibility for the accredited inspectors to determine dust to be asbestos containing.

3. Significantly damaged friable surfacing and miscellaneous ACM. Many commenters thought that significantly damaged asbestos should be defined to be damage that is either extensive "or" severe, rather than extensive "and" severe as in the proposal. These commenters included education groups and unions. They believe that either condition can pose a significant health threat.

The Agency disagrees with the comments. Significantly damaged friable surfacing and miscellaneous ACM must refer to the most severely damaged areas where the damage is also widespread. Damage that is widespread or only severe is of concern, but should not necessarily require a response
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action of the same magnitude as those situations where both are present.

4. Operations and maintenance. Many commenters recommended that O&M apply to all ACM, not just friable ACM. Section 203(f) states that O&M is for friable ACM. Periodic surveillance (see section 203(g) and training requirements (see generally section 206), however, apply to all ACM. The final rule makes clear these statutory distinctions. Section 763.91 dealing with O&M refers to friable asbestos and § 763.82 dealing with periodic surveillance and training apply to all ACM (including friable and nonfriable material).

5. Potential damage or potential significant damage. Many groups commented on these definitions. A group representing former asbestos manufacturers argue that the best indicator of potential damage is evidence of past damage. Some union groups and State attorneys general commented that in addition to accessibility, potential significant damage ought to include air erosion and vibration as disturbance factors.

The Agency believes adding the terms air erosion and vibration increases the specificity of the rule and clarifies the original intent of the proposed regulation. As a result, the Agency accepts the comments regarding air erosion and vibration and has added definitions for each of these terms. EPA believes that whether past damage is the best indicator of potential damage is irrelevant to defining potential damage. As asbestos material ages, it may become more susceptible to damage. The Agency, accordingly, believes that all circumstances must be considered in assessing potential damage.

6. Repair and enclosure. A sizable number of commenters suggested that EPA change the wording of both of these definitions to require the preventing of fiber release. In the proposed rule, repair "contained" fiber release and enclosure "controlled" fiber release. In addition, another commenter suggested adding the requirements of inaccessibility and permanence for enclosed ACM. One commenter suggested that the enclosure definition to account for spray applied enclosures.

EPA agrees with the recommendation regarding fiber release. Preventing fiber release clarifies the intent of the repair definition. An enclosure is an airtight, impermeable, permanent barrier and as such must by definition prevent the release of fibers.

7. Vibration and air erosion. Several commenters suggested these terms be defined in the proposed rule. EPA agrees with the commenters and has added definitions for both terms.

C. LEA Responsibilities

Several issues in this section were commented upon by LEAs, education associations, school administrators and school board groups and state government officials.

Comments were received on the requirement in the proposed rule for the LEA to designate a person to ensure that the requirements of this section are properly implemented. Some commenters felt that this requirement was unnecessary while other commenters felt that the requirement of the proposed rule was sufficiently flexible to allow for differences in size and capabilities of LEAs. Some commenters favored appointment of an asbestos program manager with more stringent training or qualification requirements for that person. EPA has retained for the final rule the requirement for a designee to ensure proper implementation of LEA responsibilities. This approach provides the benefits of having a single overseer for the asbestos program without the added burden of more stringent training or qualification requirements.

Many parties commented on the requirement that LEAs ensure that short-term workers (telephone repair workers, administrators, etc.) who may come in contact with asbestos are "instructed in safe work practices" regarding ACM. Commenters felt that this placed an undue burden on LEAs that the responsibility for this kind of instruction for short-term workers rests with their employer. EPA agrees with these comments and has eliminated this requirement while retaining the provision that LEAs ensure that short-term workers are provided information about the locations of ACM.

The potential for conflicts of interest between accredited inspectors, management planners, and persons who design or conduct abatement actions also was discussed by a variety of commenters. Some commenters suggested that EPA should require the accredited persons to sign a conflict of interest statement and that no party has a financial relationship with other parties involved in the inspection, development of the management plan, or performance of the response action. The Agency recommends that LEAs consider requesting a full financial disclosure from all potential accredited professions. It may be more efficient for LEAs to use the same firm to conduct the inspections and develop the management plans to promote continuity in the process. However, LEAs should be wary of employing one firm to develop both the management plan and conduct response actions, since the management planner's recommendations about response actions could be influenced by the potential profitability of the recommendation. A similar conflict of interest problem could exist when an abatement firm and an air monitoring firm are directly or indirectly connected. The air monitoring firm could conceivably provide false results that indicate a building is safe for reoccupancy and the abatement contractor has successfully completed the job. EPA has modified the LEA responsibilities section of the rule to specifically state that LEAs must consider conflict of interest issues. However, any resolution of such issues is solely at the discretion of the LEA.

D. Inspections and Reinspections

Comments received on this section dealt with three subjects: the scope of the inspection; the standardization of the inspection; and the inspection process itself.

Regarding the scope of the inspection, commenters were received on whether dormitories should be included in the inspection requirement. EPA concurs with the comments supporting the proposed rule's language including dormitories in the inspection. The Agency believes this is a reasonable extension of the definition of school building since the intent of AHERA is to protect children while attending school. Comments were also received regarding incorporation into the rule of all exterior ACM and other asbestos-containing products. As described in the "Definitions" part of this Unit, EPA believes these additions are unwarranted.

Comments were received regarding the use of a standardized inspection form, and commenters also urged EPA to issue a guidance document for inspectors and management planners. EPA disagrees with comments supporting a mandatory inspection form. The Agency believes LEAs, accredited inspectors, and States should be allowed the flexibility to develop inspection forms to suit their needs. However, EPA is developing a guidance document for LEAs which explains the requirements of this rule, and that document will contain, among other
The Agency believes this is a misrepresentation of the true nature of the material, which is still friable under its covering.

The Agency agreed with comments that state friable thermal system insulation cannot properly be “deemed” nonfriable. This constitutes an inaccurate depiction of the true nature of this material. An undamaged jacket on thermal system insulation may be properly seen as an enclosure, which prevents fiber release and reduces hazard, but does not change the characteristics of material friability behind or under the enclosure.

However, while the Agency considers it inappropriate to “deem” or characterize friable thermal system insulation as nonfriable, it is appropriate to “treat” this material as nonfriable. EPA, in its guidance and technical assistance activities, has traditionally used an undamaged friable thermal system insulation as nonfriable, for the purposes of cleaning and other O&M activities.

Accordingly, the regulation at § 793.85(f) has been modified to state that thermal insulation that has retained its structural integrity and that has an undamaged protective jacket or wrap that prevents fiber release shall be treated as nonfriable.

Ultimately, however, the change in wording does not change the intent of the regulation that thermal insulation that has both an intact protective jacket and has retained structural integrity should be subject to periodic surveillance and preventive measures.

The Agency concerned that an annual reinspection as suggested by some commenters would prove unduly burdensome to LEAs while providing limited information. The rule provides for periodic surveillance activities at least twice a year to keep track of changes in the ACBM’s condition. On the other hand, the Agency believes a reinspection every 5 years is too long a period of time for a school’s ACBM not to be checked by an accredited inspector. ACBM could deteriorate substantially over a 5-year period of time. The Agency disagrees with comments suggesting that unaccredited persons should be permitted to perform inspections. Accredited inspectors will have special training to determine changes in the physical condition of ACBM. The purpose of periodic surveillance, which may be conducted by unaccredited personnel, is to note observable changes in the condition of ACBM. For example, a periodic surveillance check would notice a water leak through an ACBM ceiling. The Agency believes the combination of the semiannual periodic surveillance check and the 3-year reinspection by an accredited inspector provides adequate scrutiny of ACBM present in schools.

Industry commenters advocated a proposed rule for allowing thermal system insulation “that has retained its structural integrity and that has an undamaged protective jacket or wrap that prevents fiber release” to be “deemed” nonfriable for the purposes of this regulation. Others commenters believed this is a misrepresentation of the true nature of the material, which is still friable under its covering.

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Ultimately, however, the change in wording does not change the intent of the regulation that thermal insulation that has both an intact protective jacket and has retained structural integrity should be subject to periodic surveillance and preventive measures. and that custodial and maintenance workers must be trained to deal with such material. Furthermore, if the thermal insulation is disturbed or is about to be disturbed such that it would be rendered friable, all applicable O&M and response action provisions will apply. EPA believes that this is consistent with NESHAP, which considers such material to be friable when disturbed or removed.

F. Bulk Asbestos Sample Measurement

Comments suggested that EPA allow use of electron microscopy and X-ray diffraction (XRD) for the analysis of bulk samples. For purposes of this rule, PLM will be used for analyzing bulk samples for asbestos. The analytical method to be employed is the EPA “Interim Method for the Determination of Asbestos in Bulk Insulation Samples” (40 CFR 763, Appendix A to Subpart 14 F). EPA feels that the existing EPA PLM protocol is technically sufficient for determining asbestos fiber identity and quantity. Currently, allowance is made in the EPA PLM protocol for additional determination of a fiber quantity by XRD. Additionally, validated methods for the use of electron microscopy in bulk asbestos analysis do not exist at this time. New developments in electron microscopy or XRD technology may lead EPA to reconsider the use of these tools for primary analysis at a future time.

The Agency received comments about the requirement for reinspection every 3 years by an accredited inspector. Some commenters supported this requirement. others thought the reinspection should be less frequent. and management planners which will provide uniform guidance to inspectors and management planners regarding their responsibilities. Further, before any course is offered to accredited inspectors and management planners, it must be reviewed and approved by EPA in accordance with the provisions of the Model Accreditation Plan. This review process will help ensure that inspectors and management planners receive uniform guidance.

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algorithms and “decision tree” methods for consideration. Other commenters supported the proposed rule’s language to allow various assessment methods. The Agency believes it is not possible to point to one assessment method as most capable of producing an appropriate response action recommendation: there are a number of suitable assessment methods available for use by accredited management planners. EPA’s management planner accreditation course will provide instruction about a variety of such methods.

G. Response Actions

1. Protection of human health and the environment in response action selection. Several commenters, particularly several State attorneys general and unions, expressed concern that the structure of the response action subsection allowed costs and other considerations to be granted equal consideration with protecting human health and the environment.

EPA has clarified language in the response action subsection (§ 763.90) to underscore its original intent in the proposed rule that protecting human health and the environment is the prime consideration in selecting an appropriate response action. Comments from the Service Employees International Union were particularly useful in this regard.

The Agency believes its response action approach is consistent with congressional direction to apply the prior and inviolable standard of protecting human health and the environment, and allows the consideration and selection of the least burdensome method only after the overriding health determination is made.

2. Air monitoring for determining response actions. Several commenters, primarily from industry, encouraged the establishment of air monitoring standards as the primary basis for hazard assessment. Most commenters, however, supported EPA’s position in the proposed rule.

Traditionally, EPA has recommended assessment of asbestos in schools by visual evaluation of qualitative factors such as the material’s condition, physical characteristics, and location. A careful examination of physical characteristics of the material, conducted by a trained expert, provides a direct method for determining both the relative degree of hazard and the likelihood of future fiber release.

EPA continues to discourage the use of air monitoring as the primary technique for assessing asbestos hazards, since that method only measures current conditions and provides no information about potential and future levels of fiber release.

Further, when the costs and technical requirements necessary for acquiring truly meaningful air monitoring data are considered, the Agency maintains that assessment of qualitative factors continues to be the appropriate method for assessment of hazards and selection of response actions which protect human health and the environment. However, air monitoring may provide useful supplemental information, when conducted in conjunction with a comprehensive visual inspection.

Several industry commenters proposed that EPA adopt air monitoring standards for damaged and significantly damaged ACM. The levels most often proposed were 0.01 fibers per cubic centimeter (f/cm³) for damaged friable ACM; 0.1 f/cm³ for significantly damaged friable ACM, with fibers longer than 5 um as measured by transmission electron microscopy (TEM) in each case. No commenters, however, provided any substantive rationale for choosing such levels. The Agency believes that such standards used for purposes of assessing asbestos hazards could not ensure protection of human health and the environment as intended by TSCA Title II. As factors to be used in determining whether response actions are necessary, these numerical values provide a false sense of precision regarding the presence and severity of asbestos hazards and the appropriateness of a given response action. For the same reasons cited in the above discussion of the use of air monitoring, the Agency disagrees with the suggestion that a numerical standard is appropriate as the primary criterion for selection of response actions.

3. Specificity in definitions related to response actions. Many commenters felt that more objective and definite response action definitions should be provided by EPA with regard to damage-related definitions and response actions. Some believed that too much discretion was vested in accredited experts, who would be making technical judgments to advise LEAs of actions. One comment cited EPA’s economic impact analysis of the rule as an illustration of the lack of objectivity of the response action definitions. In this analysis, EPA’s own regional asbestos coordinators varied greatly in their estimates of what percentages of materials in schools in their regions fell into the various damage conditions described in TSCA Title II.

In response to comments, the Agency has added much more illustrative detail to three important definitions—damaged and significantly damaged friable thermal system insulation ACM; damaged friable miscellaneous ACM; and damaged friable surfacing ACM—which will help accredited experts better identify asbestos hazards in schools. EPA agrees that this language, taken from the preamble of the proposed rule, adds necessary clarification to conditions which may constitute ACM damage and warrant appropriate response actions. These descriptions were not available to occasional asbestos coordinators when they gave their estimates of damage in schools. In addition, the extensive training program developed in the rule should achieve much greater consistency in evaluating and assessing asbestos in schools, although perfect consistency will never be achieved.

However, a rigid response action decision structure is not appropriate for this rule, primarily because many asbestos hazard situations are too circumstantial and appropriate response actions are too “hazard specific” to fit neatly into a discrete set of prescriptive categories.

There appears, then, to substitute for the judgment of the accredited management planner, who must recommend appropriate response actions within the general requirements established in § 763.90. That section provides a process by which a range of available choices may be considered by the accredited expert and selected by the LEA to best protect human health and the environment from each particular asbestos hazard in the school.

Under the provisions of the regulation, LEAs may take into account a variety of particular considerations, such as local circumstances, technological feasibility of appropriate response actions, economic considerations, and other relevant factors in selecting the least burdensome method. Such factors, however, may be considered only after the response action has been determined to protect human health and the environment.

Finally, accreditation alone does not imply “expertness.” It only assures a suitable and common level of competence and awareness which is necessary for inspection, assessment and response action recommendation. School officials are well-advised to consider a variety of factors, including quality of training, experience, and prior performance of accredited personnel in selecting inspectors, management plan developers, abatement project designers, and contractors for school asbestos projects.

4. Removal as the “only” appropriate response action for significantly
damaged ACM. Several State attorneys general, among several other commenters, contended that "in cases of significant damage, the only appropriate response is to remove the material. as this is the only action which adequately protects human health and the environment."

EPA disagrees that removal is the only appropriate response in all cases of significantly damaged ACM, particularly thermal system insulation. There may be the technologies or circumstances of significant damage in which removal is both inappropriate and undesirable.

EPA agrees that, particularly with regard to significantly damaged friable miscellaneous and surfacing ACM, isolation of the functional space and removal is often the most appropriate (and possibly, only acceptable) response. Encapsulation, for example, would be an acceptable response action for friable surfacing ACM only under very limited circumstances, given current technology. However, the Agency will not categorically preclude response actions of repair, encapsulation, or enclosure which, under certain circumstances, may also protect human health and the environment.

5. Implementation of response actions in a timely fashion. Several commenters asked the Agency to clarify the requirement that appropriate response actions be selected and implemented by LEAs "in a timely fashion," perhaps by establishing time limits for particular actions.

Many of the response actions themselves imply timeliness in response. Damaged or significantly damaged thermal system insulation ACM or its covering, for example, must be constantly maintained in an intact state and undamaged condition. In addition, the rule specifies, in the case of significantly damaged friable surfacing or miscellaneous ACM, that LEAs must immediately isolate the functional space and restrict access, unless isolation is not necessary to protect human health and the environment.

The Agency does not believe it is able to define "timely fashion" or specify time limits or deadlines in applying such requirements in all cases any better than it is able to prescribe a single response action for every particular damage category. LEAs, in the context of particular asbestos hazards, in consultation with accredited experts and in full view of school-community groups, are responsible for determining appropriate schedules for their asbestos response actions.

However, LEAs should be advised that in providing "a schedule for beginning and completing each preventive measure and response action" as required in § 763.93(e)(6), the LEA is specifying what constitutes implementation of preventive measures and response actions in a timely fashion for that LEA. EPA and State enforcement officials will be monitoring LEA adherence to these schedules to determine whether enforcement actions are warranted against those schools which fail to meet their own deadlines for completing preventive measures and response actions.

6. Repair for significantly damaged friable thermal system insulation ACM. Several commenters, State attorney general and the unions in particular, questioned the efficacy of repair for significantly damaged friable thermal system insulation ACM.

Repair is often successful in preventing fiber release from damaged thermal system insulation and, after assurance that it will protect human health and the environment, an LEA may find repair the least burdensome method of response. Techniques for thermal system insulation ACM repair are well-developed and easily accomplished. Furthermore, the nature of the material makes it especially susceptible to quick remediation with simple techniques.

EPA recognizes that severely damaged friable thermal system ACM may warrant removal to protect human health and the environment, but this is not always the case. If feasible, as determined by the accredited expert, and protective of human health and the environment, repair may be an appropriate response action for this level of damage under particular circumstances. Further, new and emerging repair technologies may offer LEAs new ways to prevent fiber release, protect human health and the environment, and postpone the major disruption often associated with asbestos removal projects until a more appropriate time.

Finally, "feasibility" does not imply, as one commenter feared, "repair first, and only if repair is impossible, then remove." There is no predisposition toward repair, but rather a prior consideration of repair feasibility as a check to avoid a major disruption to the material, through removal, if it is not necessary or desirable.

7. Airborne asbestos fiber measurement for clearance of abatement sites. EPA has received comments on the use of transmission electron microscopy (TEM), scanning electron microscopy, and phase contrast microscopy for the analysis of air samples taken for clearance air monitoring. Comments dealt with issues that included the possible uses of each of these analytical methods for clearance air monitoring, as well as issues specific to the use of TEM.

The final rule sets forth TEM as the analytical method to be used for analysis of samples taken for clearance air monitoring. Implementation of this TEM requirement will be phased-in gradually. EPA convened a committee of leading microscopists from private and Federal laboratories to produce an analytical protocol specific for post-abatement clearance monitoring. Each microscopist had extensive experience in TEM, scanning electron microscopy (SEM), and airborne asbestos analysis. The unanimous conclusion of the microscopists was that, for purposes of clearance air monitoring, TEM was the technique of choice. Consequently, an interim TEM protocol has been formulated for clearance air monitoring of asbestos abatement sites in schools.

EPA chose to require analysis by TEM for four reasons: (1) TEM is capable of measuring the smallest diameter fibers; (2) based on existing, validated methods, a formal protocol has been developed; (3) TEM has been validated by intra- and inter-laboratory comparisons conducted by NBS; and (4) a formal laboratory accreditation program for TEM laboratories is currently under development by the NBS.

Phase Contrast Microscopy (PCM) will be allowed for clearance of small projects (removal of less than 160 ft² or 200 linear feet of asbestos) and during a phase-in of the TEM requirement, for clearance of some larger projects. This phase-in period will give laboratories a period of time to acquire and install TEM instruments, and will permit economical clearance of small projects where clearance analysis costs are a significant portion of total abatement costs.

PCM analysis must be made using the latest version of the NIOSH 7400 method. Two other methods of PCM analysis were considered: the OSHA/EPa Reference Method (ORM) and P&CAM 239. The ORM cannot be used for area clearance because it is intended for personal sampling of abatement workers during abatement work clearance following an abatement action. P&CAM 239 will not be allowed since both NIOSH and OSHA have determined that the NIOSH 7400 method is more accurate and reliable.

The PCM method is nonspecific for asbestos and it cannot detect the small
thin fibers found at abatement sites. EPA research data has shown that PCM is often inadequate for post-abatement monitoring of airborne asbestos. These data indicate that sites which were shown to be clean with PCM data were found by TEM data to be still contaminated. Therefore, reoccupancy of sites initially cleared by PCM, and thus, assumed to have been adequately cleaned, may in fact result in exposures to asbestos.

SEM, for purposes of this rulemaking, was determined to be inadequate for building clearance for the following reasons: (1) Currently available methodologies are not validated for the analysis of asbestos fibers; (2) SEM is limited in its ability to identify the crystalline structure of a particular fiber. (SEM analysis is therefore confined to identification of structures by elemental composition and morphology); (3) recent studies conducted by NBS have evaluated several types of scanning electron microscopes and the variability between these instruments. (NBS has found the image contrast of the microscopes is difficult to standardize between individual scanning electron microscopes); and (4) currently no laboratory accreditation program exists for accrediting SEM laboratories. EPA is aware of two methodologies for SEM: a draft method currently in its initial review by the American Society for Testing and Materials (ASTM) and an Asbestos International Association (AIA) protocol. Neither method has been validated. Additionally, NBS has determined that the AIA method has inherent difficulty when examining certain types of asbestos.

Currently, a laboratory accreditation program is in development for TEM by NBS. Additionally, the AIHA PAT Program evaluates laboratories conducting PCM analyses. The NBS has unconditionally stated that it will not formulate a laboratory accreditation program for SEM based on existing methodologies. Until suitable methodologies are developed, EPA will continue to monitor and investigate the progress of SEM methodologies and research for asbestos analysis. New developments in SEM technology may allow SEM to be considered as an acceptable asbestos measurement tool in the future.

Regarding the use of TEM, several commenters suggested that the aspect ratio (length to width) of 5:1 or larger is defined as a fiber. This represents a change in the previous EPA proposed TEM methodologies which examine fibers with aspect ratios of 3:1 and above; it follows the direction set by NIOSH in proposing modified counting rules in the 7400 method. It is consistent with the panel of microscopists' observations that asbestos structures have aspect ratios of at least 5:1 and greater than 5:1 whereas the majority of asbestos structures, minerals and particles, for example, gypsum, have aspect ratios of less than 5:1. Analysis of these asbestos structures tends to comprise a large portion of the time required for sample analysis. EPA believes that further research is needed to justify the extension of aspect ratio to 10:1. Consequently, for the purpose of TEM building clearance, fibers must have an aspect ratio of at least 5:1.

8. Phase-in period for TEM. Several commenters asked that the phase-in period for requiring TEM analysis be lengthened, abbreviated, or eliminated altogether. EPA believes the 3-year phase-in period for requiring TEM for all but the smallest abatement jobs allows commercial laboratories the necessary time to purchase and set up additional TEM instruments. In December 1987, estimates developed by EPA's Office of Research and Development (ORD) indicated that there were approximately 62 commercial laboratories in the country which advertised the ability to perform TEM analysis on airborne asbestos samples. Testimony received during the August 25 and 26 public hearings for this rulemaking as well as information gathered by EPA staff indicate that many laboratories intended to purchase additional TEM equipment. In addition, several laboratories own more than one transmission electron microscope.

EPA believes that an increased demand for TEM instruments will drive the supply of instruments, and has stipulated the 3-year phase-in to allow commercial laboratories time to react to the increased demand. The Agency believes a shorter phase-in period, or requiring the immediate use of TEM for all jobs would create a substantial burden on schools and laboratories. The delay to clear abatement jobs and the high cost associated with TEM analysis for relatively small jobs would be burdensome. EPA has consequently decided to retain the length and type of phase-in described in the proposed rule.

H. Operations and Maintenance and Worker Protection

1. Worker protection and "small-scale-short-duration" activities. Several commenters, particularly union groups, advised the Agency to increase worker protection standards and alter the definition and requirements for small-scale, short-duration projects (as defined by Appendix B to Subpart E) prescribed by the Occupational Safety and Health Administration's (OSHA's) and EPA's relevant worker protection regulations. In particular, comments focused on permissible exposure limits (PEL), the allowance of historical air monitoring data, respiratory protection, and the practice of glove bag removal. Other commenters recommended no change, citing OSHA's primacy in this area.

This final regulation, through the provisions of the EPA worker protection rule, extends coverage already in place for O&M workers in private schools under the OSHA construction standard to public sector O&M workers now unprotected in schools. This OSHA standard also includes Appendix B of this rule. LEAs may implement the provisions of Appendix B of the rule instead of the full scope of the EPA/OSHA worker protection regulation when they conduct small-scale, short-duration activities (all of which are presumed to exceed the action level of 0.1 f/cm 3).

The Agency maintains that OSHA is the most appropriate Federal agency for determining worker protection policy. As noted in the preamble to the proposed rule, EPA believes that OSHA's recently completed worker protection rulemaking, a lengthy and detailed process focused specifically on issues, is as appropriate to school O&M workers via the EPA worker protection rule as it is to other private sector O&M workers. EPA continues in this belief and no commenters have indicated substantive reasons why the OSHA protections should not be followed.

Therefore, the Agency does not intend to reassess the OSHA determination with respect to issues such as PEL, the use of historical air monitoring data, respiratory protection, and the allowance of glove bag removal. EPA will, however, change the provisions of its worker protection rule (and hence, this regulation) to conform with any modifications subsequently adopted by OSHA.

Finally, with regard to the definition of "small-scale, short-duration" activities, the Agency provides further clarification of the OSHA definition in Appendix B to Subpart E by adding five additional points which may be used to define such projects. EPA believes these additional considerations are instructive.
and useful, but will not require their consideration in defining "small-scale, short-duration" activities.

2. Respiratory protection. Many organizations, in their comments, advocated the use of respiratory protection for all operations and maintenance O&M work which might affect asbestos-containing materials ACM.

Once again, the Agency maintains that OSHA is the most appropriate Federal agency for determining worker protection regulations policy, including appropriate respiratory protection, and EPA finds that OSHA's respiratory protection regulations which govern O&M workers in the private sector are equally relevant in schools. EPA does not intend to reassess the OSHA determination in this regard.

However, the regulation does require specific respiratory protection training for all O&M workers who conduct any activities which will result in the disturbance of ACM. Such training must include: (1) Notification of information on the use of respiratory protection as contained in the EPA/National Institute for Occupational Safety and Health (NIOSH) "Guide to Respiratory Protection for the Asbestos Abatement Industry," September 1988 (EPA-660/0PT5-88-001); and (2) hands-on training in the use of respiratory protection.

EPA believes the effect of these training requirements will be to ensure that LEAs determine the appropriate level of protection for its O&M workers and that workers are adequately informed of protection levels and properly trained in respiratory protection practices.

Concerned that O&M workers could be at risk in situations where peak exposures occur and, thus, may need additional respiratory protection. The comments claim these exposures may exceed OSHA standards and are unpredictable. EPA, however, believes its regulations cover these situations since the regulations provide that respirators shall be supplied in areas where airborne concentrations "can reasonably be expected to exceed permissible limits" 40 CFR 763.121(e)(1) and (4). Since this regulation requires warning labels for asbestos materials (§ 793.99), workers and LEAs should be aware of situations in which asbestos materials will be disturbed to such an extent that respirators are appropriate.

3. Right to refuse work. Several unions provided comments which advanced a proposal to include a right to refuse unsafe or illegal work in the regulation.

EPA believes that the issue of right to refuse work, which is protected under other labor legislation and worker protection regulations, is more properly addressed by the Department of Labor. This is a general worker protection issue, outside the scope of EPA's expertise. Comments noted that OSHA has promulgated a general regulation affecting an employee's right to refuse work (29 CFR 1977.2(C)(2)) and argue that EPA should extend this safeguard to school workers in the same way the Agency extended the OSHA safeguards to school workers. This point, however, is misplaced. EPA does not believe it should extend general OSHA safeguards to school workers. EPA is not charged with general worker protection, although it is appropriate to extend specific asbestos-related standards to school workers.

AHERA section 211(a) does prohibit State or LEA discrimination in any way against someone because that person has provided information relating to a potential violation of the Act or regulation, including a school directive that workers perform unsafe or illegal activities. The Act allows for any employee or representative of employees who believes they have been fired or otherwise discriminated against to apply for review at the Department of Labor under section 11(c) of the Occupational Safety and Health Act.

4. Routine cleaning. Several commenters, particularly the State attorneys general and the unions, recommended that the Agency require routine or periodic cleaning in areas with friable ACM, as outlined in the EPA Purple Book.

The Agency has traditionally recommended, as a prudent measure, routine cleaning by wet methods in school areas with asbestos-containing materials, particularly when they are friable. Monthly wet cleaning has been recommended in previous EPA guidance for areas where friable surfacing ACM is present and semiannual wet cleaning is suggested in areas with damaged thermal system insulation ACM.

Other commenters stated the belief that improper cleaning on a regular basis might disturb the material and could actually increase fiber levels in the air. Further, periodic cleaning in limited-access areas, such as pipe tunnels, would not appreciably reduce exposure to school occupants and might actually increase hazard to custodial workers who conduct the cleaning. EPA is persuaded by the comments that a decision on routine cleaning by the accredited management planner in the context of the particular asbestos hazard is appropriate. The final rule now requires that the accredited management planner shall make a written recommendation to the LEA regarding the appropriateness and frequency of additional cleaning, which must be included in the management plan.

I. Management Plans

The contents of the management plan were the subject of many comments. In general, EPA is persuaded by the comments regarding the need for the plan in the context of the particular asbestos hazard is appropriate. The final rule now requires that the accredited management planner shall make a recommendation to the LEA regarding the appropriateness and frequency of additional cleaning, which must be included in the management plan.
plan has not changed since the previous notification. The purpose for the annual notification is to ensure that parents and employees now to the LEA each year have an opportunity to be informed about the availability of the plan. Other commenters suggested that annual notification about the plan should include any asbestos abatement planned for that year, and that the notification requirement be expanded to inform parents whenever actions are taken under the management plans. EPA believes that these ends are achieved in a less burdensome fashion through § 763.84(c), which requires that the LEA inform workers and building occupants, or their legal guardians, at least once each school year about inspections, response actions, and post-response action activities, including periodic surveillance activities that are planned or in progress.

Regarding access to the plan, commenters suggested the plan required to be maintained at the individual school should not be the plan for the entire LEA, but only the plan for that school. The final rule has been clarified to specify that a school needs to have available only that part of the LEA's plan which pertains to that school. Another comment regarding access to the plan came from private school groups interested in limiting access to parents, students, and employees, thereby excluding the general public. EPA believes that this is contrary to Title II, section 204(g)(5), which states that the plan shall be available "for inspection by the public, including teachers, or other school personnel, and parents." Since persons involved with the school are only among those "included" in the public, EPA interprets the statute to preclude limiting access to all other members of the public.

K. Exclusions

Comments on the proposed exclusion criteria ranged from general support to opposing any exclusions. Some commenters agreed that EPA's 1982 rule was frequently not complied with, dealt only with friable ACM, and the inspectors were not required to have accreditation. As a result, these commenters believe few if any exclusions could be granted based on the 1982 rule. Several commenters believe the term "substantial compliance" is vague and unenforceable. In addition, other commenters agreed that the requirement in the proposed rule to assess friable ACM would require inspectors to visually inspect all areas anyway. Lastly, some commenters suggested that requiring an accredited inspector to determine whether the LEA qualifies for an exclusion is too stringent and thus, unreasonable.

TSCA Title II directs the Agency to promulgate regulations which will provide for the exclusion of any area of a school building from the inspection requirements. If LEAs were required to repeat actions conducted properly in the past, the Agency would place an unnecessary burden on those LEAs and penalize LEAs which made a good faith effort to address asbestos hazards in their building. EPA believes a number of States and localities have developed inspection programs in recent years that are similar to Title II. In addition, LEAs that complied with EPA's 1982 rule could receive an exclusion from part of the final rule's requirements. For example, friable material sampled and found to contain asbestos on the ceiling of the cafeteria would not have to be resampled. Although friable ACM is not be assessed even if previously identified, the above example illustrates a savings to the LEA.

Substantial compliance" allows previous sampling that was done in a random manner with sufficient samples to be adequate to determine no ACM is present. EPA believes previous adequate inspection and sampling efforts conducted by LEAs should not prove worthless. For example, if a LEA had records that it took three random samples in a 1,500 square foot classroom to comply with EPA's 1982 rule or a State law, and all samples were analyzed negative for asbestos, an accredited inspector may determine that this is sufficient to indicate no asbestos is present even though the current rule would require five samples for the same classroom.

EPA believes only an accredited inspector has the training necessary to determine whether previous inspections and sampling were adequate. EPA has evidence to suggest that many inspections performed under the 1982 rule were conducted by persons with little or no inspection training. If these same individuals were responsible for determining the validity of previous inspections, large areas of schools may not be examined by accredited inspectors. In many respects, this would defeat the purpose of TSCA Title II.

L. Enforcement

Some commenters stated that the "Compliance and Enforcement" section of the proposed rule (§ 763.97) incorrectly describes the provisions of TSCA Title II and that the final rule should explicitly state the following points. First, LEAs that violate the regulations under Title II are not liable under any enforcement provision of Title I. Second, Title II does not allow EPA to assess penalties against individuals. Third, criminal penalties are not permitted for violation of Title II.

EPA disagrees. The provisions of the "Compliance and Enforcement" section
Section 3 of AHERA, "Technical and Conforming Amendments," amends section 15(t) of TSCA Title I to provide that it is unlawful for any person to fail or refuse to comply with any requirement of TSCA Title II or any rule promulgated or order issued under Title II. Therefore, violations of Title II regulations, published in this document are generally subject to the civil and criminal penalties under section 16 of Title I and to civil injunctive actions under section 17 of Title I. This liability is qualified, however, by section 207 of Title II which describes LEA civil liabilities for violation of regulations and provides that LEAs are not liable for any civil penalty under Title I. Section 207, however, does not alter the criminal liabilities of Title I or the injunctive provisions of section 17 of Title I. Nor does section 207 provide any exemption from Title I provisions for inspectors, management planners or any other person other than an LEA that has responsibilities under TSCA Title II. Finally, regardless of the provisions of TSCA, applicable case law provides that liability for actions of organizations may extend to responsible officials.

Thus the three points noted in the comments are wrong. First, LEAs that violate Title II rules are liable for criminal penalties under section 16 of Title I and are subject to injunctive relief in Federal District Courts under section 17 of Title I. Second, individuals may be liable for violating TSCA Title II regulations. Individuals other than LEAs that violate Title II regulations are subject to any of the penalties under Title I, and responsible LEA officials may be liable for any LEA violation of Title II. Third, the effect of the conforming amendments to TSCA Title I is that criminal penalties may be assessed for violation or Title II.

M. Other Issues

1. Cost estimates for inspection. Several commenters, ranging from school districts to independent consultants, expressed concern that the economic impact analysis of the proposed rule underestimated the cost of inspecting for ACM. Comments claimed that labor rates and time required to conduct inspections were too low.

EPA agreed with these comments. As a result the Agency's estimates for the final rule increased due to an update of unit labor costs and a small increase in the time estimated to perform several inspection activities. As a result the estimated total cost for all inspection activities increased from the proposal to the final rule from approximately $58.2 million to approximately $78.5 million. The cost for the building walkthrough and visual inspection, assessment, and mapping and reporting activities increased, while the cost estimates for bulk sampling and analysis remained the same. The total inspection costs are now estimated to be $1,144 for public primary schools, $1,627 for public secondary schools and $1,557 for private schools.

2. Cost estimates for management plans. A number of commenters expressed concern that the proposed rule underestimated the cost of developing management plans due to low assumptions for labor rates and time needed to prepare the plan. EPA also received comments that training and recordkeeping costs were too low. These costs are considered by EPA as part of the cost of the management plan implementation. Several commenters also expressed concern that EPA underestimated the burden associated with the state review of management plans.

EPA agrees that labor costs and time needed to prepare plans were too low in the proposal and has increased these estimates. EPA has also increased the cost for training by raising labor rate estimates and including travel expenses in the cost of training. As a result, the average costs for first year development and implementation of a management plan for a typical school is estimated to be $3,270 for a public prim.-y school, $4,521 for a public secondary school and $4,460 for a private school. The total cost for development and implementation of management plans increased from $970.8 million in the proposed rule to $1,272 million in the final rule.

With respect to the cost to States of reviewing management plans, EPA has not substantially changed its estimates. While the proposed rule stated a range of $63 to $95 for a State to review a plan, the final rule estimates this cost at approximately $77. The plan review burden will vary with the different number of schools found in each State. For example, California, with an estimated 10,832 schools, would incur a review cost of roughly $642,000. Delaware, with an estimated 228 schools, would incur a cost of about $23,000. States will incur this burden of $63 to $95 for a State to review a plan.

Delaware, with an estimated 228 schools, would incur a cost of about $23,000. States will incur this burden within the 90-day review period specified in the law. The burden for each State, if it must review many plans, may be substantial. However, this burden is imposed by statute.

3. Costs for operations and maintenance (O&M) programs. EPA received a comment that it should not have included a cost for levels of overhead and contingency costs for O&M programs because schools are not run like a business and would not charge themselves overhead. In addition, the comment argued that EPA's assumed rate of three minor fiber release episodes per school per year was too high. It was also argued that EPA should not have included an opportunity cost associated with O&M work, since schools would not actually spend money on many O&M activities but would redirect their employees' activities. Finally, the commenter identified a mistake in the calculations of the cost of consumable supplies used in O&M programs.

EPA agrees that schools would not incur overhead and contingency costs for O&M work. EPA used these indirect costs to calculate the expenses associated with the incremental utility, payroll, and other expenses attributable to an O&M program. EPA believes that these estimates of indirect rates are reasonable.

EPA slightly modified its assumptions with respect to fiber release episodes. However, this change did not have a significant impact on the total cost of O&M programs.

With respect to using an opportunity cost approach in the calculation of O&M costs, EPA believes that these costs are, indeed, a real cost of conducting O&M. However, the Agency acknowledges that some portion of the O&M cost may not result in actual expenditures by a school if the school chooses to give up some other activity to absorb the additional O&M activity. Regardless of how the school chooses to react, these are costs imposed by the rule. Accordingly, the Agency has included the opportunity costs analysis in the final rule estimates.

EPA acknowledges its mistake in the cost of consumables and has adjusted the O&M costs accordingly. This yields a fairly substantial drop in per school annual expenses for O&M programs. The reason for the decrease in O&M costs noted below is almost entirely due to this decrease in cost of consumables.

The final rule's costs of O&M programs per school on a yearly basis (excluding the cost of special equipment acquisition) are now estimated to be $3,800 for a public primary school, $5,100 for a public secondary school and $3,600 for a private school. The total O&M costs have decreased from $25.4 million in the proposal to $29.2 million for the final rule.

4. Costs for removal, enclosure and encapsulation projects. Commenters argued that cost estimates in the
The Agency has noted elsewhere in this preamble the problems with post-removal air monitoring for asbestos materials removed during building demolition. These errors have been corrected in the final rule estimates.

In addition, EPA assumed in the preamble that all post-response action air samples would be analyzed using TEM. Since the rule allows limited PCM, the costs of response actions have increased accordingly. This cost increase is approximately $4,000 in direct expenses per project for those projects using PCM.

Total costs for removal, enclosure and encapsulation projects have decreased from $1,587 million in the proposal to $1,432 million in the final rule.

5. Risk related to asbestos in buildings. Comments argued that EPA did not adequately assess the evidence relating to the harm caused by asbestos in schools. Specifically, they claimed that EPA’s assessment of risk for this rule (1) did not consider estimates of the occupational potency of asbestos developed by a number of scientists who disagree with the potency estimates accepted by the Agency; (2) ignored studies showing that prevailing exposure to asbestos in schools has often been measured at levels far below those assumed by the Agency in its assessment (75 to 500 ng/m³); and (3) did not consider documentation that asbestos exposures after major abatement, especially removal, may not be reduced at all and may even be elevated. Had such evidence been considered, according to one of these comments (Safe Buildings Alliance), EPA would have come to the conclusion that operations and maintenance programs are, in almost all schools, the appropriate response action to protect health and the environment. This evidence is cited to support the position that protection of health and the environment requires specification of an airborne exposure level of protection.

EPA disagrees that the evidence cited in these comments supports the need for an airborne asbestos standard in schools. Rather, EPA believes that the data cited by these comments, even if assumed to be correctly interpreted by the commenters, supports the rule as promulgated:

The Agency has noted elsewhere in this preamble the problems with air monitoring as the primary assessment tool for asbestos in schools.

Furthermore, no comments have provided any substantive health based justification for setting any airborne level as an appropriate level to protect public health from asbestos in schools.

Nevertheless, EPA believes that the rule accomplishes the goals of these commenters to ensure that unnecessary removal activities do not occur. Indeed, one of these commenters (Safe Buildings Alliance) specifically stated that it believes removals could typically be the response action if the rules were incorrectly applied. The rules, however, are not designated to prefer one response action over another, but to allow schools the flexibility to deal with their particular situations. Certainly, asbestos in many schools may not present significant risks in its current condition, but could cause considerable harm if not dealt with properly. Also, there are plainly schools in which serious measures would be needed immediately. In this context the evidence cited by the comments is supportive of EPA’s rule as discussed below.

With respect to the potency of asbestos, EPA has decided that for purposes of this rule there is no need to resolve the divergence of opinion. See preamble to Proposed Rule, 52 FR 15833.

In any event, EPA has considered differing views on asbestos health effects in other proceedings (see, e.g., 51 FR 3728 et seq., January 29, 1986) and commenters have not presented new evidence. The important point for purposes of this rule, is that varying local circumstances will drive the decision on the appropriate response action.

With respect to asbestos exposure, EPA acknowledges that many building air measurements show low prevaling levels. However, peak levels during serious disturbances can be extremely high and may cause very serious risks to individuals involved. Regardless of the actual average measurements in all schools, regardless of whether one accepts the levels used by EPA in its assessment or the levels presented by the commenters, the basic structure of the rule should not be changed.

Assessment of all the evidence leads to the conclusion that local educational agencies should at least adopt operations and maintenance programs and institute more serious response actions if local conditions warrant. The levels EPA used in its risk assessment are actual measurements (see, e.g., “Measuring Airborne Asbestos Levels in Buildings,” EPA 590/13-80-026; “Airborne Asbestos Levels in Schools,” EPA 590/5-63-003) and are reasonable for purposes of decisionmaking in the context of this rule. In any event, the lower airborne asbestos levels cited by the commenters do not make the case for an airborne regulatory level.

Finally, EPA interprets data on airborne levels of asbestos before and after removal action differently from the commenters. The information available on airborne concentrations before and after asbestos removal is actually limited, dealing with a very small number of abatement actions. Nevertheless, EPA believes that this information indicates that, in the past, some abatement actions were not done properly and led to increased airborne levels. The rule, therefore, was designed to prevent shoddy abatement work. A draft report prepared by Battelle (March 1987) shows significant reduction in airborne asbestos concentrations in the enclosed abatement area in schools immediately after removal operations. Airborne levels measured in the Battelle study did increase back to approximately the same as pre-removal levels after school resumed (based on a statistical analysis of pre- and post-removal levels). However, these levels could only have been the result of reentrainment of asbestos from outside the immediate removal area. Removals, thus, were successful at the removal site but could not guarantee no fiber release from asbestos-containing materials remaining in the building. The Battelle draft, therefore, does not show an increase in exposure, but indicates the removal activities as suggested by the comments.

At the very least, removal reduced some danger of peak exposures. The data in the Battelle draft may indicate a need for continuing O&M programs following abatement, particularly where all asbestos is not removed.

6. Model accreditation plan. EPA received comments about the provisions of the Model Accreditation Plan required under section 208 of TSCA Title II. Under Title II, the Agency was required to submit a final Model Accreditation Plan by April 20, 1987. The final plan was issued by EPA in accordance with that deadline. The final plan appeared in the Federal Register of April 30, 1987, entitled “Asbestos-Containing Material in Schools; Model Accreditation Plan.”

IV. Economic Impact

The economic impact analysis estimates the incremental costs attributable to the proposed regulation, including costs of inspection, sampling, development, and implementation of management plans, training of school employees, periodic surveillance, and the implementation of abatement actions. Estimates of the number of schools affected and square footage of asbestos were developed based on the 1984 EPA survey of asbestos in schools.
and data compiled from the Asbestos School Hazard Abatement Act (ASHAA) loan and grant program. Estimates of the percentage of asbestos which falls into each of the hazard categories were based on the results of a survey of the EPA's Regional Asbestos Coordinators (RACs).

Using a model school mode, a project approach, costs of inspection, sampling, and appropriate response actions were developed for schools with ACM in each of the different hazard categories. For schools with only nonfriable ACM, the only costs estimated were for management plan implementation, nominial plan implementation activities, training of the asbestos program manager, custodial training for minor repair and maintenance of ACM, and the periodic surveillance and reinspection of ACM. For purposes of the economic analysis, EPA assumed that all schools with only nonfriable ACM would choose to forego sampling and instead just treat suspect materials as asbestos-containing.

Asbestos abatement-related costs expected to be incurred regardless of the existence of these regulations were subtracted from the total costs to calculate only the incremental cost of the final regulations. For example, data from the ASHAA loan and grant application data base were used to project an average annual rate of removal asbestos that is assumed would have occurred even if TSCA Title II legislation and these regulations were not promulgated. That average annual rate was estimated to be approximately 3.4 percent for primary schools, 3.3 percent for secondary schools, and 1.8 for private schools. The costs associated with this underlying rate of removal were subtracted from the total costs. The cost of removal of friable ACM prior to demolition that is required by the NESHAPs's regulations were also netted out of the total costs.

The estimated present value of the costs of these final regulations is approximately $3,145 million (using a 10 percent discount rate) over 30 years. This includes the cost of initial inspection and sampling—$79.5 million; development and implementation of management plans—$1,272 million; periodic surveillance—$47.7 million; reinspection—$23.2 million; special operations and maintenance programs—$352.7 million; and abatement response actions—$1,431 million.

The total number of primary and secondary schools potentially affected by these final regulations is estimated to be 106,903. Approximately 44,600 are estimated to have about 213 million square feet of surfacing or thermal systems insulation ACM. Of these, an estimated 10,700 have surfacing ACM only. It is likely that every school contains some amount of nonfriable ACM such as floor tile, transite board, and fire doors.

The cost of an asbestos inspection is estimated to range from $1,144 to $1,627 per school for schools with both surfacing and thermal systems insulation ACM. This cost varies depending upon the size of the school, the amount and type of ACM contained in the school, and the type of professional doing the work. The costs of sampling and analysis if friable materials are found will depend upon the number of samples taken and analyzed. Costs of analysis are estimated to range from $25 to $47 per sample. Assuming the average school has to analyze 3 samples, the cost of analysis will be $50 to $940 per school. The cost of mapping ACM is estimated to range from $110 to over $270 per school.

The cost of developing a management plan if asbestos-containing surfacing ACM or thermal systems insulation ACM is present is estimated to range from $1,025 for an average-size public primary school to $1,450 for an average-size public school. These estimates are weighted averages of the costs of plans developed by trained school personnel and by outside consultants. A less extensive management plan would be required for schools containing only nonfriable materials. The average development cost for a management plan where only nonfriable materials are present is estimated to be approximately $500 for both public primary and private schools, and about $715 for public secondary schools.

The cost of training for school employees involves a variety of factors ranging from course and accreditation exam fees to the possible expenses for any out of town travel required for the training. The estimated course fee for a 2-hour awareness session required of all school employees is estimated to be approximately $50 per person. The additional 13 hours of training for school maintenance workers who may come in contact with asbestos is estimated to cost $250. A fee of $420 is estimated for the 24 hours of training required for the certification of asbestos abatement workers who may interact with ACM. The cost of training is estimated to be $840.

Response action costs depend primarily on the condition of the asbestos in a school and to a lesser extent on many other factors. In general, for surfacing ACM in all but the significantly damaged category, it is likely that the primary response action undertaken by a school will be special O&M activities. Use of O&M activities would likely continue until the ACM deteriorates to a significantly damaged condition. The annual cost of a special O&M program (excluding acquisition of special equipment) is estimated to range from $3,800 for a typical public primary school to $5,100 for a typical public secondary school.

The cost of removal depends upon many factors including size of the project. The estimated cost of removal for a 4,000 ft² project in which surfacing material is removed would be approximately $551,000. The cost of removal for a 900 ft² boiler wrap project is estimated to be approximately $30,900. The total discounted costs of response actions were estimated assuming schools undertake a combination of response actions that depend on the condition of the ACM.

V. Rulemaking Record

EPA has established a record for this rulemaking (docket control number OPTS-62048E). The record is available in the Office of Toxic Substances Public Information Office, from 8 a.m. to 4 p.m., Monday through Friday, except legal holidays. The Public Information Office is located in Rm. NE-G004, 401 M St., SW., Washington, DC.

The record includes information considered by EPA in developing the proposed and final rules. The record now includes the following categories of information:

1. Federal Register notices.
2. Support documents.
3. Reports.
5. Records of the negotiating committee.
6. Public comments received on the proposed rule.
7. Response to comments document.
8. Transcript of the August 25 and 26 Public Meeting.

EPA requests that any person who commented on this rule submit to the Agency in writing any information which such person believes shows there are errors or omissions in the record. EPA will evaluate such submissions and supplement the record as appropriate.
PART 763—Asbestos-Containing Materials in Schools

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§ 763.80 Scope and purpose.

(a) This rule requires local education agencies to identify friable and nonfriable asbestos-containing material (ACM) in public and private elementary and secondary schools by visually inspecting school buildings for such materials, sampling such materials if they are not assumed to be ACM, and having samples analyzed by appropriate techniques referred to in this rule. The rule requires local education agencies to submit management plans to the Governor of their State by October 12, 1988, begin to implement the plans by July 9, 1989, and complete implementation of the plans in a timely fashion. In addition, local education agencies are required to use persons who have been accredited to conduct inspections, reinspections, develop management plans, or perform response actions. The rule also includes recordkeeping requirements. Local education agencies may contractually delegate their duties under this rule, but they remain responsible for the proper performance of those duties. Local education agencies are encouraged to consult with EPA Regional Asbestos Coordinators, or if applicable, a State’s lead agency designated by the State Governor, for assistance in complying with this rule.

(b) Local education agencies must provide for the transportation and disposal of asbestos in accordance with EPA’s “Asbestos Waste Management Guidance.” For convenience, applicable sections of this guidance are reprinted as Appendix D of this subpart. There are regulations in place, however, that affect transportation and disposal of asbestos waste generated by this rule. The transportation of asbestos waste is covered by the Department of Transportation (49 CFR Part 173, Subpart J) and disposal is covered by the National Emissions Standards for Hazardous Air Pollutants (NESHAP) (40 CFR Part 61, Subpart M).

§ 763.83 Definitions.

For purposes of this subpart:

“Air erosion” means the passage of air over friable ACM which may result in the release of asbestos fibers.

“Asbestos” means the asbestiform varieties of serpentine, amphibole, and their hydrated derivatives:

(1) serpentine:

(a) chrysotile (serpentine);

(b) crocidolite (riebeckite);

(c) amosite (ami
erite);

(d) anthophyllite;

(e) tremolite; and
tactinolite.

“Asbestos-containing material” (ACM) when referring to school buildings means any material or product which contains more than 1 percent asbestos.

“Asbestos-containing building material” (ACBM) means surfacing ACM, thermal system insulation ACM, or miscellaneous ACM that is found in or on interior structural members or other parts of a school building.

“Asbestos debris” means pieces of ACBM that can be identified by color, texture, or composition, or means dust, if the dust is determined by an accredited inspector to be ACM.

“Damaged friable miscellaneous ACM” means 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, cracks, gouges, spalls or other signs of physical injury on the ACM. Asbestos debris originating from the ACBM in question may also indicate damage.

"Damaged friable surfacing ACM" means friable surfacing ACM which has deteriorated or sustained physical injury such that the internal structure (cohesion) of the 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 repeated water stains, cracks, gouges, spalls or other signs of physical injury on the ACM. Asbestos debris originating from the ACBM in question may also indicate damage.

"Damaged or significantly damaged thermal system insulation ACM" means 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 ACBM in question may also indicate damage.

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

"Enclosure" means an airtight, impermeable, permanent barrier around ACBM to prevent the release of asbestos fibers into the air.

"Fiber release episode" means any uncontrolled or unintentional disturbance of ACBM resulting in visible emission

"Friable" when referring to material in a school building means that the material, 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.

"Functional space" means 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), such as classroom(s), a cafeteria, gymnasium, hallway(s), designated by a person accredited to prepare management plans, design abatement projects, or conduct response actions.

"High-efficiency particulate air" (HEPA) refers to a filtering system capable of trapping and retaining at least 99.97 percent of all monodispersed particles 0.3 μm in diameter or larger.

"Homogeneous area" means an area of surfacing material, thermal system insulation material, or miscellaneous material that is uniform in color and texture.

"Local education agency" means:

(1) Any local educational agency as defined in section 198 of the Elementary and Secondary Education Act of 1965 (20 U.S.C. 2801 et seq.).

(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.).

"Miscellaneous ACM" means miscellaneous material that is ACM in a school building.

"Miscellaneous material" means 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.

"Nonfriable" means material in a school building which when dry may not be crumbled, pulverized, or reduced to powder by hand pressure.

"Operations and maintenance program" means a program of work practices to maintain friable ACBM in good condition, ensure clean up of asbestos fibers previously released, and prevent further release by minimizing and controlling friable ACBM disturbance or damage.

"Potential damage" means circumstances in which:

(1) Friable ACBM is in an area regularly used by building occupants, including maintenance personnel, in the course of their normal activities.

(2) 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" means circumstances in which:

(1) Friable ACBM is in an area regularly used by building occupants, including maintenance personnel.

(2) There are indications that there is a reasonable likelihood that the material or its covering will become significantly 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.

(3) The material is subject to major or continuing disturbance, due to factors including, but not limited to, accessibility or, under certain circumstances, vibration or air erosion.

"Preventive measures" means actions taken to reduce disturbance of ACBM or otherwise eliminate the reasonable likelihood of the material's becoming damaged or significantly damaged.

"Removal" means the taking out or the stripping of substantially all ACBM from a damaged area, a functional space, or a homogeneous area in a school building.

"Repair" means returning damaged ACBM to an undamaged condition or to an intact state so as to prevent fiber release.

"Response action" means a method, including removal, encapsulation, enclosure, repair, operations and maintenance, that protects human health and the environment from friable ACBM.

"Routine maintenance area" means 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.


"School building" means:

(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.

"Significantly damaged friable miscellaneous ACM" means damaged friable miscellaneous ACM where the damage is extensive and severe.

"Significantly damaged friable surfacing ACM" means damaged friable surfacing ACM in a functional space where the damage is extensive and severe.

"State" means a State, the District of Columbia, the Commonwealth of Puerto Rico, Guam, American Samoa, the Northern Marianas, the Trust Territory of the Pacific Islands, and the Virgin Islands.

"Surfacing ACM" means surfacing material that is ACM.

"Surfacing material" means material in a school building that is sprayed-on, troweled-on, or otherwise applied to surfaces, such as acoustical plaster on ceilings and fireproofing materials on structural members, or other materials on surfaces for acoustical, fireproofing, or other purposes.

"Thermal system insulation" means material in a school building 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" means thermal system insulation that is ACM.

"Vibration" means the periodic motion of friable ACBM which may result in the release of asbestos fibers.

§ 763.84 General local education agency responsibilities.

Each local education agency shall:

(a) Ensure that the activities of any persons who perform inspections, reinspections, and periodic surveillance, develop and update management plans, and develop and implement response actions, including operations and maintenance, are carried out in accordance with Subpart E of this part.

(b) Ensure that all custodial and maintenance employees are properly trained as required by this Subpart E and other applicable Federal and/or State regulations (e.g., the Occupational Safety and Health Administration asbestos standard for construction, the EPA worker protection rule, or applicable State regulations).

(c) Ensure that workers and building occupants, or their legal guardians, are informed at least once each school year about inspections, response actions, and post-response action activities, including periodic reinspections and surveillance activities that are planned or in progress.

(d) Ensure that short-term workers (e.g., telephone repair workers, utility workers, or exterminators) who may come in contact with asbestos in a school are provided information regarding the locations of ACM and suspected ACM assumed to be ACM.

(e) Ensure that warning labels are posted in accordance with § 763.35.

(f) Ensure that management plans are available for inspection and notification of such availability has been provided as specified in the management plan under § 763.93(g).

(g)(1) Designate a person to ensure that requirements under this section are properly implemented.

(2) Ensure that the designated person receives adequate training to perform duties assigned under this section. Such training shall provide, as necessary, basic knowledge of:

(i) Health effects of asbestos.

(ii) Detection, identification, and assessment of ACM.

(iii) Options for controlling ACBM.

(iv) Asbestos management programs.

(v) Relevant Federal and State regulations concerning asbestos, including those in this Subpart E and those of the Occupational Safety and Health Administration, U.S. Department of Labor, the U.S. Department of Transportation and the U.S. Environmental Protection Agency.

(h) Consider whether any conflict of interest may arise from the interrelationship among accredited personnel and whether that should influence the selection of accredited personnel to perform activities under this subpart.

§ 763.85 Inspection and reinspections.

(a) Inspection. (1) Except as provided in paragraph (a)(2) of this section, before October 12, 1988, local education agencies shall inspect each school building that they lease, own, or otherwise use as a school building to identify all locations of friable and nonfriable ACM.

(2) Any building leased or acquired on or after October 12, 1988, that is to be used as a school building shall be inspected as described under paragraphs (a)(3) and (4) of this section prior to use as a school building. In the event that emergency use of an uninspected building as a school building is necessitated, such buildings shall be "inspected within 90 days after commencement of such use.

(3) Each inspection shall be made by an accredited inspector.

(4) For each area of a school building, except as excluded under § 763.59, each person performing an inspection shall:

(i) Visually inspect the area to identify the locations of all suspected ACBM.

(ii) Touch all suspected ACBM to determine whether they are friable.

(iii) Identify all homogeneous areas of friable suspected ACBM and all homogeneous areas of nonfriable suspected ACBM.

(iv) Assume that some or all of the homogeneous areas are ACM, and, for each homogeneous area that is not assumed to be ACM, collect and submit for analysis bulk samples under §§ 763.86 and 763.87.

(v) Assess, under § 763.88, friable material in areas where samples are collected, friable material in areas that are assumed to be ACM, and friable ACBM identified during a previous inspection.

(vi) Record the following and submit to the person designated under § 763.84 a copy of such record for inclusion in the management plan within 30 days of the inspection:

(A) An inspection report with the date of the inspection signed by each accredited person making the inspection. State of accreditation, and, if applicable, his or her accreditation number.

(B) An inventory of the locations of the homogeneous areas where samples are collected, exact location where each bulk sample is collected, dates that samples are collected, homogeneous areas where friable suspected ACBM is assumed to be ACM, and homogeneous areas where nonfriable suspected ACBM is assumed to be ACM.

(C) A description of the manner used to determine sampling locations, the name and signature of each accredited inspector who collected the samples, State of accreditation, and, if applicable, his or her accreditation number.

(D) A list of whether the homogeneous areas identified under paragraph (a)(1)(iii) of this section are surfacing material, thermal system insulation, or miscellaneous material.

(E) Assessments made of friable material, the name and signature of each accredited inspector making the
assessment, State of accreditation, and if applicable, his or her accreditation number.

(b) Reinspection: (1) At least once every 3 years after a management plan is in effect, each local education agency shall conduct a reinspection of all friable and nonfriable known or assumed ACM in each school building that they lease, own, or otherwise use as a school building.

(2) Each inspection shall be made by an accredited inspector.

(3) For each area of a school building, each person performing a reinspection shall:

(i) Visually reinspect, and reassess, under § 763.88, the condition of all friable known or assumed ACM.

(ii) Visually inspect material that was previously considered nonfriable ACM and touch the material to determine whether it has become friable since the last inspection or reinspection.

(iii) Identify any homogeneous area with material that has become friable since the last inspection or reinspection.

(iv) For each homogeneous area of newly friable material that is already assumed to be ACM, bulk samples may be collected and submitted for analysis in accordance with §§ 763.86 and 763.87.

(v) Assess, under § 763.88, the condition of the newly friable material in areas where samples are collected, and newly friable materials in areas that are assumed to be ACM.

(vi) Reassess, under § 763.88, the condition of friable known or assumed ACM previously identified.

(vii) Record the following and submit to the person designated under § 763.84 for inclusion in the management plan within 30 days of the reinspection:

(A) The date of the reinspection, the name and signature of the person making the reinspection, State of accreditation, and if applicable, his or her accreditation number, and any changes in the condition of known or assumed ACM.

(B) The exact locations where samples are collected during the reinspection, a description of the manner used to determine sampling locations, the name and signature of each accredited inspector who collected the samples, State of accreditation, and, if applicable, his or her accreditation number.

(C) Any assessments or reassessments made of friable material, the name and signature of the accredited inspector making the assessments, State of accreditation, and if applicable, his or her accreditation number.

(D) General. Thermal system insulation that has retained its structural integrity and that has an undamaged protective jacket or wrap that prevents fiber release shall be treated as nonfriable and therefore is subject only to periodic surveillance and preventive measures as necessary.

§ 763.86 Sampling.

(a) Surfacting material. An accredited inspector shall collect, in a statistically random manner that is representative of the homogeneous area, bulk samples from each homogeneous area of friable surfacing material that is not assumed to be ACM, and shall collect the samples as follows:

(1) At least three bulk samples shall be collected from each homogeneous area that is 1,000 ft² or less, except as provided in § 763.87(c)(2).

(2) At least five bulk samples shall be collected from each homogeneous area that is greater than 1,000 ft² but less than or equal to 5,000 ft², except as provided in § 763.87(c)(2).

(3) At least seven bulk samples shall be collected from each homogeneous area that is greater than 5,000 ft², except as provided in § 763.87(c)(2).

(b) Thermal system insulation. (1) Except as provided in paragraphs (b)(2) through (4) of this section and as provided in § 763.87(c), an accredited inspector shall collect, in a randomly distributed manner, at least three bulk samples from each homogeneous area of thermal system insulation that is not assumed to be ACM.

(2) Collect at least one bulk sample from each homogeneous area of patches of thermal system insulation that is not assumed to be ACM if the patched section is less than 6 linear or square feet.

(3) In a manner sufficient to determine whether the material is ACM or not ACM, collect bulk samples from each insulated mechanical system that is not assumed to be ACM where cement or plaster is used on fittings such as tees, elbows, or valves, except as provided under § 763.67(c)(2).

(4) Bulk samples are not required to be collected from any homogeneous area where the accredited inspector has determined that the thermal system insulation is fiberglass, foam glass, rubber, or other non-ACBM.

(c) Miscellaneous material. In a manner sufficient to determine whether material is ACM or not ACM, an accredited inspector shall collect bulk samples from each homogeneous area of friable miscellaneous material that is not assumed to be ACM.

§ 763.87 Analysis.

(e) Local education agencies shall have bulk samples collected under § 763.86 and submitted for analysis, analyzed for asbestos using laboratories accredited by the National Bureau of Standards (NBS). Local education agencies shall use laboratories which have received interim accreditation for polarized light microscopy (PLM) analysis under the EPA Interim Asbestos Bulk Sample Analysis Quality Assurance Program until the NBS PLM laboratory accreditation program for PLM is operational.

(b) Bulk samples shall not be composited for analysis and shall be analyzed for asbestos content by PLM, using the "Interim Method for the Determination of Asbestos in Bulk Insulation Samples" found at Appendix A to Subpart F in 40 CFR Part 763.

(c)(1) A homogeneous area is considered not to contain ACM only if the results of all samples required to be collected from the area show asbestos in amounts of 1 percent or less.

(2) A homogeneous area shall be determined to contain ACM based on a finding that the results of at least one sample collected from the area shows that asbestos is present in an amount greater than 1 percent.

(d) The name and address of each laboratory performing an analysis, the date of analysis, and the name and signature of the person performing the analysis shall be submitted to the person designated under § 763.84 for inclusion into the management plan within 30 days of the analysis.

§ 763.88 Assessment.

(a)(1) For each inspection and reinspection conducted under § 763.85 and (c) and (d) and previous inspections specified under § 763.88, the local education agency shall have an accredited inspector provide a written assessment of all friable known or assumed ACM in the school building.

(2) Each accredited inspector providing a written assessment shall sign and date the assessment, provide his or her State of accreditation, and if applicable, accreditation number, and submit a copy of the assessment to the person designated under § 763.84 for inclusion in the management plan within 30 days of the assessment.
(b) The inspector shall classify and give reasons in the written assessment for classifying the ACBM and suspect ACM assumed to be ACM in the school building into one of the following categories:

1. Damaged or significantly damaged thermal system insulation ACM.
2. Damaged friable surfacing ACM.
3. Significantly damaged friable surfacing ACM.
4. Damaged or significantly damaged friable miscellaneous ACM.
5. ACM with potential for damage.
6. ACM with potential for significant damage.
7. Any remaining friable ACBM or friable suspected ACBM.

(c) Assessment may include the following considerations:

1. Location and the amount of the material, both in total quantity and as a percentage of the functional space.
2. Condition of the material, specifying:
   i. Type of damage or significant damage (e.g., flaking, blistering, water damage, or other signs of physical damage).
   ii. Extent of damage (e.g., major flaking, severely torn jackets, as opposed to occasional flaking, minor tears to jackets).
   iii. Extent or spread of damage over large areas or large percentages of the homogeneous area.
   iv. Whether the material is accessible.
3. The material’s potential for disturbance.
4. Known or suspected causes of damage or significant damage (e.g., air erosion, vandalism, vibration, water).
5. Preventive measures which might eliminate the reasonable likelihood of undamaged ACM from becoming significantly damaged.

(d) The local education agency shall select a person accredited to develop management plans to review the results of each inspection, reinspection, and maintenance of each functional space. The person designated by the local education agency shall:

1. Immediately isolate the functional space and restrict access, unless isolation is not necessary to protect human health and the environment.
2. Remove the material in the functional space or, depending upon whether isolation or encapsulation would be sufficient to protect human health and the environment, enclose or encapsulate.
3. If any friable surfacing ACM, thermal system insulation ACM, or friable miscellaneous ACM that has potential for significant damage is present in a building or structure, the local education agency shall:
   i. Implement an O&M program, as described under § 763.91.
   ii. Conduct periodic maintenance, and repair of the damaged material.
   iii. If any friable surfacing ACM, thermal system insulation ACM, or friable miscellaneous ACM that has potential for significant damage is present in a building, the local education agency shall:
      i. Remove and replace the ACM.
      ii. Conduct periodic maintenance, and repair of the damaged material, as described under § 763.91.

(f) If any friable surfacing ACM, thermal system insulation ACM, or friable miscellaneous ACM that has potential for significant damage is present in a building, the local education agency shall:

1. Implement an O&M program, as described under § 763.91.
2. Conduct periodic maintenance, and repair of the damaged material.
3. If any friable surfacing ACM, thermal system insulation ACM, or friable miscellaneous ACM that has potential for significant damage is present in a building, the local education agency shall:
   i. Remove and replace the ACM.
   ii. Conduct periodic maintenance, and repair of the damaged material, as described under § 763.91.

(h) The requirements of this Subpart E in no way supersede the worker protection and work practice requirements under 29 CFR 1926.110(c)(1) (Occupational Safety and Health Administration (OSHA) asbestos worker protection standards for construction), 30 CFR Part 763, Subpart G (EPA asbestos worker protection standards for public employees), and 40 CFR Part 61, Subpart M (National Emission Standards for Hazardous Air Pollutants—Asbestos).

(i) Completion of response actions. (1) At the conclusion of any action to remove, encapsulate, or enclose ACBM or material assumed to be ACM, the person designated by the local education agency shall visually inspect each functional space where such action was conducted to determine whether the action has been properly completed.

(2)(i) A person designated by the local education agency shall conduct the local education agency shall conduct the following:

   1. Air samples using appropriate sampling as described in Appendix A to this Subpart E to monitor air for clearance after each removal, encapsulation, and enclosure project involving ACBM, except for projects that are of small-scale, short-duration.

   2. Local education agencies shall conduct such analysis using transmission electron microscopy (TEM) or, under circumstances permitted in this section,
laboratories enrolled in the American Industrial Hygiene Association Proficiency Analytical Testing Program for phase contrast microscopy (PCM).

(iii) Until the National Bureau of Standards TEM laboratory accreditation program is operational, local educational agencies shall use laboratories that use the protocol described in Appendix A to Subpart E of this part.

(3) Except as provided in paragraphs (i) (4), (5), (6), or (7) of this section, an action to remove, encapsulate, or enclose ACBM shall be considered complete when the average concentration of asbestos of five air samples collected within the affected functional space and analyzed by the TEM method in Appendix A of this Subpart E, is not statistically significantly different, as determined by the Z-test calculation found in Appendix A of this Subpart E, from the average concentration of asbestos of five air samples collected at the same time outside the affected functional space and analyzed in the same manner, and the average asbestos concentration of the three field blanks described in Appendix A of this Subpart E is below the filter background level, as defined in Appendix A of this Subpart E, of 70 structures per square millimeter (70 s/mm²).

(4) An action may also be considered complete if the volume of air drawn for each of the five samples collected within the affected functional space is equal to or greater than 1,199 L of air for a 25 mm filter or equal to or greater than 2,799 L of air for a 37 mm filter, and the average concentration of asbestos as analyzed by the TEM method in Appendix A of this Subpart E, for the five air samples does not exceed the filter background level, and the average asbestos concentration of the three field blanks described in Appendix A of this Subpart E, is below the filter background level, as defined in Appendix A of this Subpart E, of 70 structures per square millimeter (70 s/mm²). If the average concentration of asbestos of the five air samples within the affected functional space exceeds 70 s/mm², or if the volume of air in each of the samples is less than 1,199 L of air for a 25 mm filter or less than 2,799 L of air for a 37 mm filter, the action shall be considered complete only when the requirements of paragraph (i) (2), (5), (6), or (7) of this section are met.

(5) At any time, a local education agency may analyze air monitoring samples collected for clearance purposes by phase contrast microscopy (PCM) to confirm completion of removal, encapsulation, or enclosure of ACBM that is greater than small-scale, short-duration and less than or equal to 100 square feet or 260 linear feet. The action shall be considered complete when the results of samples collected in the affected functional space and analyzed by phase contrast microscopy using the National Institute for Occupational Safety and Health (NIOSH) Method 7400 entitled "Fibers" published in the NIOSH Manual of Analytical Methods. 3rd Edition, Second Supplement, August 1987, show that the concentration of fibers for each of the five samples is less than or equal to a limit of quantitation for PCM (0.01 fibers per cubic centimeter) of air. The method is available at the Office of the Federal Register Information Center, 11th and L St., NW., Room 4401, Washington, DC, 20408, and at the EPA OPTS Reading Room, Rm. G004 Northeast Mall, 401 M St., SW., Washington, DC 20490. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552 (a) and 1 CFR Part 51. The method is incorporated as it exists on the effective date of this rule, and a notice of any change to the method will be published in the Federal Register.

(6) Until October 7, 1989, a local education agency may analyze air monitoring samples collected for clearance purposes by PCM to confirm completion of removal, encapsulation, or enclosure of ACBM that is less than or equal to 3,000 square feet or 1,000 linear feet. The action shall be considered complete when the results of samples collected in the affected functional space and analyzed by PCM using the NIOSH Method 7400 entitled "Fibers" published in the NIOSH Manual of Analytical Methods, 3rd Edition, Second Supplement, August 1987, show that the concentration of fibers for each of the five samples is less than or equal to a limit quantitation for PCM (0.01 fibers per cubic centimeter, 0.01 f/cm²). The method is available at the Office of the Federal Register, 11th and L St., NW., Room 8401, Washington, DC, 20408, and in the EPA OPTS Reading Room, Rm. G004 Northeast Mall, 401 M St., SW., Washington, DC 20490. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR Part 51. The method is incorporated as it exists on the effective date of this rule and a notice of any change to the method will be published in the Federal Register.

(8) To determine the amount of ACBM affected under paragraphs (i) (5), (6), and (7) of this section, the local education agency shall add the total square or linear footage of ACBM within the containment barriers to state the functional space for the action to remove, encapsulate, or enclose the ACBM. Contiguous portions of material subject to such action conducted concurrently or at approximately the same time within the same school building shall not be separated to qualify under paragraphs (i) (5), (6), or (7) of this section.

§ 763.91 Operations and maintenance.

(a) Applicability. The local education agency shall implement an operations, maintenance, and repair (O&M) program under this section whenever any friable ACBM is present or assumed to be present in a building that it leases, owns, or otherwise uses as a school building. Any material identified as nonfriable ACBM or nonfriable assumed ACBM must be treated as friable ACBM for purposes of this section when the material is about to become friable as a result of activities performed in the school building.

(b) Worker protection. The protection provided by EPA at 40 CFR 763.121 for worker protection during asbestos abatement projects is extended to employees of local education agencies who perform operations, maintenance, and repair (O&M) activities involving ACM and who are not covered by the OSHA asbestos construction standard at 29 CFR 1828.58 or an asbestos worker approved by OSHA under section 19 of the Occupational Safety and Health Act. Local education agencies may consult...
Appendix B of this Subpart if their employees are performing operations, maintenance, and repair activities that are of small-scale, short-duration.

(c) Cleaning. Unless the building has been cleaned using equivalent methods within the previous 6 months, all areas of a school building where friable ACM, damaged or significantly damaged thermal system insulation ACM, or friable suspected ACM assumed to be ACM are present shall be cleaned at least once after the completion of the inspection required by § 763.85(a) and before the initiation of any response action, other than O&M activities or repair, according to the following procedures:

(i) HEPA-vacuum or steam-clean all carpets.

(ii) HEPA-vacuum or wet-clean all other floors and all other horizontal surfaces.

(iii) Dispose of all debris, filters, mopheads, and cloths in sealed, leak-tight containers.

(2) Additional cleaning. The accredited management plan shall make a written recommendation to the local education agency whether additional cleaning is needed, and if so, the methods and frequency of such cleaning.

(c) Operations and maintenance activities. The local education agency shall ensure that the procedures described below to protect building occupants shall be followed for any operations and maintenance activities disturbing friable ACM:

(1) Restrict entry into the area by persons other than those necessary to perform the maintenance project, either by physically isolating the area or by scheduling;

(ii) Post signs to prevent entry by unauthorized persons.

(iii) Shut off or temporarily modify the air-handling system to prevent the distribution of fibers to other areas in the building.

(iv) The response action for any major fiber release episode must be designed by persons accredited to design response actions and conducted by persons accredited to conduct response actions.

(i) Fiber release episodes—(1) Minor fiber release episode. The local education agency shall ensure that the procedures described below are followed in the event of a minor fiber release episode (i.e., the falling or dislodging of 3 square or linear feet or less of friable ACM):

(ii) Thoroughly saturate the debris using wet methods.

(iii) Place the clean area, as described in paragraph (e) of this section.

(iv) Repair the area of damaged ACM with materials such as asbestos-free spackling, plaster, cement, or insulation, or seal with latex paint or an encapsulant, or immediately have the appropriate response action implemented as required by § 783.90.

(ii) Major fiber release episode. The local education agency shall ensure that the procedures described below are followed in the event of a major fiber release episode (i.e., the falling or dislodging of more than 3 square or linear feet of friable ACM):

(i) Restrict entry into the area and post signs to prevent entry into the area by persons other than those necessary to perform the response action.

(ii) Shut off or temporarily modify the air-handling system to prevent the distribution of fibers to other areas in the building.

(iii) The response action for any major fiber release episode must be designed by persons accredited to design response actions and conducted by persons accredited to conduct response actions.

§ 763.92 Training and periodic surveillance.

(a) Training. (1) The local education agency shall ensure, prior to the implementation of the O&M provisions of the management plan, that all members of its maintenance and custodial staff (custodians, electricians, heating/air conditioning engineers, plumbers, etc.) who may work in a building that contains ACM receive awareness training of at least 2 hours, whether or not they are required to work with ACM. New custodial and maintenance employees shall be trained within 60 days after commencement of employment. Training shall include, but not be limited to:

(i) Information regarding asbestos and its various uses and forms;

(ii) Information on the health effects associated with asbestos exposure.
§ 763.93 Management plans.

(a)(1) On or before October 12, 1988, each local education agency shall develop an asbestos management plan for each school, including all buildings on the site, that are leased by or otherwise acquired after October 17, 1987, the local education agency shall include the new building in the management plan for the school prior to its use as a school building. The revised portions of the management plan shall be submitted to the Agency designated by the Governor.

(b) On or before October 17, 1987, the Governor of each State shall notify local education agencies in the State regarding where to submit their management plans. States may establish administrative procedures for reviewing management plans. If the Governor does not disapprove a management plan within 90 days after receipt of the plan, the local education agency shall implement the plan.

(c) Each local education agency shall maintain and update its management plan to keep it current with ongoing operations and maintenance, periodic surveillance, inspection, reinspection, and response, action activities. All provisions required to be included in the management plan under this section shall be retained as part of the management plan, as well as any information that has been revised to bring the plan up-to-date.

(d) Each local education agency shall develop an accredited management planner and shall include:

1. A list of the name and address of each school building and whether the school building contains friable ACM, nonfriable ACM, and friable and nonfriable suspected ACM assumed to be ACM.
2. For each inspection conducted before the December 14, 1987:
   i. The date of the inspection.
   ii. A blueprint, diagram, or written description of each school building that identifies clearly each location and approximate square or linear footage of any homogenous or sampling area where material was sampled for ACM, and, if possible, the exact locations where bulk samples were collected, and the dates of collection.
   iii. A copy of the analyses of any bulk samples, dates of analyses, and a copy of any other laboratory reports pertaining to the analyses.
   iv. A description of any response actions or preventive measures taken to reduce asbestos exposure, including, if possible, the names and addresses of all contractors involved, start and completion dates of the work, and results of any air samples analyzed during and upon completion of the work.
   v. A description of assessments, required to be made under § 763.88, of material that was identified before December 14, 1987, as friable ACM or friable suspected ACM assumed to be ACM, and if applicable, the accreditation number of each approved inspector performing the inspection or reinspection.
   vi. A description of assessments, required to be made under § 763.88, of nonfriable suspected ACM assumed to be ACM, and if applicable, the accreditation number of each accredited inspector performing the inspection or reinspection.
   vii. A description of the manner used to determine sampling locations, and the name and signature of each accredited inspector collecting samples, the State of accreditation and, if applicable, the accreditation number.
   viii. A description of the locations where such measures and action will be taken, reasons for selecting the response action or preventive measure, and a schedule for beginning and completing each preventive measure and response action.
   ix. A plan for reinspection under § 763.85, a plan for operations and maintenance, with respect to the ACM, one of the following statements:
      i. If the State has adopted a contractor accreditation program under section 206(b) of Title II of the Act, a statement that the person(s) is accredited under such plan.
      ii. A statement that the local education agency used (or will use) persons who have been accredited by another State which has adopted a contractor accreditation plan under section 206(b) of Title II of the Act or is accredited by an EPA-approved course under section 206(c) of Title II of the Act.
   x. A detailed description of preventive measures and response actions to be taken, including methods to be used, for any friable ACM, the locations where such measures and action will be taken, reasons for selecting the response action or preventive measure, and a schedule for beginning and completing each preventive measure and response action.
   xi. A plan for reinspection under § 763.85, a plan for operations and maintenance, with respect to the ACM, that the laboratory meets the applicable requirements of § 763.27(a) the date of analysis, and the name and signature of the person performing the analysis.
   xii. A description of assessments, required to be made under § 763.88, of all ACM and suspected ACM assumed to be ACM, the name, signature, State of accreditation, and, if applicable, accreditation number of each accredited person making the assessments.
   xiii. The name, address, and telephone number of the person designated under § 763.84 to ensure that the duties of the local education agency are carried out, and the person making the recommendations, and if applicable, his or her accreditation number.
   xiv. A detailed description of preventive measures and response actions to be taken, including methods to be used, for any friable ACM, the locations where such measures and action will be taken, reasons for selecting the response action or preventive measure, and a schedule for beginning and completing each preventive measure and response action.
   xv. A plan for reinspection under § 763.85, a plan for operations and maintenance, with respect to the ACM, that the laboratory meets the applicable requirements of § 763.27(a) the date of analysis, and the name and signature of the person performing the analysis.
   xvi. A description of assessments, required to be made under § 763.88, of all ACM and suspected ACM assumed to be ACM, the name, signature, State of accreditation, and, if applicable, accreditation number of each accredited person making the assessments.
   xvii. The name, address, and telephone number of the person designated under § 763.84 to ensure that the duties of the local education agency are carried out, and the person making the recommendations, and if applicable, his or her accreditation number.
   xviii. A detailed description of preventive measures and response actions to be taken, including methods to be used, for any friable ACM, the locations where such measures and action will be taken, reasons for selecting the response action or preventive measure, and a schedule for beginning and completing each preventive measure and response action.

(2) If a building to be used as part of a school is leased or otherwise acquired after October 12, 1988, the local education agency shall submit a management plan to the Agency designated by the Governor. The local education agency shall submit a management plan to the Agency designated by the Governor. The plan may be submitted in stages that cover a portion of the school buildings that are currently used as a school building. The revised portions of the management plan shall be submitted to the Agency designated by the Governor.

(3) If a local education agency begins to use a building as a school after October 12, 1988, the local education agency shall submit a management plan for the school to the Agency designated by the Governor prior to its use as a school building. The revised portions of the management plan shall be submitted to the Agency designated by the Governor.

(4) If the State has adopted a contractor accreditation program under section 206(b) of Title II of the Act, a statement that the person(s) is accredited under such plan.

(5) A detailed description of preventive measures and response actions to be taken, including methods to be used, for any friable ACM, the locations where such measures and action will be taken, reasons for selecting the response action or preventive measure, and a schedule for beginning and completing each preventive measure and response action.

(6) A detailed description of preventive measures and response actions to be taken, including methods to be used, for any friable ACM, the locations where such measures and action will be taken, reasons for selecting the response action or preventive measure, and a schedule for beginning and completing each preventive measure and response action.

(7) With respect to the person or persons who inspected for ACM and who will design or carry out response actions, except for operations and maintenance, with respect to the ACM, one of the following statements:

(i) If the State has adopted a contractor accreditation program under section 206(b) of Title II of the Act, a statement that the person(s) is accredited under such plan.

(ii) A statement that the local education agency used (or will use) persons who have been accredited by another State which has adopted a contractor accreditation plan under section 206(b) of Title II of the Act or is accredited by an EPA-approved course under section 206(c) of Title II of the Act.

(iii) A detailed description in the form of a blueprint, diagram, or in writing of any ACM or suspected ACM assumed to be ACM which remains in the school once response actions are undertaken pursuant to § 763.80. This description shall be updated as response actions are completed.

(iv) A plan for reinspection under § 763.85, a plan for operations and maintenance activities under § 763.91, that the laboratory meets the applicable requirements of § 763.27(a) the date of analysis, and the name and signature of the person performing the analysis.

(v) A description of assessments, required to be made under § 763.88, of all ACM and suspected ACM assumed to be ACM, the name, signature, State of accreditation, and, if applicable, accreditation number of each accredited person making the assessments.

(vi) The name, address, and telephone number of the person designated under § 763.84 to ensure that the duties of the local education agency are carried out, and the person making the recommendations, and if applicable, his or her accreditation number.

(vii) A detailed description of preventive measures and response actions to be taken, including methods to be used, for any friable ACM, the locations where such measures and action will be taken, reasons for selecting the response action or preventive measure, and a schedule for beginning and completing each preventive measure and response action.

(viii) A plan for reinspection under § 763.85, a plan for operations and maintenance activities under § 763.91, that the laboratory meets the applicable requirements of § 763.27(a) the date of analysis, and the name and signature of the person performing the analysis.

(ix) A description of assessments, required to be made under § 763.88, of all ACM and suspected ACM assumed to be ACM, the name, signature, State of accreditation, and, if applicable, accreditation number of each accredited person making the assessments.

(x) The name, address, and telephone number of the person designated under § 763.84 to ensure that the duties of the local education agency are carried out, and the person making the recommendations, and if applicable, his or her accreditation number.
and a plan for periodic surveillance under § 763.92, a description of the recommendation made by the management planner regarding additional cleaning under § 763.91(c)(2) as part of an operations and maintenance program, and the response of the local education agency to that recommendation.

(10) A description of steps taken to inform workers and building occupants, or their legal guardians, about inspections, re-inspections, response actions, and post-response action activities, including periodic reinspection and surveillance activities that are planned or in progress.

(11) An evaluation of the resources needed to complete response actions successfully and carry out reinspection, operations and maintenance activities, periodic surveillance and training.

(12) With respect to each consultant who contributed to the management plan, the name of the consultant and one of the following statements:

(i) If the State has adopted a contractor accreditation plan under section 206(b) of Title II of the Act, a statement that the consultant is accredited under such plan.

(ii) A statement that the contractor is accredited by another State which has adopted a contractor accreditation plan under section 206(b) of Title II of the Act, or is accredited by an EPA-approved course developed under section 206(c) of Title II of the Act.

(i) A local education agency may require each management plan to contain a statement signed by an accredited management plan developer that such person has prepared or assisted in the preparation of such plan or has reviewed such plan, and that such plan is in compliance with this Subpart E. Such statement may not be signed by a person who, in addition to preparing or assisting in preparing the management plan, also implements (or will implement) the management plan.

(g) (1) Upon submission of a management plan to the Governor for review, a local education agency shall keep a copy of the plan in its administrative office. The management plans shall be available, without cost or restriction, for inspection by representatives of EPA and the State, the public, including teachers, other school personnel and their representatives, and parents. The local education agency may charge a reasonable cost to make copies of management plans.

(2) Each local education agency shall maintain in its administrative office a complete, updated copy of a management plan for each school under its administrative control or direction. The management plans shall be available, during normal business hours, without cost or restriction, for inspection by representatives of EPA and the State, the public, including teachers, other school personnel and their representatives, and parents. The local education agency may charge a reasonable cost to make copies of management plans.

(3) Each school shall maintain in its administrative office a complete, updated copy of the management plan for that school. Management plans shall be available for inspection, without cost or restriction, to workers before work begins in any area of a school building. The school shall make management plans available for inspection to representatives of EPA and the State, the public, including parents, teachers, and other school personnel and their representatives within 5 working days after receipt of a request for inspection. The school may charge a reasonable cost to make copies of management plans.

(4) Upon submission of its management plan to the Governor and at least once each school year, the local education agency shall notify in writing parent, teacher, and employee organizations of the availability of management plans and shall include in the management plan a description of the steps taken to notify such organizations, and a dated copy of the notice. In the absence of any such organizations for parents, teachers, or employees, the local education agency shall provide written notice to the general, relevant group of the availability of management plans: and shall include in the management plan a description of the steps taken to notify such groups, and a dated copy of the notification.

(h) Records required under § 763.94 shall be made by local education agencies and maintained as part of the management plan.

(i) Each management plan must contain a true and correct statement, signed by the individual designated by the local education agency under § 763.94, which certifies that the general, local education agency responsibilities, as stipulated by § 763.84, have been met or will be met.

§ 763.94 Recordkeeping.

(a) Records required under this section shall be maintained in a centralized location in the administrative office of both the school and the local education agency as part of the management plan. For each homogeneous area where all ACM has been removed, the local education agency shall ensure that such records are retained for 3 years after the next reinspection required under § 763.85(b)(1), or for an equivalent period.

(b) For each preventive measure and response action taken for friable and nonfriable ACM and friable and nonfriable suspected ACM assumed to be ACM, the local education agency shall provide:

(1) A detailed written description of the measure or action, including methods used, the location where the measure or action was taken, reasons for selecting the measure or action, start and completion dates of the work, names and addresses of all contractors involved, and if applicable, their State of accreditation, and accreditation numbers, and if ACM is removed, the name and location of storage or disposal site of the ACM.

(2) The name and signature of any person collecting any air sample required to be collected at the completion of certain response actions specified by § 763.90(i), the locations where samples were collected, date of collection, the name and address of the laboratory analyzing the samples, the date of analysis, the results of the analysis, the method of analysis, the name and signature of the person performing the analysis, and a statement that the laboratory meets the applicable requirements of § 763.90(j)(1)(ii).

(c) For each person required to be trained under § 763.92(a)(1) and (2), the local education agency shall provide the person's name and job title, the date that training was completed by that person, the location of the training, and the number of hours completed in such training.

(d) For each time that periodic surveillance under § 763.92(b) is performed, the local education agency shall record the name of each person performing the surveillance, the date of the surveillance, and any changes in the conditions of the materials.

(e) For each time that cleaning under § 763.91(c) is performed, the local education agency shall record the name of each person performing the cleaning, the date of such cleaning, the location cleaned, and the methods used to perform such cleaning.

(f) For each time that operations and maintenance activities under § 763.81(d) are performed, the local education agency shall record the name of each person performing the activity, the start and completion dates of the activity, the locations where such activity occurred, a description of the activity including preventive measures used, and if ACM
is removed, the name and location of storage or disposal site of the ACM.

(g) For each time that major asbestos activity under § 763.91(e) is performed, the local education agency shall provide the name and signature, State of accreditation, and if applicable, the accreditation number of each person performing the activity, the start and completion dates of the activity, the locations where such activity occurred, a description of the activity including preventive measures used, and if ACM is removed, the name and location of storage or disposal site of the ACM.

(h) For each fiber release episode under § 763.91(f), the local education agency shall provide the date and location of the episode, the method of repair, preventive measures or response action taken, the name of each person performing the work, and if ACM is removed, the name and location of storage or disposal site of the ACM.

(Approved by the Office of Management and Budget under control number 2070-0091)

§ 763.95 Warning labels.
(a) The local education agency shall attach a warning label immediately adjacent to any friable and nonfriable ACBM and suspected ACBM assumed to be ACM located in routine maintenance areas (such as boiler rooms) at each school building. This shall include:
(1) Friable ACBM that was responded to by a means other than removal.
(2) ACM for which no response action was carried out.

(b) All labels shall be prominently displayed in readily visible locations and shall remain posted until the ACM that is labeled is removed.

(c) The warning label shall read, in print which is readily visible because of large size or bright color, as follows: CAUTION: ASBESTOS. HAZARDOUS. DO NOT DISTURB WITHOUT PROPER TRAINING AND EQUIPMENT.

§ 763.97 Compliance and enforcement.
(a) Compliance with Title II of the Act. (1) Section 207(a) of Title II of the Act (15 U.S.C. 2647) makes it unlawful for any local education agency which violates any provision of section 207 shall be liable for a civil penalty of not more than $5,000 for each day during which the violation continues. For the purposes of this subpart, a "violation" means a failure to comply with respect to a single school building.

(b) Compliance with Title I of the Act. (1) Section 1511(d) of Title I of the Act (15 U.S.C. 2614) makes it unlawful for any person to fail or refuse to comply with any requirement of Title I or any rule promulgated or order issued under Title I. Therefore, any person who violates any requirement of this Subpart is in violation of section 15 of Title I of the Act.

(2) Section 153 of Title I of the Act (15 U.S.C. 2614) makes it unlawful for any person to fail or refuse to establish or maintain records, submit reports, notices or other information, or permit access to or copying of records, as required by this Act or a rule thereunder.

(3) Section 154(15 U.S.C. 2614) of Title I of the Act makes it unlawful for any person to fail or refuse to permit entry or inspection as required by sections 11 of Title I of the Act.

(4) Section 18(a) of Title I of the Act (15 U.S.C. 2615) provides that any person who violates any provision of section 15 of Title I of the Act shall be liable to the United States for a civil penalty in an amount not to exceed $25,000 for each such violation. Each day each such violation continues shall, for purposes of this paragraph, constitute a separate violation of section 15. A local education agency is not liable for any civil penalty under Title I of the Act for failing or refusing to comply with any rule promulgated or order issued under Title II of the Act.

(c) Criminal penalties. If any violation committed by any person (including a local education agency) is knowing or willful, criminal penalties may be assessed under section 16(b) of Title I of the Act.

(d) Injunctive relief. The Agency may obtain injunctive relief under section 208(b) of Title II of the Act to prevent or restrain any violation of section 15 of Title I of the Act or to compel the taking of action required by or under Title I of the Act.

(e) Citizen complaints. Any citizen who wishes to file a complaint pursuant to section 207(d) of Title II of the Act should direct the complaint to the Governor of the State or the EPA Asbestos Ombudsman, 401 M Street, SW., Washington, DC 20460. The citizen complaint should be in writing and identified as a citizen complaint pursuant to section 207(d) of Title II of TSCA. The EPA Asbestos Ombudsman or the Governor shall investigate and respond to the complaint within a reasonable period of time if the allegations provide a reasonable basis to believe that a violation of the Act has occurred.

(f) Inspections. EPA may conduct inspections and review management plans under section 11 of Title I of the Act (15 U.S.C. 2610) to ensure compliance.

§ 763.98 Waiver; delegation to State.
(a) General. (1) Upon request from a State Governor and after notice and comment and an opportunity for a public hearing in accordance with paragraphs (b) and (c) of this section, EPA may waive some or all of the requirements of this Subpart E if the State has established and is implementing or intends to implement a program of asbestos inspection and management that contains requirements that are at least as stringent as the requirements of this Subpart E.

(2) A waiver from any requirement of this Subpart E shall apply only to the specific provision for which a waiver has been granted under this section. All requirements of this Subpart E shall apply until a waiver is granted under this section.

(b) Request. Each request by a Governor to waive any requirement of this Subpart E shall be sent with three complete copies of the request to the Regional Administrator for the EPA Region in which the State is located and shall include:
(1) A copy of the State provisions or proposed provisions relating to its program of asbestos inspection and management in schools for which the request is made.

(2)(i) The name of the State agency that is or will be responsible for administering and enforcing the requirements for which a waiver is requested, the names and job titles of responsible officials in that agency, and phone numbers where the officials can be contacted.

(ii) In the event that more than one agency is or will be responsible for administering and enforcing the requirements for which a waiver is requested, a description of the functions to be performed by each agency, how the program will be coordinated by the lead agency to ensure consistency and
effective administration in the asbestos inspection and management program within the State, the names and job titles of responsible officials in the agencies, and phone numbers where the officials can be contacted. The lead agency shall serve as the central contact point for the EPA.

(3) Detailed reasons, supporting papers, and the rationale for concluding that the State's asbestos inspection and management program provisions for which the request is made are at least as stringent as the requirements of this Subpart E.

(4) A discussion of any special situations, problems, and needs pertaining to the waiver request accompanied by an explanation of how the State intends to handle them.

(5) A statement of the resources that the State intends to devote to the administration and enforcement of the provisions relating to the waiver request.

(6) Copies of any specific or enabling laws (enacted and pending enactment) and regulations (promulgated and pending promulgation) relating to the request, including provisions for assessing criminal and/or civil penalties.

(7) Assurance from the Governor, the Attorney General, or the legal counsel of the lead agency that the lead agency or other cooperating agencies have the legal authority necessary to carry out the requirements relating to the request.

(c) General notice—hearing. (1) Within 30 days after receipt of a request for a waiver, the EPA will determine the completeness of the request. If the EPA does not request further information within the 30-day period, the request will be deemed complete.

(2) Within 30 days after EPA determines that a request is complete, EPA will issue for publication in the Federal Register a notice that announces receipt of the request, describes the information submitted under paragraph (b) of this section, and solicits written comment from interested members of the public. Comments must be submitted within 60 days.

(3) If, during the comment period, EPA receives a written objection to a Governor's request and a request for a public hearing detailing specific objections to the granting of a waiver, EPA will schedule a public hearing to be held in the affected State after the close of the comment period and will announce the public hearing date in the Federal Register before the date of the hearing. Each comment shall include the name and address of the person submitting the comment.

(d) Criteria. EPA may waive some or all of the requirements of Subpart E of this part if:

(1) The State's lead agency and other cooperating agencies have the legal authority necessary to carry out the provisions of asbestos inspection and management in schools relating to the waiver request.

(2) The State's program of asbestos inspection and management in schools relating to the waiver request and implementation of the program are or will be at least as stringent as the requirements of this Subpart E.

(3) The State has an enforcement mechanism to allow it to implement the program described in the waiver request.

(4) The lead agency and any cooperating agencies have or will have qualified personnel to carry out the provisions relating to the waiver request.

(5) The State will devote adequate resources to the administration and enforcement of the asbestos inspection and management provisions relating to the waiver request.

(6) When specified by EPA, the State gives satisfactory assurances that necessary steps, including specific actions it proposes to take and a time schedule for their accomplishment, will be taken within a reasonable time to conform with applicable criteria under paragraph (d) (2) through (4) of this section.

(e) Decision. EPA will issue for publication in the Federal Register a notice announcing its decision to grant or deny, in whole or in part, a Governor's request for a waiver from some or all of the requirements of this Subpart E within 30 days after the close of the comment period or within 30 days following a public hearing, whichever is applicable. The notice will include the Agency's reasons and rationale for granting or denying the Governor's request. The 30-day period may be extended if mutually agreed upon by EPA and the State.

(f) Modifications. When any substantial change is made in the administration or enforcement of a State program for which a waiver was granted under this section, a responsible official in the lead agency shall submit such changes to EPA.

(g) Reports. The lead agency in each State that has been granted a waiver by EPA from any requirement of Subpart E of this part shall submit a report to the Regional Administrator for the Region in which the State is located at least once every 12 months to include the following information:

(1) A summary of the State's implementation and enforcement activities during the last reporting period relating to provisions waived under this section, including enforcement actions taken.

(2) Any changes in the administration or enforcement of the State program implemented during the last reporting period.

(3) Other reports as may be required by EPA to carry out effective oversight of any requirement of this Subpart E that was waived under this section.

(h) Oversight. EPA may periodically evaluate the adequacy of a State's implementation and enforcement of requirements devoted to carrying out requirements relating to the waiver. This evaluation may include, but is not limited to, site visits to local education agencies without prior notice to the State.

(i) Informal conference. (1) EPA may request that an informal conference be held between appropriate State and EPA officials when EPA has reason to believe that a State has failed to:

(i) Substantially comply with the terms of any provision that was waived under this section.

(ii) Meet the criteria under paragraph (d) of this section, including the failure to carry out enforcement activities or act on violations of the State program.

(2) EPA will:

(i) Specify to the State those aspects of the State's program believed to be inadequate.

(ii) Specify to the State the facts that underlie the belief of inadequacy.

(iii) If EPA finds, on the basis of information submitted by the State at the conference, that deficiencies did not exist or were corrected by the State, no further action is required.

(iv) Where EPA finds that deficiencies in the State program exist, a plan to correct the deficiencies shall be negotiated between the State and EPA. The plan shall detail the deficiencies found in the State program, specify the steps the State has taken or will take to remedy the deficiencies, and establish a schedule for each remedial action to be initiated.

(j) Recission. (1) If the State fails to meet with EPA or fails to correct deficiencies raised at the informal conference, EPA will deliver to the Governor of the State and a responsible official in the lead agency a written notice of its intent to rescind, in whole or part, the waiver.

(2) EPA will issue for publication in the Federal Register a notice that announces the rescission of the waiver, describes those aspects of the State's
program determined to be inadequate, and specifies the facts that underlie the findings of inadequacy.

§ 783.99 Exclusions.

(a) A local education agency shall not be required to perform an inspection under § 783.85(a) in any sampling area as defined in 40 CFR 763.103 or homogeneous area of a school building where:

(1) An accredited inspector has determined that, based on sampling records, friable ACBM was identified in that homogeneous or sampling area during an inspection conducted before December 14, 1987. The inspector shall sign and date a statement to that effect with his or her State of accreditation and if applicable, accreditation number and, within 30 days after such determination, submit a copy of the statement to the person designated under § 783.84 for inclusion in the management plan. However, an accredited inspector shall assess the friable ACBM under § 783.88.

(2) An accredited inspector has determined that, based on sampling records, nonfriable ACBM was identified in that homogeneous or sampling area during an inspection conducted before December 14, 1987. The inspector shall sign and date a statement to that effect with his or her State of accreditation and if applicable, accreditation number and, within 30 days after such determination, submit a copy of the statement to the person designated under § 783.84 for inclusion in the management plan. However, an accredited inspector shall identify the nonfriable ACBM under § 783.88.

(3) Based on sampling records and inspection records, an accredited inspector has determined that no ACBM is present in the homogeneous or sampling area and the records show that the area was sampled, before December 14, 1987 in substantial compliance with § 783.85(a), which for purposes of this section means in a random manner and with a sufficient number of samples to reasonably ensure that the area is not ACBM.

(i) The accredited inspector shall sign and date a statement, with his or her State of accreditation and if applicable, accreditation number, that no ACBM was used as a building material in that homogeneous or sampling area and that no ACBM was used in the building that was inspected and sampled by the inspector before December 14, 1987. The local education agency shall submit a copy of the statement to the EPA Regional Office and shall include the statement in the management plan for that school.

(ii) Within 30 days after the inspector’s determination, the local education agency shall submit a copy of the inspector’s statement to the EPA Regional Office and shall include the statement in the management plan for that school.

(b) The exclusion, under paragraph (a) (1) through (4) of this section, from conducting the inspection under § 783.85(a) shall apply only to homogeneous or sampling areas of a school building that were inspected and sampled before October 17, 1987. The local education agency shall conduct an inspection under § 783.85(a) of all areas inspected before October 17, 1987, that were not sampled or were not assumed to be ACBM.

(c) If ACBM is subsequently found in a homogeneous or sampling area of a local education agency that had been identified as receiving an exclusion by an accredited inspector under paragraphs (a) (3), (4), or (5) of this section, or an architect, project engineer or accredited inspector under paragraph (a) (7) of this section, the local education agency shall have 180 days following the date of identification of ACBM to comply with this Subpart E.

Appendix A to Subpart E—Interim Transmission Electron Microscopy Analytical Methods—Mandatory and Nonmandatory—and Mandatory Section to Determine Completion of Response Actions

I. Introduction

The following appendix contains three units. The first unit is the mandatory transmission electron microscopy (TEM) method which all laboratories must follow; it is the minimum requirement for analysis of air samples for asbestos by TEM. The mandatory method contains the essential elements of the TEM method. The second unit contains the complete non-mandatory method. The non-mandatory method supplements the mandatory method by including additional steps to improve the analysis. EPA recommends that the non-mandatory method be employed for analyzing air filters; however, the laboratory may choose to employ the mandatory method. The non-mandatory method contains the same minimum requirements as are outlined in the mandatory method. Hence, laboratories may choose either of the two methods for analyzing air samples by TEM.

The final unit of this Appendix A to Subpart E defines the steps which must be taken to determine completion of response actions. This unit is mandatory.

II. Mandatory Transmission Electron Microscopy Method

A. Definitions of Terms

1. "Analytical sensitivity"—Airborne asbestos concentration represented by each fiber counted under the electron
microscope. It is determined by the air volume collected and the proportion of the filter examined. This method requires that the analytical sensitivity be no greater than 0.005 structures/cm³.

2. "Asbestiform"—A specific type of mineral fibrosity in which the fibers and fibrils possess high tensile strength and flexibility.

3. "Aspect ratio"—A ratio of the length to the width of a particle. Minimum aspect ratio as defined by this method is equal to or greater than 5:1.

4. "Bundle"—A structure composed of three or more fibers in a parallel arrangement with each fiber closer than one fiber diameter.

5. "Clean area"—A controlled environment which is maintained and monitored to assure a low probability of asbestos contamination to materials in that space. Clean areas used in this method have HEPA filtered air under positive pressure and are capable of sustained operation with an open laboratory blank which on subsequent analysis has an average of less than 18 structures/mm² in an area of 0.057 mm² (nominally 10 200-mesh grid openings) and a maximum of 53 structures/mm² for any single preparation for that same area.

6. "Cluster"—A structure with fibers in a random arrangement such that all fibers are intermixed and no single fiber is isolated from the group. Groupings must have more than two intersections.


9. "Fiber"—A structure greater than or equal to 0.5 μm in length with an aspect ratio (length to width) of 5:1 or greater and having substantially parallel sides.

10. "Grid"—An open structure for mounting on the sample to aid in its examination in the TEM. The term is used here to denote a 200-mesh copper lattice approximately 3 mm in diameter.

11. "Intersection"—Nonparallel touching or crossing of fibers with the projection having an aspect ratio of 5:1 or greater.

12. "Laboratory sample coordinator"—That person responsible for the conduct of sample handling and the certification of the testing procedures.

13. "Filter background level"—The concentration of structures per square millimeter of filter that is considered indistinguishable from the concentration measured on a blank (filters through which no air has been drawn). For this method the filter background level is defined as 70 structures/mm².

14. "Matrix"—Fiber or fibers with one end free and the other end embedded in or hidden by a particulate. The exposed fiber must meet the fiber definition.

15. "NSD"—No structure detected.


17. "PCM"—Phase contrast microscopy.

18. "SAED"—Selected area electron diffraction.


20. "STEM"—Scanning transmission electron microscope.

21. "Structure"—A microscopic bundle, cluster, fiber, or matrix which may contain asbestos.

22. "S/cm³"—Structures per cubic centimeter.

23. "S/mm²"—Structures per square millimeter.


B. Sampling

1. The sampling agency must have written quality control procedures and documents which verify compliance.

2. Sampling operations must be performed by qualified individuals completely independent of the abatement contractor to avoid possible conflict of interest (References 1, 2, 3, and 5 of Unit II.j.).

3. Sampling for airborne asbestos following an abatement action must use commercially available cassettes.

4. Prescreen the loaded cassette collection filters to assure that they do not contain concentrations of asbestos which may interfere with the analysis of the sample. A filter blank average of less than 18 s/mm² in an area of 0.057 mm² (nominally 10 200-mesh grid openings) and a single preparation with a maximum of 53 s/mm² for that same area is acceptable for this method.

5. Use sample collection filters which are either polycarbonate having a pore size less than or equal to 0.4 μm or mixed cellulose ester having a pore size less than or equal to 0.45 μm.

6. Place these filters in series with a 5.0 μm backup filter (to serve as a diffuser) and a support pad. See the following Figure 1:
FIGURE I—SAMPLING CASSETTE CONFIGURATION

- Inlet Plug
- Cassette Cap
- Extension Cowl or Retainer Ring
- ≤ 0.4 μm pore PC filter or ≤ 0.45 μm pore MCE filter
- 5 μm MCE Diffuser
- Support Pad
- Cassette Base
- Outlet Plug
7. Reloading of used cassettes is not permitted.
8. Orient the cassette downward at approximately 45 degrees from the horizontal.
9. Maintain a log of all pertinent sampling information.
10. Calibrate sampling pumps and their flow indicators over the range of their intended use with a recognized standard. Assemble the sampling system with a representative filter (not the filter which will be used in sampling) before and after the sampling operation.
11. Record all calibration information.
12. Ensure that the mechanical vibrations from the pump will be minimized to prevent transferral of vibration to the cassette.
13. Ensure that a continuous smooth flow of negative pressure is delivered by the pump by damping out any pump action fluctuations if necessary.
14. The final plastic barrier around the abatement area remains in place for the sampling period.
15. After the area has passed a thorough visual inspection, use aggressive sampling conditions to dislodge any remaining dust. (See suggested protocol in Unit III.B.7.d.)
16. Select an appropriate flow rate equal to or greater than 1 liter per minute (L/min) or less than 10 L/min for 25 mm cassettes. Larger filters may be operated at proportionally higher flow rates.
17. A minimum of 13 samples are to be collected for each testing site consisting of the following:
   a. A minimum of five samples per abatement area.
   b. A minimum of five samples per ambient area positioned at locations representative of the air entering the abatement site.
   c. Two field blanks are to be taken by removing the cap for not more than 30 seconds and replacing it at the time of sampling before sampling is initiated at the following places:
      i. Near the entrance to each abatement area.
      ii. At one of the ambient sites. (DO NOT leave the field blanks open during the sampling period.)
   d. A sealed blank is to be carried with each sample set. This representative cassette is not to be opened in the field.
18. Perform a leak check of the sampling system at each indoor and outdoor sampling site by activating the pump with the closed sampling cassette in line. Any flow indicates a leak which must be eliminated before initiating the sampling operation.
19. The following Table I specifies volume ranges to be used:
   BILLING CODE 6590-19-18
**TABLE 1--NUMBER OF 200 MESH EM GRID OPENINGS (0.0057 mm²) THAT NEED TO BE ANALYZED TO MAINTAIN SENSITIVITY OF 0.005 STRUCTURES/CC BASED ON VOLUME AND EFFECTIVE FILTER AREA**

<table>
<thead>
<tr>
<th>Effective Filter Area 385 sq mm</th>
<th>Effective Filter Area 855 sq mm</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Volume (liters)</strong></td>
<td><strong># of grid openings</strong></td>
</tr>
<tr>
<td>560</td>
<td>24</td>
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<tr>
<td>600</td>
<td>23</td>
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<tr>
<td>700</td>
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<tr>
<td>3,800</td>
<td>4</td>
</tr>
</tbody>
</table>

Note minimum volumes required:

- 25 mm: 560 liters
- 37 mm: 1250 liters

Filter diameter of 25 mm = effective area of 385 sq mm
Filter diameter of 37 mm = effective area of 855 sq mm

**BILLING CODE 4560-50-C**
20. Ensure that the sampler is turned upright before interrupting the pump flow.

21. Check that all samples are clearly labeled and that all pertinent information has been enclosed before transfer of the samples to the laboratory.

22. Ensure that the samples are stored in a secure and representative location.

23. Do not change containers if portions of these filters are taken for other purposes.

24. A summary of Sample Data Quality Objectives is shown in the following Table II:
**TABLE II--SUMMARY OF SAMPLING AGENCY DATA QUALITY OBJECTIVES**

This table summarizes the data quality objectives from the performance of this method in terms of precision, accuracy, completeness, representativeness, and comparability. These objectives are assured by the periodic control checks and reference checks listed here and described in the text of the method.

<table>
<thead>
<tr>
<th>Unit Operation</th>
<th>QC Check</th>
<th>Frequency</th>
<th>Conformance Expectation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sampling materials</td>
<td>Sealed blank</td>
<td>1 per I/O site</td>
<td>95%</td>
</tr>
<tr>
<td>Sample procedures</td>
<td>Field blanks</td>
<td>2 per I/O site</td>
<td>95%</td>
</tr>
<tr>
<td></td>
<td>Pump calibration</td>
<td>Before and after each field series</td>
<td>90%</td>
</tr>
<tr>
<td>Sample custody</td>
<td>Review of chain-of-custody record</td>
<td>Each sample</td>
<td>95% complete</td>
</tr>
<tr>
<td>Sample shipment</td>
<td>Review of sending report</td>
<td>Each sample</td>
<td>95% complete</td>
</tr>
</tbody>
</table>

BILLING CODE 6560-50-C
C. Sample Shipment

Ship bulk samples to the analytical laboratory in a separate container from air samples.

D. Sample Receiving

1. Designate one individual as sample coordinator at the laboratory. While that individual will normally be available to receive samples, the coordinator may train and supervise others in receiving procedures for those times when he/she is not available.

2. Bulk samples and air samples delivered to the analytical laboratory in the same container shall be rejected.

E. Sample Preparation

1. All sample preparation and analysis shall be performed by a laboratory independent of the abatement contractor.

2. Wet-wipe the exterior of the cassettes to minimize contamination possibilities, then taking them into the clean room facility.


Note: The clean area is required to have the following minimum characteristics. The area or hood must be capable of maintaining a positive pressure with make-up air being HEPA filtered. The cumulative analytical blank concentration must average less than 10 s/mm² in an area of 0.057 mm² (nominally 100 mesh grid openings) and a single preparation with a maximum of 53 s/mm² for that same area.

4. Preparation areas for air samples must not only be separated from preparation areas for bulk samples, but they must be prepared in separate rooms.

5. Direct preparation techniques are required. The object is to produce an intact film containing the particulates of the filter surface which is sufficiently clear for TEM analysis.

   a. TEM Grid Opening Area measurement must be done as follows:

      i. The filter portion being used for sample preparation must have the surface collapsed using an acetone vapor technique or the Burdette procedure (Ref. 7 of Unit II.J.).

      ii. Plasma etching of the collapsed filter is required. The microscope slide to which the collapsed filter pieces are attached is placed in a plasma asher. Because plasma asher vary greatly in their performance, both from unit to unit and between different positions in the ash chamber, it is difficult to specify the conditions that should be used. Insufficient etching will result in a failure to expose embedded filters, and too much etching may result in loss of particulate from the surface. As an interim measure, it is recommended that the time for ashing of a known weight of a collapsed filter be established and that the etching rate be calculated in terms of micrometers per second. The actual etching time used for the particulate asher and operating conditions will then be set such that a 1-2 μm (10 percent) layer of collapsed surface will be removed.

      iii. Procedures as described in Unit III. or other equivalent methods may be used to prepare samples.

6. TEM Method

   a. An 80-120 kV TEM capable of performing electron diffraction with a fluorescent screen inscribed with calibrated gradations is required. If the TEM is equipped with EDX, it must either have a STEM attachment or be capable of producing a spot less than 250 nm in diameter at crossover. The microscope shall be calibrated routinely for magnification and camera constant.

   b. Determination of Camera Constant and ED Pattern Analysis. The camera length of the TEM in ED operating mode must be calibrated before ED patterns on unknown samples are observed. This can be achieved by using a carbon-coated grid on which a thin film of gold is evaporated. A thin film of gold is evaporated on the specimen TEM grid to obtain zone-axis ED patterns superimposed with a ring pattern from the polycrystalline gold film. In practice, it is desirable to optimize the thickness of the gold film so that only one or two sharp rings are obtained on the superimposed ED pattern. Thicker gold film would normally give multiple gold rings, but it will tend to mask weaker diffraction spots from the unknown fibrous particulate. Since the unknown d-spacings of most interest in asbestos analysis are those which lie closest to the transmitted beam, multiple gold rings are unnecessary on zone-axis ED patterns. An average camera constant using multiple gold rings can be determined. The camera constant is one-half the diameter of the rings times the interplanar spacing of the ring being measured.

   c. Magnification Calibration. The magnification calibration must be done at the fluorescent screen. The TEM must be calibrated at the grid opening magnification (if used) and also at the magnification used for fiber counting. This is performed with a cross grating replica (e.g., one containing 2,160 lines/mm). Define a field of view on the fluorescent screen either by markings or physical boundaries. The field of view must be measurable or previously inscribed with a scale or concentric circles (all scales should be metric). A logbook must be maintained, and the dates of calibration and the values obtained must be recorded. The frequency of calibration depends on the past history of the particular microscope. After any maintenance of the microscope that involved adjustment of the power supplied to the lenses or the high-voltage system or the mechanical disassembly of the electron optical column apart from filament exchange, the magnification must be recalibrated. Before the TEM calibration is performed, the analyst must ensure that the cross grating replica is placed at the same distance from the objective lens as the specimens are. For instruments that incorporate an eucentric tilting specimen stage, all specimens and the cross grating replica must be placed at the eucentric position.

   d. While not required on every microscope in the laboratory, the laboratory must have either one microscope equipped with energy dispersive X-ray analysis or access to an equivalent system on a TEM in another laboratory.

   e. Microscope settings: 80-120 kV, grid accelerating 250-1,000X, then 15,000-20,000X screen magnification for analysis.

   f. Approximately one-half (0.5) of the predetermined sample area to be analyzed shall be performed on one sample grid preparation and the remaining half on a second sample grid preparation.

7. Individual grid openings with greater than 5 percent openings (holes)
or covered with greater than 25 percent particulate matter or obviously having nonuniform loading must not be analyzed.

8. Reject the grid if:
   a. Less than 50 percent of the grid openings covered by the replica are intact.
   b. The replica is doubled or folded.
   c. The replica is too dark because of incomplete dissolution of the filter.

   a. Any continuous grouping of particles in which an asbestos fiber with an aspect ratio greater than or equal to 5:1 and a length greater than or equal to 0.5 µm is detected shall be recorded on the count sheet. These will be designated asbestos structures and will be classified as fibers, bundles, clusters, or matrices. Record as individual fibers any contiguous grouping having 0, 1, or 2 definable intersections. Groupings having more than 2 intersections are to be described as cluster or matrix. An intersection is a nonparallel touching or crossing of fibers, with the projection having an aspect ratio of 5:1 or greater. See the following Figure 2:

BILLIN. CODE 6560-50-M
FIGURE 2--COUNTING GUIDELINES USED IN DETERMINING ASBESTOS STRUCTURES

Count as 1 fiber; 1 Structure; no intersections.

Count as 2 fibers if space between fibers is greater than width of 1 fiber diameter or number of intersections is equal to or less than 1.

Count as 3 structures if space between fibers is greater than width of 1 fiber diameter or if the number of intersections is equal to or less than 2.

Count bundles as 1 structure; 3 or more parallel fibrils less than 1 fiber diameter separation.
Count clusters as 1 structure; fibers having greater than or equal to 3 intersections.

Count matrix as 1 structure.

---

DO NOT COUNT AS STRUCTURES:

- Fiber protrusion $<5:1$ Aspect Ratio
- No fiber protrusion
- Fiber protrusion $<0.5$ micrometer

- $<0.5$ micrometer in length
- $<5:1$ Aspect Ratio
X-ray analysis alone can be used only after 70 s/mm² have been exceeded for a particular sample.

I. Fiber. A structure having a minimum length greater than or equal to 0.5 μm and a width greater than or equal to 0.05 μm. (Generally speaking, the first four fibers identified as amphiboles would require EDXA.)

II. Bundle. A structure composed of three or more fibers in a parallel arrangement with each fiber closer than one fiber diameter.

III. Cluster. A structure with fibers in a random arrangement such that all fibers are intermixed and no single fiber is isolated from the group. Groupings must have more than two intersections.

IV. Matrix. Fiber or fibers with one end free and the other end embedded in or hidden by a particulate. The exposed fiber must meet the fiber definition.

V. Separate categories will be maintained for fibers less than 5 μm and for fibers equal to or greater than 5 μm in length.

VI. Record NSD when no structures are detected in the field.

VII. Visual identification of electron diffraction (ED) patterns is required for each asbestos structure counted which would cause the analysis to exceed the 70 s/mm² concentration. (Generally this means the first four fibers identified as amphiboles must exhibit an identifiable diffraction pattern for chrysotile or amphibole.)

VIII. The micrograph number of the recorded diffraction patterns must be reported to the client and maintained in the laboratory's quality assurance records. In the event that examination of the pattern by a qualified individual indicates that the pattern has been misidentified visually, the client shall be contacted.

IX. Energy Dispersive X-ray Analysis (EDXA) is required of all amphiboles which would cause the analysis results to exceed the 70 s/mm² concentration. (Generally speaking, the first four amphiboles would require EDXA.)

X. If the number of fibers in the nonasbestos class would cause the analysis to exceed the 70 s/mm² concentration, the fact that they are not asbestos must be confirmed by EDXA or measurement of a zone axis diffraction pattern.

XI. Fibers classified as chrysotile must be identified by diffraction or X-ray analysis and recorded on a count sheet. X-ray analysis alone can be used only outside the work site. The indoor and outdoor samples shall be taken during the same time period.

XII. Remaining steps in the analytical sequence are contained in Unit IV of this Appendix.

H. Reporting

1. The following information must be reported to the client for each sample analyzed:
   a. Concentration in structures per square millimeter and structures per cubic centimeter.
   b. Analytical sensitivity used for the analysis.
   c. Number of asbestos structures.
   d. Area analyzed.
   e. Volume of air sample (which must be initially supplied to lab by client).
   f. Copy of the count sheet must be included with the report.
   g. Signature of laboratory official to indicate that the laboratory met specifications of the method.
   h. Report form must contain official laboratory identification (e.g., letterhead).
   i. Type of asbestos.

I. Quality Control/Quality Assurance Procedures (Data Quality Indicators)

Monitoring the environment for airborne asbestos requires the use of sensitive sampling and analysis procedures. Because the test is sensitive, it may be influenced by a variety of factors. These include the supplies used in the sampling operation, the preparation of the grid from the filter and the actual examination of this grid in the microscope. Each of these unit operations must produce a product of defined quality if the analytical result is to be a reliable and meaningful test result. Accordingly, a series of control checks and reference standards are to be performed along with the sample analysis as indicators that the materials used are adequate and the operations are within acceptable limits. In this way, the quality of the data is defined and the results are of known value. These checks and tests also provide timely and specific warning of any problems which might develop within the sampling and analysis operations. A description of these quality control/quality assurance procedures is summarized in the following Table III:
### TABLE III—SUMMARY OF LABORATORY DATA QUALITY OBJECTIVES

<table>
<thead>
<tr>
<th>Unit Operation</th>
<th>QC Check</th>
<th>Frequency</th>
<th>Conformance Expectation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample receiving</td>
<td>Review of receiving report</td>
<td>Each sample</td>
<td>95% complete</td>
</tr>
<tr>
<td>Sample custody</td>
<td>Review of chain-of-custody record</td>
<td>Each sample</td>
<td>95% complete</td>
</tr>
<tr>
<td>Sample preparation</td>
<td>Supplies and reagents</td>
<td>On receipt</td>
<td>Meet specs. or reject</td>
</tr>
<tr>
<td></td>
<td>Grid opening size</td>
<td>20 openings/20 grids/lot of 1000 or 1 opening/sample</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>Special clean area monitoring</td>
<td>After cleaning or service</td>
<td>Meet specs or reclean</td>
</tr>
<tr>
<td></td>
<td>Laboratory blank</td>
<td>1 per prep series or 10%</td>
<td>Meet specs or reanalyze series</td>
</tr>
<tr>
<td></td>
<td>Plasma etch blank</td>
<td>1 per 20 samples</td>
<td>75%</td>
</tr>
<tr>
<td></td>
<td>Multiple preps (3 per sample)</td>
<td>Each sample</td>
<td>One with cover of 15 complete grid sqs.</td>
</tr>
<tr>
<td>Sample analysis</td>
<td>System check</td>
<td>Each day</td>
<td>Each day</td>
</tr>
<tr>
<td></td>
<td>Alignment check</td>
<td>Each day</td>
<td>Each day</td>
</tr>
<tr>
<td></td>
<td>Magnification calibration with low and high standards</td>
<td>Each month or after service</td>
<td>95%</td>
</tr>
<tr>
<td></td>
<td>ED calibration by gold standard</td>
<td>Weekly</td>
<td>95%</td>
</tr>
<tr>
<td></td>
<td>EDS calibration by copper line</td>
<td>Daily</td>
<td>95%</td>
</tr>
<tr>
<td>Performance check</td>
<td>Laboratory blank (measure of cleanliness)</td>
<td>Prep 1 per series or 10% read 1 per 25 samples</td>
<td>Meet specs or reanalyze series</td>
</tr>
<tr>
<td></td>
<td>Replicate counting (measure of precision)</td>
<td>1 per 100 samples</td>
<td>1.5 x Poisson Std. Dev.</td>
</tr>
<tr>
<td></td>
<td>Duplicate analysis (measure of reproducibility)</td>
<td>1 per 100 samples</td>
<td>2 x Poisson Std. Dev.</td>
</tr>
<tr>
<td></td>
<td>Known samples of typical materials (working standards)</td>
<td>Training and for comparison with unknowns</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>Analysis of NBS SRM 1876 and/or RM 8410 (measure of accuracy and comparability)</td>
<td>1 per analyst per year</td>
<td>1.5 x Poisson Std. Dev.</td>
</tr>
<tr>
<td></td>
<td>Data entry review (data validation and measure of completeness)</td>
<td>Each sample</td>
<td>95%</td>
</tr>
<tr>
<td></td>
<td>Record and verify ID electron diffraction pattern of structure</td>
<td>1 per 5 samples</td>
<td>80% accuracy</td>
</tr>
<tr>
<td>Calculations and data reduction</td>
<td>Hand calculation of automated data reduction procedure or independent recalculation of hand-calculated data</td>
<td>1 per 100 samples</td>
<td>85%</td>
</tr>
</tbody>
</table>
Asbestos-Containing Materials in
consulted.

2. Check all laboratory reagents and
supplies for acceptable asbestos
background levels.

3. Conduct all sample preparation in a
clean room environment monitored by
laboratory biotags. Testing with blanks
must also be done after cleaning or
servicing the room.

4. Prepare multiple grids of each
sample.

5. Provide laboratory blanks with
each sample batch. Maintain a
cumulative average of these results. If
there are more than 53 fibers/mm² per
10 200-mesh grid openings, the system
must be checked for possible sources of
contamination.

6. Perform a system check on the
transmission electron microscope daily.

7. Make periodic performance checks of
captivation, electron diffraction and
energy dispersive X-ray systems as
set forth in Table III under Unit II I.

8. Ensure qualified operator
performance by evaluation of replicate
analysis and standard sample
comparisons as set forth in Table III
under Unit III.

9. Validate all data entries.

10. Recalculate a percentage of all
computations and automatic data
reduction steps as specified in Table III
under Unit II I.

11. Record an electron diffraction
pattern of one asbestos structure from
every five samples that contain
asbestos. Verify the identification of the
pattern by measurement or comparison of
the pattern with patterns collected from
standards under the same conditions. The records must also
demonstrate that the identification of the
pattern has been verified by a
qualified individual and that the
operator who made the identification is
maintaining at least an 80 percent
correct visual identification based on his
measured patterns.

12. Appropriate logs or records must
be maintained by the analytical
laboratory verifying that it is in
compliance with mandatory quality
assurance procedures.

J. References

For additional background
information on this method, the
following references should be
consulted.

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Asbestos-Containing Materials in

2. "Measuring Airborne Asbestos
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3. Small, John and B. Steel. Asbestos
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4. Campbell, W.J., R.L. Blake, L.L.
Brown, E.E. Cather, and J.J. Sjoberg.
Selected Silicate Minerals and Their
Asbestosform Varieties. Information
1977.

5. Quality Assurance Handbook for
Air Pollution Measurements at System.
Ambient Air Methods, EPA 600/4-77-
027a, USEPA, Office of Research and
Development. 1977.

6. Method 2A: Direct Measurement of
Gas Volume through Pipes and Small
Ducts. 40 CFR Part 60 Appendix A.

"Proposed Analytical Method for
Determination of Asbestos 1st Air."

Cons. Ltd., Clark, T., PEL Assoc.,
"Standard Operating Procedure for
Determination of Airborne asbestos
Fibers by Transmission Electron
Microscopy Using Polycarbonate
Membrane Filters," WERL SOP 87-1.
March 5, 1987.

9. NIOSH Method 7402 for Asbestos
Fibers, 12-11-86 Draft.

10. Yamate, G., Agarwall, S.C.,
Gibbons, R.D., IIT Research Institute,
"Methodology for the Measurement of
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11. "Guidance to the Preparation of
Quality Assurance Project Plans."
USEPA, Office of Toxic Substances.
1984.

III. Nonmandatory Transmission
Electron Microscopy Method

A. Definitions of Terms

1. "Analytical sensitivity"—Airborne
asbestos concentration represented by
each fiber counted under the electron
microscope. It is determined by the air
volume collected and the proportion of
the filter examined. This method
requires that the analytical sensitivity
be no greater than 0.005 s/cm².

2. "Asbestiform"—A specific type of
mineral fibrility in which the fibers and
fibrils possess high tensile strength and
flexibility.

3. "Aspect ratio"—A ratio of the
length to the width of a particle.
Minimum aspect ratio as defined by this
method is equal to or greater than 5:1.

4. "Bundle"—A structure composed of
two or more fibers in a parallel
arrangement with each fiber closer than
one fibril diameter.

5. "Clean area"—A controlled
environment which is maintained and
monitored to assure a low probability of
asbestos contamination to materials in
that space. Clean areas used in this
method have HEPA filtered air under
positive pressure and are capable of
sustained operation with an open
laboratory blank which on subsequent
analysis has an average of less than 18
structures/mm² in an area of 0.057 mm²
(nominally 10 200 mesh grid openings)
and a maximum of 53 structures/mm²
for no more than one single preparation
for that same area.

6. "Cluster"—A structure with fibers
in a random arrangement such that all
fibers are intermixed and no single fiber
is isolated from the group. Groupings
must have more than two intersections.
8. "EDXA"—Energy dispersive X-ray
analysis.

9. "Fiber"—A structure greater than or
equal to 0.5 µm in length with an aspect
ratio (length to width) of 5:1 or greater
and having substantially parallel sides.
10. "Grid"—An open structure for
mounting on the sample to aid in its
examination in the TEM. The term is
used here to denote a 200-mesh copper
lattice approximately 3 mm in diameter.
11. "Intersection"—Nonparallel
touching or crossing of fibers, with the
projection having an aspect ratio of 5:1
or greater.

12. Laboratory sample
coordinator”—That person responsible
for the conduct of sample handling and
the certification of the testing
procedures.

13. "Filter background level"—The
concentration of structures per square
millimeter of filter that is considered
indistinguishable from the concentration
measured on blanks (filters through
which no air has been drawn). For this
method the filter background level is
defined as 70 structures/mm².

14. "Matrix"—Fiber or fibers with one
end free and the other end embedded in
or hidden by a particulate. The exposed
fiber must meet the fiber definition.

15. "NSD"—No structure detected.
16. "Operator"—A person responsible
for the TEM instrumental analysis of the
sample.

17. "PCM"—Phase contrast
microscopy.

18. "SAED"—Selected area electron
diffraction.
19. "SEM"—Scanning electron
microscope.
20. "STEM"—Scanning transmission
electron microscope.
21. "Structure"—A microscopic
bundle, cluster, fiber, or matrix which
may contain asbestos.
22. “S/cm²”—Structures per cubic centimeter.
23. “S/mm²”—Structures per square millimeter.

B. Sampling

1. Sampling operations must be performed by qualified individuals completely independent of the abatement contractor to avoid possible conflict of interest (see References 1, 2, and 5 of Unit III.L.). Special precautions should be taken to avoid contamination of the sample. For example, materials that have not been prescreened for their asbestos background content should not be used; also, sample handling procedures which do not take cross contamination possibilities into account should not be used.

2. Material and supply checks for asbestos contamination should be made on all critical supplies, reagents, and procedures before their use in a monitoring study.

3. Quality control and quality assurance steps are needed to identify problem areas and isolate the cause of the contamination (see Reference 5 of Unit III.L.). Control checks shall be permanently recorded to document the quality of the information produced. The sampling firm must have written quality control procedures and documents which verify compliance. Independent audits by a qualified consultant or firm should be performed once a year. All documentation of compliance should be retained indefinitely to provide a guarantee of quality. A summary of Sample Data Quality Objectives is shown in Table II of Unit II.B.

4. Sampling materials.
   a. Sample for airborne asbestos following an abatement action using commercially available cassettes.
   b. Use either a cowling or a filter-retaining middle piece. Conductive material may reduce the potential for particulates to adhere to the walls of the cowl.
   c. Cassettes must be verified as “clean” prior to use in the field. If packaged filters are used for loading or preloaded cassettes are purchased from the manufacturer or a distributor, the manufacturer’s name and lot number should be entered on all field data sheets provided to the laboratory, and are required to be listed on all reports from the laboratory.
   d. Assemble the cassettes in a clean facility (See definition of clean area under Unit III.A.).
   e. Reloading of used cassettes is not permitted.
   f. Use sample collection filters which are either polycarbonate having a pore size of less than or equal to 0.4 μm or mixed cellulose ester having a pore size of less than or equal to 0.45 μm.
   g. Place these filters in series with a backup filter with a pore size of 5.0 μm (to serve as a diffuser) and a support pad. See the following Figure 1:

BILLING CODE 6560-50-M
FIGURE I--SAMPLING CASSETTE CONFIGURATION

- Inlet Plug
- Cassette Cap
- Extension Cowl or Retainer Ring
- ≤ 0.4 μm pore PC filter or ≤ 0.45 μm pore MCE filter
- 5 μm MCE Diffuser
- Support Pad
- Cassette Base
- Outlet Plug
h. When polycarbonate filters are used, position the highly reflective face such that the incoming particulate is received on this surface.

i. Seal the cassettes to prevent leakage around the filter edges or between cassette part joints. A mechanical press may be useful to achieve a reproducible leak-free seal. Shrink fit gel-bands may be used for this purpose and are available from filter manufacturers and their authorized distributors.

j. Use wrinkle-free loaded cassettes in the sampling operation.

5. Pump setup.

a. Calibrate the sampling pump over the range of flow rates and loads anticipated for the monitoring period with this flow measuring device in series. Perform this calibration using guidance from EPA Method 2A each time the unit is sent to the field (See Reference 8 of Unit III.).

b. Configure the sampling system to preclude pump vibrations from being transmitted to the cassette by using a sampling stand separate from the pump station and making connections with flexible tubing.

c. Maintain continuous smooth flow conditions by damping out any pump action fluctuations if necessary.

d. Check the sampling system for leaks with the end cap still in place and the pump operating before initiating sample collection. Trace and stop the source of any flow indicated by the flowmeter under these conditions.

e. Select an appropriate flow rate equal to or greater than 1 L/min or less than 10 L/min for 25 mm cassettes. Larger filters may be operated at proportionally higher flow rates.

f. Orient the cassette downward at approximately 45 degrees from the horizontal.

g. Maintain a log of all pertinent sampling information, such as pump identification number, calibration data, sample location, date, sample identification number, flow rates at the beginning, middle, and end, start and stop times, and other useful information or comments. Use of a sampling log form is recommended. See the following Figure 2:

BILING CODE 6550-50-M
## FIGURE 2—SAMPLING LOG FORM

<table>
<thead>
<tr>
<th>Sample Number</th>
<th>Location of Sample</th>
<th>Pump I.D.</th>
<th>Start Time</th>
<th>Middle Time</th>
<th>End Time</th>
<th>Flow Rate</th>
</tr>
</thead>
<tbody>
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</tbody>
</table>

Inspector: ____________________________  Date: ____________________________

BILLING CODE 6560-50-C
h. Initiate a chain of custody procedure at the start of each sampling, if this is requested by the client.

i. Maintain a close check of all aspects of the sampling operation on a regular basis.

j. Continue sampling until at least the minimum volume is collected, as specified in the following Table I:

BILLING CODE 4500-50-M
### TABLE 1--NUMBER OF 200 MESH EM GRID OPENINGS (0.0057 MM²) THAT NEED TO BE ANALYZED TO MAINTAIN SENSITIVITY OF 0.005 STRUCTURES/CC BASED ON VOLUME AND EFFECTIVE FILTER AREA

<table>
<thead>
<tr>
<th>Effective Filter Area</th>
<th>Volume (liters)</th>
<th># of grid openings</th>
<th>Effective Filter Area</th>
<th>Volume (liters)</th>
<th># of grid openings</th>
</tr>
</thead>
<tbody>
<tr>
<td>385 sq mm</td>
<td>560</td>
<td>24</td>
<td>855 sq mm</td>
<td>1,250</td>
<td>24</td>
</tr>
<tr>
<td>600</td>
<td></td>
<td>23</td>
<td></td>
<td>1,300</td>
<td>23</td>
</tr>
<tr>
<td>700</td>
<td></td>
<td>19</td>
<td></td>
<td>1,400</td>
<td>21</td>
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<tr>
<td>800</td>
<td></td>
<td>17</td>
<td></td>
<td>1,600</td>
<td>19</td>
</tr>
<tr>
<td>900</td>
<td></td>
<td>15</td>
<td></td>
<td>1,800</td>
<td>17</td>
</tr>
<tr>
<td>1,000</td>
<td></td>
<td>14</td>
<td></td>
<td>2,000</td>
<td>15</td>
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<tr>
<td>1,100</td>
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<td>12</td>
<td></td>
<td>2,200</td>
<td>14</td>
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<td>11</td>
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<td>2,400</td>
<td>13</td>
</tr>
<tr>
<td>1,300</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>1,400</td>
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<td></td>
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<tr>
<td>1,500</td>
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<tr>
<td>1,600</td>
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<td></td>
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<tr>
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<td>4</td>
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<td>4</td>
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</table>

Note minimum volumes required:
- 25 mm : 560 liters
- 37 mm : 1250 liters

Filter diameter of 25 mm = effective area of 385 sq mm
Filter diameter of 37 mm = effective area of 855 sq mm

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k. At the conclusion of sampling, turn the cassette upward before stopping the flow to minimize possible particle loss. If the sampling is resumed, restart the flow before reorienting the cassette downward. Note the condition of the filter at the conclusion of sampling.

l. Double check to see that all information has been recorded on the data collection forms and that the cassette is securely closed and appropriately identified using a waterproof label. Protect cassettes in individual clean resealable polyethylene bags. Bags are to be used for storing cassette caps when they are removed for sampling purposes. Caps and plugs should only be removed or replaced using clean hands or clean disposable plastic gloves.

m. Do not change containers if portions of these filters are taken for other purposes.

6. Minimum sample number per site. A minimum of 13 samples are to be collected for each testing consisting of the following:

a. A minimum of five samples per abatement area.

b. A minimum of five samples per ambient area positioned at locations representative of the air entering the abatement site.

c. Two field blanks are to be taken by removing the cap for not more than 30 sec and replacing it at the time of sampling before sampling is initiated at the following places:

i. Near the entrance to each ambient area.

ii. At one of the ambient sites.

(Note: Do not leave the blank open during the sampling period.)

d. A sealed blank is to be carried with each sample set. This representative cassette is not to be opened in the field.

7. Abatement area sampling.

a. Conduct final clearance sampling only after the primary containment barriers have been removed; the abatement area has been thoroughly dried; and, it has passed visual inspection tests by qualified personnel. (See Reference 1 of Unit III.)

b. Containment barriers over windows, doors, and air passageways must remain in place until the TEM clearance sampling and analysis is completed and results meet clearance test criteria. The final plastic barrier remains in place for the sampling period.

c. Select sampling sites in the abatement area on a random basis to provide unbiased and representative samples.

d. After the area has passed a thorough visual inspection, use aggressive sampling conditions to dislodge any remaining dust.

i. Equipment used in aggressive sampling such as a leaf blower and/or fan should be properly cleaned and decontaminated before use.

ii. Air filtration units shall remain on during the air monitoring period.

iii. Prior to air monitoring, floors, ceiling and walls shall be swept with the exhaust of a minimum one (1) horsepower leaf blower.

iv. Stationary fans are placed in locations which will not interfere with air monitoring equipment. Fan airflow is directed toward the cell(s). One fan shall be used for each 10,000 ft² of worksite.

v. Monitoring of an abatement work area with high-volume pumps and the use of circulating fans will require electrical power. Electrical outlets in the abatement area may be used if available. If no such outlets are available, the equipment must be supplied with electricity by the use of extension cords and strip plug units. All electrical power supply equipment of this type must be approved Underwriter Laboratory equipment that has not been modified. All wiring must be grounded. Ground fault interrupters should be used. Extreme care must be taken to clean up any residual water and ensure that electrical equipment does not become wet while operational.

vi. Low volume pumps may be carefully wrapped in 6-mil polyethylene to insulate the pump from the air. High volume pumps cannot be sealed in this manner since the heat of the motor may melt the plastic. The pump exhausts should be kept free.

vii. If recleaning is necessary, removal of this equipment from the work area must be handled with care. It is not possible to completely decontaminate the pump motor and parts since these areas cannot be wetted. To minimize any problems in this area, all equipment such as fans and pumps should be carefully wet wiped prior to removal from the abatement area. Wrapping and sealing low volume pumps in 6-mil polyethylene will provide easier decontamination of this equipment. Use of clean water and disposable wipes should be available for this purpose.

e. Pump flow rate equal to or greater than 1 L/min or less than 10 L/min may be used for 25 mm cassettes. The larger cassette diameters may have comparably increased flow.

f. Sample a volume of air sufficient to ensure the minimum quantitation limits. (See Table I of Unit III.B.5.)

8. Ambient sampling.

a. Position ambient samplers at locations representative of the air entering the abatement site. If makeup air entering the abatement site is drawn from another area of the building which is outside of the abatement area, place the pumps in the building. Pumps should be placed out of doors located near the building and away from any obstructions that may influence wind patterns. If construction is in progress immediately outside the enclosure, it may be necessary to select another ambient site. Samples should be representative of any air entering the work site.

b. Locate the ambient samplers at least 3 ft apart and protect them from adverse weather conditions.

c. Sample a representative volume of air as samples taken inside the abatement site.

C. Sample Shipment

1. Ship bulk samples in a separate container from air samples. Bulk samples and air samples delivered to the analytical laboratory in the same container shall be rejected.

2. Select a rigid shipping container and pack the cassettes upright in a noncontaminating nonfibrous medium such as a bubble pack. The use of resealable polyethylene bags may help to prevent jostling of individual cassettes.

3. Avoid using expanded polystyrene because of its static charge potential. Also avoid using particle-based packaging materials because of possible contamination.

4. Include a shipping bill and a detailed listing of samples shipped, their descriptions and all identifying numbers or marks, sampling date, infant's name, and contact information. For each sample set, designate which are the ambient samples, which are the abatement area samples, which are the field blanks, and which is the sealed blank if sequential analysis is to be performed.

5. Hand-carry samples to the laboratory in an upright position if possible; otherwise close packages tightly to ensure that mode of transportation least likely to jar the samples in transit.

6. Address the package to the laboratory sample coordinator by name when known and alert him or her of sample description, shipment mode, and anticipated arrival as part of the c.ain of custody and sample tracking procedures. The laboratory schedule staff shall help the laboratory schedule the analysis for the samples when they are received.

D. Quality Control/Quality Assurance Procedures (Data Quality Indicators)

Monitoring the environment for airborne asbestos requires the use of...
sensitive sampling and analysis procedures. Because the test is sensitive, it may be influenced by a variety of factors. These include the supplies used in the sampling operation, the performance of the sampling, the preparation of the grid from the filter and the actual examination of this grid in the microscope. Each of these unit operations must produce a product of defined quality if the analytical result is to be a reliable and meaningful test result. Accordingly, a series of control checks and reference standards is performed along with the sample analysis as indicators that the materials used are adequate and the operations are within acceptable limits. In this way, the quality of the data is defined, and the results are of known value. These checks and tests also provide timely and specific warning of any problems which might develop within the sampling and analysis operations. A description of these quality control/quality assurance procedures is summarized in the text below.

1. Prescreen the loaded cassette collection filters to assure that they do not contain concentrations of asbestos which may interfere with the analysis of the sample. A filter blank average of less than 18 s/m² in an area of 0.057 mm² (nominally 10 200-mesh grid openings) and a maximum of 53 s/mm² for that same area for any single preparation is acceptable for this method.

2. Calibrate sampling pumps and their flow indicators over the range of their intended use with a recognized standard. Assemble the sampling system with a representative filter—not the filter which will be used in sampling—before and after the sampling operation.

3. Record all calibration information with the data to be used on a standard sampling form.

4. Ensure that the samples are stored in a secure and representative location.

5. Ensure that mechanical calibrations from the pump will be minimized to prevent transfer of vibration to the cassette.

6. Ensure that a continuous smooth flow of negative pressure is delivered by the pump by installing a damping chamber if necessary.

7. Open a loaded cassette momentarily at one of the indoor sampling sites when sampling is initiated. This sample will serve as an indoor field blank.

8. Open a loaded cassette momentarily at one of the outdoor sampling sites when sampling is initiated. This sample will serve as an outdoor field blank.

9. Carry a sealed blank into the field with each sample series. Do not open this cassette in the field.

10. Perform a leak check of the sampling system at each indoor and outdoor sampling site by activating the pump with the closed sampling cassette in line. Any flow indicates a leak which must be eliminated before initiating the sampling operation.

11. Ensure that the sampler is turned upright before interrupting the pump flow.

12. Check that all samples are clearly labeled and that all pertinent information has been enclosed before transfer of the samples to the laboratory.

E. Sample Receiving

1. Designate one individual as sample coordinator at the laboratory. While that individual will normally be available to receive samples, the coordinator may train and supervise others in receiving procedures for those times when he/she is not available.

2. Adhere to the following procedures to ensure both the continued chain-of-custody and the accountability of all samples passing through the laboratory:

   a. Note the condition of the shipping package and data written on it upon receipt.

   b. Retain all bills of lading or shipping slips to document the shipper and delivery time.

   c. Examine the chain-of-custody seal, if any, and the package for its integrity.

   d. If there has been a break in the seal or substantive damage to the package, the sample coordinator shall immediately notify the shipper and a responsible laboratory manager before any action is taken to unpack the shipment.

   e. Packages with significant damage shall be accepted only by the responsible laboratory manager after discussions with the client.

3. Unwrap the shipment in a clean, uncluttered facility. The sample coordinator or his or her designee will record the contents, including a description of each item and all identifying numbers or marks. A Sample Receiving Form to document this information is attached for use when necessary. (See the following Figure 3.)
FIGURE 3--SAMPLE RECEIVING FORM

Date of package delivery __________________ Package shipped from __________________

Carrier __________________ Shipping bill retained __________________

*Condition of package on receipt __________________

*Condition of custody seal __________________

Number of samples received _____________ Shipping manifest attached _____________

Purchase Order No. __________________ Project I.D. __________________

Comments __________________

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<th>Description</th>
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<td>13</td>
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</tbody>
</table>

(Use as many additional sheets as needed.)

Comments __________________

Date of acceptance into sample bank __________________

Signature of chain-of-custody recipient __________________

Disposition of samples __________________

*Note: If the package has sustained substantial damage or the custody seal is broken, stop and contact the project manager and the shipper.

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F. Sample Preparation

1. Personnel not affiliated with the Abatement Contractor shall be used to prepare samples and conduct TEM analysis. Wet-wipe the exterior of the cassettes to minimize contamination possibilities before taking them to the clean sample preparation facility.

2. Perform sample preparation in a well-equipped clean facility.

Note.—The clean area is required to have the following minimum characteristics. The area or hood must be capable of maintaining a positive pressure with make-up air being HEPA filtered. The cumulative analytical blank concentration must average less than 78 s/mm² in an area of 0.057 simm² (nominally 10 200-mesh grid openings) with no more than one single preparation to exceed 53 s/mm² for that same area.

3. Preparation areas for air samples must be separated from preparation areas for bulk samples. Personnel must not prepare air samples if they have previously been preparing bulk samples without performing appropriate personal hygiene procedures, i.e., clothing change, showering, etc.

4. Preparation. Direct preparation techniques are required. The objective is to produce an intact carbon film containing the particulates from the filter surface which is sufficiently clear for TEM analysis. Currently recommended direct preparation procedures for polycarbonate (PC) and mixed cellulose ester (MCE) filters are described in Unit III.F.7 and 6. Sample preparation is a subject requiring additional research. Variation on those steps which do not substantively change the procedure, which improve filter clearing or which reduce contamination problems in a laboratory are permitted.

a. Use only TEM grids that have had grid openings areas measured according to directions in Unit III.J.

b. Remove the inlet and outlet plugs prior to opening the cassette to minimize any pressure differential that may be present.

c. Examples of techniques used to prepare polycarbonate filters are described in Unit III.F.7.

d. Examples of techniques used to prepare mixed cellulose ester filters are described in Unit III.F.6.

e. Prepare multiple grids for each sample.

f. Store the three grids to be measured in appropriately labeled grid holders or polyethylene capsules.

g. Equipment.

a. Clean area.

b. Tweezers. Fine-point tweezers for handling of filters and TEM grids.

c. Scalpel Holder and Curved No. 10 Surgical Blades.

d. Microscope slides.

e. Double-coated adhesive tape.

f. Gummed page reinforcements.

g. Micro-pipet with disposal tips 10 to 100 μL variable volume.

h. Vacuum coating unit with facilities for evaporation of carbon. Use of a liquid nitrogen cold trap above the diffusion pump will minimize the possibility of contamination of the filter surface by oil from the pumping system. The vacuum-coating unit can also be used for deposition of a thin film of gold.

i. Carbon rod electrodes.

Spectrochemically pure carbon rods are required for use in the vacuum evaporator to achieve a coating of filters.

j. Carbon rod sharpener. This is used to sharpen carbon rods to a neck. The use of necked carbon rods (or equivalent) allows the carbon to be applied to the filters with a minimum of heating.

k. Low-temperature plasma ashers.

This is used to etch the surface of collapsed mixed cellulose ester (MCE) filters. The ashers should be supplied with oxygen and should be modified as necessary to provide a throttle or bleed valve to control the speed of the vacuum to minimize disturbance of the filter.

Some early models of asher admit air too rapidly, which may disturb particulates on the surface of the filter during the etching step.

l. Glass petri dishes, 10 cm in diameter, 1 cm high. For prevention of excessive evaporation of solvent when these are in use, a good seal must be provided between the base and the lid. The seal can be improved by grinding the base and lid together with an abrasive grinding material.

m. Stainless steel mesh.

n. Lens tissue.

o. Copper 200-mesh TEM grids, 3 mm in diameter, or equivalent.

p. Gold 200-mesh TEM grids, 3 mm in diameter, or equivalent.

q. Condensation washer.

r. Carbon-coated, 200-mesh TEM grids, or equivalent.

s. Analytical balance, 0.1 mg sensitivity.

t. Filter paper, 9 cm in diameter.

u. Oven or slide warmer. Must be capable of maintaining a temperature of 65-70 °C.
point placed in contact with the filter. The process can be repeated to cut a strip approximately 3 mm wide across the diameter of the filter. The strip of polycarbonate filter is separated from the corresponding strip of backing filter and carefully placed so that it bridges the gap between the adhesive tape strips on the microscope slide. The filter strip can be held with fine-point tweezers and supported underneath by the scalpel blade during placement on the microscope slide. The analyst can place several such strips on the same microscope slide, taking care to rinse and wet-wipe the scalpel blade and tweezers before handling a new sample. The filter strips should be identified by etching the glass slide or marking the slide using a marker insoluble in water and solvents. After the filter strip has been cut from each filter, the residual parts of the filter must be returned to the cassette and held in position by reassembly of the cassette. The cassette will then be archived for a period of 30 days or returned to the client upon request.

e. Carbon coating of filter strips. The glass slide holding the filter strips is placed into the coating unit, and the evaporator chamber is evacuated. The evaporation must be performed in very short bursts, separated by some seconds to allow the electrodes to cool. If evaporation is too rapid, the strips of polycarbonate filter will begin to curl, which will lead to cross-linking of the surface material and make it relatively insoluble in chloroform. An experienced analyst can judge the thickness of carbon film to be applied, and some test should be made first on unused filters. If the film is too thin, large particles will be lost from the TEM specimen, and there will be few complete and undamaged grid openings on the specimen. If the coating is too thick, the filter will tend to curl when exposed to chloroform vapor and the carbon film may not adhere to the support mesh. Too thick a carbon film will also lead to a TEM image that is lacking in contrast, and the ability to obtain ED patterns will be compromised. The carbon film should be as thin as possible and remain intact on most of the grid openings of the TEM specimen intact.

f. Preparation of the Jaffe washer. The precise design of the Jaffe washer is not considered important, so any one of the published designs may be used. A washer consisting of a simple stainless steel bridge is recommended. Several pieces of lens tissue approximately 1.0 cm x 0.5 cm are placed on the stainless steel bridge, and the washer is filled with chloroform to a level where the meniscus contacts the underside of the mesh, which results in saturation of the lens tissue. See References 8 and 10 of Unit III.L.

g. Placing of specimens into the Jaffe washer. The TEM grids are first placed on a piece of lens tissue so that individual grids can be picked up with tweezers. Using a curved scapel blade, the analyst excises three 3 mm square pieces of the carbon-coated polycarbonate filter from the filter strip. The three squares are selected from the center of the strip and from two points between the outer periphery of the active surface and the center. The piece of filter is placed on a TEM specimen grid with the shiny side of the TEM grid facing upwards, and the whole assembly is placed boldly onto the saturated lens tissue in the Jaffe washer. If carbon-coated grids are used, the filter should be placed carbon-coated side down. The three excised squares of filters are placed on the same piece of lens tissue. Any number of separate pieces of lens tissue may be placed in the same Jaffe washer. The lid is then placed on the Jaffe washer, and the system is allowed to stand for several hours, preferably overnight.

h. Condensation washing. It has been found that many polycarbonate filters will not dissolve completely in the Jaffe washer, even after being exposed to chloroform for as long as 3 days. This problem becomes more serious if the surface of the filter was overheated during the carbon evaporation. The presence of undissolved filter medium on the TEM preparation leads to partial or complete obscuration of areas of the sample, and fibers that may be present in these areas of the specimen will be overlooked; this will lead to a low result. Undissolved filter medium also compromises the ability to obtain ED patterns. Before they are counted, TEM grids must be examined critically to determine whether they are adequately cleared of residual filter medium. It has been found that condensation washing of the grids after the initial Jaffe washer treatment, with chloroform as the solvent, clears all residual filter medium in a period of approximately 1 hour. In practice, the piece of lens tissue supporting the specimen grids is transferred to the cold finger of the condensation washer, and the washer is operated for about 1 hour. If the specimens are cleared satisfactorily by the Jaffe washer alone, the condensation washer step may be unnecessary.

a. TEM specimen preparation from MCE filters.

b. This method of preparing TEM specimens from MCE filters is similar to that specified in NIOSH Method 7402. See References 7, 8, and 9 of Unit III.L.

c. Upon receipt at the analytical laboratory, the sample cassettes must be cleaned of any contamination adhering to the outside surfaces before entering the clean sample preparation area.

d. Remove a section from any quadrant of the sample and blank filters.

e. Place the section on a clean microscope slide. Affix the filter section to the slide with a gummed paper reinforcement or other suitable means. Label the slide with a water and solvent-proof marking pen.

f. Place the slide in a petri dish which contains several paper filters soaked with 2 to 3 mL acetone. Place the dish. Wait 2 to 4 minutes for the filter sample to fuse and clear.

g. Plasma etching of the collapsed filter is required.

h. The microscope slide to which the collapsed filter pieces are attached is placed in a plasma asher. Because plasma ashers vary greatly in their performance, both from unit to unit and between different positions in the asher chamber, it is difficult to specify the conditions that should be used. This is one area of the method that requires further evaluation. Insufficient etching will result in a failure to expose embedded filters, whereas etching too much may result in loss of particulate from the surface. As an interim measure, it is recommended that the time for ashing of a known weight of a collapsed filter be established and that the etching rate be calculated in terms of micrometers per second. The actual etching time used for a particular asher and operating conditions will then be set such that a 1-2 μm (10 percent) layer of collapsed surface will be removed.

i. Place the slide containing the collapsed filters into a low-temperature plasma asher, and etch the filter.

j. Transfer the slide to a rotating stage inside the bell jar of a vacuum evaporator. Evaporate a 1 mm x 5 mm section of graphite rod onto the cleared filter. Remove the slide to a clean, dry, covered petri dish.

k. Prepare a second petri dish as a Jaffe washer with the wicking substrate prepped from filter or lens paper placed on top of a 6 mm thick disk of clean spongy polyurethane foam. Cut a V-notch on the edge of the foam and cut filter paper. Use the V-notch as a reservoir for adding solvent. The wicking substrate should be thin enough to fit into the petri dish without touching the lid.

l. Place carbon-coated TEM grids face up on the filter or lens paper. Label the grids by marking with a pencil on the filter paper or by putting registration marks.
marks on the petri dish lid and marking with a waterproof marker on the dish lid. In a fume hood, fill the dish with acetone until the wicking substrate is saturated. The level of acetone should be just high enough to saturate the filter paper without creating puddles.

j. Remove about a quarter section of the carbon-coated filter samples from the glass slides using a surgical knife and tweezers. Carefully place the section of the filter, carbon side down, on the appropriately labeled grid in the acetone-saturated petri dish. When all filter sections have been transferred, slowly add more solvent to the wedge-shaped trough to bring the acetone level up to the highest possible level without disturbing the sample preparations. Cover the petri dish. Elevate one side of the petri dish by placing a slide under it. This allows drops of condensed solvent vapors to form near the edge rather than in the center where they would drip onto the grid preparation.

G. TEM Method

1. Instrumentation.
   a. Use an 80-120 kV TEM capable of performing electron diffraction with a fluorescent screen inscribed with calibrated graduations. If the TEM is equipped with EDXA it must either have a STEM attachment or be capable of producing a spot less than 250 nm in diameter at crossover. The microscope shall be calibrated routinely (see Unit III.J.) for magnification and camera constant.
   b. While not required on every microscope in the laboratory, the laboratory must have either one microscope equipped with energy dispersive X-ray analysis or access to an equivalent system on a TEM in another laboratory. This must be an Energy Dispersive X-ray Detector mounted on TEM column and associated hardware/software to collect, save, and read out spectral information.
   i. Standard replica grating may be used to determine magnification (e.g., 2160 lines/mm).
   ii. Gold standard may be used to determine camera constant.
   c. Use a specimen holder with single tilt and/or double tilt capabilities.

2. Procedure.
   a. Start a new Count Sheet for each sample to be analyzed. Record on count sheet: analyst's initials and date; lab sample number; client sample number; microscope identification; magnification for analysis; number of predetermined grid openings to be analyzed; and grid identification. See the following Figure 4:
FIGURE 4—COUNT SHEET

<table>
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<tr>
<th>Lab Sample No.</th>
<th>Filter Type</th>
<th>Operator</th>
<th>Client Sample No.</th>
<th>Filter Area</th>
<th>Date</th>
<th>Instrument I.D.</th>
<th>Grid I.D.</th>
<th>Comments</th>
<th>Magnification</th>
<th>Grid Opening (GO) Area</th>
<th>Acc. Voltage</th>
<th>No. GO to be Analyzed</th>
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</thead>
</table>

<table>
<thead>
<tr>
<th>GO</th>
<th>Structure No.</th>
<th>Structure Type*</th>
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<th>EDAX</th>
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</tr>
</tbody>
</table>

* B = Bundle  
C = Cluster  
F = Fiber  
M = Matrix  
NFD = No fibers detected  
N = No diffraction obtained  

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b. Check that the microscope is properly aligned and calibrated according to the manufacturer's specifications and instructions.

c. Microscope settings: 80-120 kV, grid assessment 250-1000X, then 15,000-20,000X screen magnification for analysis.

d. Approximately one-half (0.5) of the predetermined sample area to be analyzed shall be performed on one sample grid preparation and the remaining half on a second sample grid preparation.

e. Determine the suitability of the grid.

i. Individual grid openings with greater than 5 percent openings (holes) or covered with greater than 25 percent particulate matter or obviously having nonuniform loading shall not be analyzed.

ii. Examine the grid at low magnification (<1000X) to determine its suitability for detailed study at higher magnifications.

iii. Reject the grid if:

   (1) Less than 50 percent of the grid openings covered by the replica are intact.
   (2) It is doubled or folded.

   (3) It is too dark because of incomplete dissolution of the filter.

   iv. If the grid is rejected, load the next sample grid.

   v. If the grid is acceptable, continue on to Step 6 if mapping is to be used; otherwise proceed to Step 7.

f. Grid Map (Optional).

i. Set the TEM to the low magnification mode.

ii. Use flat edge or finder grids for mapping.

iii. Index the grid openings (fields) to be counted by marking the acceptable fields for one-half (0.5) of the area needed for analysis on each of the two grids to be analyzed. These may be marked just before examining each grid opening (field), if desired.

iv. Draw in any details which will allow the grid to be properly oriented if it is reloaded into the microscope and a particular field is to be reliably identified.

g. Scan the grid.

i. Select a field to start the examination.

ii. Choose the appropriate magnification (15,000 to 20,000X screen magnification).

h. Identify each structure for appearance and size.

i. Appearance and size: Any continuous grouping of particles in which an asbestos fiber within aspect ratio greater than or equal to 5:1 and a length greater than or equal to 0.5 μm is detected shall be recorded on the count sheet. These will be designated asbestos structures and will be classified as fibers, bundles, clusters, or matrices. Record as individual fibers any contiguous grouping having 0, 1, or 2 definable intersections. Groupings having more than 2 intersections are to be described as cluster or matrix. See the following Figure 5:

   (1) At the selected magnification, make a series of parallel traverses across the field. On reaching the end of one traverse, move the image one window and reverse the traverse.

   Note.—A slight overlap should be used so as not to miss any part of the grid opening (field).

   (2) Make parallel traverses until the entire grid opening (field) has been scanned.

   (3) It is too dark because of incomplete dissolution of the filter.

   iv. If the grid is rejected, load the next sample grid.

   v. If the grid is acceptable, continue on to Step 6 if mapping is to be used; otherwise proceed to Step 7.

f. Grid Map (Optional).

i. Set the TEM to the low magnification mode.

ii. Use flat edge or finder grids for mapping.

iii. Index the grid openings (fields) to be counted by marking the acceptable fields for one-half (0.5) of the area needed for analysis on each of the two grids to be analyzed. These may be marked just before examining each grid opening (field), if desired.

iv. Draw in any details which will allow the grid to be properly oriented if it is reloaded into the microscope and a particular field is to be reliably identified.

   g. Scan the grid.

   i. Select a field to start the examination.

   ii. Choose the appropriate magnification (15,000 to 20,000X screen magnification).

iii. Scan the grid as follows.

(1) At the selected magnification, make a series of parallel traverses across the field. On reaching the end of one traverse, move the image one window and reverse the traverse.

Note.—A slight overlap should be used so as not to miss any part of the grid opening (field).

(2) Make parallel traverses until the entire grid opening (field) has been scanned.

h. Identify each structure for appearance and size.

i. Appearance and size: Any continuous grouping of particles in which an asbestos fiber within aspect ratio greater than or equal to 5:1 and a length greater than or equal to 0.5 μm is detected shall be recorded on the count sheet. These will be designated asbestos structures and will be classified as fibers, bundles, clusters, or matrices. Record as individual fibers any contiguous grouping having 0, 1, or 2 definable intersections. Groupings having more than 2 intersections are to be described as cluster or matrix. See the following Figure 5:

   BILLING CODE 6560-50-4
FIGURE 5--COUNTING GUIDELINES USED IN DETERMINING ASPEROS STRUCTURES

Count as 1 fiber; 1 Structure; no intersections.

Count as 2 fibers if space between fibers is greater than width of 1 fiber diameter or number of intersections is equal to or less than 1.

Count as 3 structures if space between fibers is greater than width of 1 fiber diameter or if the number of intersections is equal to or less than 2.

Count bundles as 1 structure; 3 or more parallel fibrils less than 1 fiber diameter separation.
Count clusters as 1 structure; fibers having greater than or equal to 3 intersections.

Count matrix as 1 structure.

Do not count as structures:

Fiber protrusion < 5:1 Aspect Ratio
No fiber protrusion
Fiber protrusion < 0.5 micrometer

< 0.5 micrometer in length
< 5:1 Aspect Ratio
An intersection is a non-parallel touching or crossing of fibers, with the projection having an aspect ratio of 5:1 or greater. Combinations such as a matrix and cluster, matrix and bundle, or bundle and cluster are categorized by the dominant fiber quality—cluster, bundle, and matrix, respectively. Separate categories will be maintained for fibers less than 5 μm and for fibers greater than or equal to 5 μm in length. Not required, but useful, may be to record the fiber length in 1 μm intervals. Identify each structure morphologically and analyze it as it enters the "window.".

1. Fiber. A structure having a minimum length greater than 0.5 μm and an aspect ratio (length to width) of 5:1 or greater and substantially parallel sides. Note the appearance of the end of the fiber, i.e., whether it is flat, rounded or dovetailed, no intersections.

2. Bundle. A structure composed of 3 or more fibers in a parallel arrangement with each fiber closer than one fiber diameter.

3. Cluster. A structure with fibers in a random arrangement such that all fibers are intermixed and no single fiber is isolated from the group; groupings must have more than 2 intersections.

4. Matrix. Fiber or fibers with one end free and the other end embedded in or hidden by a particulate. The exposed fiber must meet the fiber definition.

5. NSD. Record NSD when no structures are detected in the field.

6. Intersection. Non-parallel touching or crossing of fibers, with the projection having an aspect ratio of 5:1 or greater.

ii. Structure information.

i. Structure type classification on the count sheet after the field number and fiber number.

5. Return the fiber to its original location in the window and scan the rest of the field for other fibers; if the direction of travel is not remembered, return to the right side of the field and begin the traverse again.

ii. Visual Identification of Electron Diffraction (ED) Patterns is required for each asbestos structure counted which would cause the analysis to exceed the 70 s/mm² concentration. (Generally this means the first four fibers identified as asbestos must exhibit an identifiable diffraction pattern for chrysotile or amphibole.)

i. Center the structure, focus, and obtain an ED pattern. (See Microscope Instruction Manual for more detailed instructions.)

ii. From a visual examination of the ED pattern, obtained with a short camera length, classify the observed structure as belonging to one of the following classifications: chrysotile, amphibole, or nonasbestos.

1. Chrysotile: The chrysotile asbestos pattern has characteristic streaks on the layer lines other than the central line and some streaking also on the central line. There will be spots of normal sharpness on the central layer line and on alternate lines (2nd, 4th, etc.). The repeat distance between layer lines is 0.53 nm and the center doublet is at 0.73 nm. The pattern should display (002), (110), (100) diffraction maxima; distances and geometry should match a chrysotile pattern and be measured semiquantitatively.

2. Amphibole Group (includes grunerite (amosite), crocidolite, anthophyllite, tremolite, and actinolite): Amphibole asbestos fiber patterns show layer lines formed by very closely spaced dots, and the repeat distance between layer lines is also about 0.53 nm. Streaking in layer lines is occasionally present due to crystal structure defects.

3. Nonasbestos: Incomplete or unobtainable ED patterns, a nonasbestos EDXA, or a nonasbestos morphology.

iii. The micrograph number of the recorded diffraction patterns must be reported to the client and maintained in the laboratory's quality assurance records. The records must also demonstrate that the identification of the pattern has been verified by a qualified individual and that the operator who made the identification is maintaining at least an 80 percent correct visual identification based on his measured patterns. In the event that examination of the pattern by the qualified individual indicates that the pattern had been missidentified visually, the client shall be contacted. If the pattern is a suspected chrysotile, take a photograph of the diffraction pattern at 0 degrees tilt. If the structure is suspected to be amphibole, the sample may have to be tilted to obtain a simple geometric array of spots.

i. Energy Dispersive X-Ray Analysis (EDXA).

i. Required of all amphiboles which would cause the analysis to exceed the 70 s/mm² concentration. (Generally speaking, the first 4 amphiboles would require EDXA.)

ii. Can be used alone to confirm chrysotile after the 70 s/mm² concentration has been exceeded.

iii. Can be used alone to confirm all nonasbestos.

iv. Compare spectrum profiles with profiles obtained from asbestos standards. The closest match identifies and categorizes the structure.

v. If the EDXA is used for confirmation, record the properly labeled spectrum on a computer disk, or if a hard copy, file with analysis data.

vi. If the number of fibers in the nonasbestos class would cause the analysis to exceed the 70 s/mm² concentration, their identities must be confirmed by EDXA or measurement of a zone axis diffraction pattern to establish that the particles are nonasbestos.

k. Stopping Rules.

i. If more than 50 asbestos structures are counted in a particular grid opening, the analysis may be terminated.

ii. After having counted 50 asbestos structures in a minimum of 4 grid openings, the analysis may be terminated. The grid opening in which the 50th fiber was counted must be completed.

iii. For blank samples, the analysis is always continued until 10 grid openings have been analyzed.

iv. In all other samples the analysis shall be continued until an analytical sensitivity of 0.005 s/cm³ is reached.

1. Recording Rules. The count sheet should contain the following information:

i. Field (grid opening): List field number.

ii. Record "NSD" if no structures are detected.

iii. Structure information.

1. If fibers, bundles, clusters, and/or matrices are found, list them in consecutive numerical order, starting over with each field.

2. Length. Record length category of asbestos fibers examined. Indicate if less than 5 μm or greater than or equal to 5 μm.

3. Structure Type. Positive identification of asbestos fibers is required by the method. At least one diffraction pattern of each fiber type from every five samples must be recorded and compared with a standard diffraction pattern. For each asbestos fiber reported, both a morphological descriptor and an identification descriptor shall be specified on the count sheet.

4. Fibers classified as chrysotile must be identified by diffraction and/or X-ray analysis and recorded on the count.
(5) Fibers classified as amphiboles must be identified by X-ray analysis and electron diffraction and recorded on the count sheet. (X-ray analysis alone can be used as sole identification only after 70 s/mm² have been exceeded for a particular sample.)

(6) If a diffraction pattern was recorded on film, the micrograph number must be indicated on the count sheet.

(7) If an electron diffraction was attempted and an appropriate spectra is not observed, N should be recorded on the count sheet.

(8) If an X-ray analysis is attempted but not observed, N should be recorded on the count sheet.

(9) If an X-ray analysis spectrum is stored, the file and disk number must be recorded on the count sheet.

m. Classification Rules.

1. Fiber. A structure having a minimum length greater than or equal to 0.5 μm and an aspect ratio (length to width) of 5:1 or greater and substantially parallel sides. Note the appearance of the end of the fiber, i.e., whether it is flat, rounded or dovetailed.

2. Bundle. A structure composed of three or more fibers in a parallel arrangement with each fiber closer than one fiber diameter.

3. Cluster. A structure with fibers in a random arrangement such that all fibers are intermixed and no single fiber is isolated from the group. Groupings must have more than two intersections.

4. Matrix. Fiber or fibers with one end free and the other end embedded in or hidden by a particulate. The exposed fiber must meet the fiber definition.

5. NSD. Record NSD when no structures are detected in the field.

After all necessary analyses of a particle structure have been completed, return the gonimeter stage to 0 degrees, and return the structure to its original location by recall of the original location.

Continue scanning until all the structures are identified, classified and sized in the field.

Select additional fields (grid openings) at low magnification; scan at a chosen magnification (15,000 to 20,000X screen magnification); and analyze until the stopping rule becomes applicable.

q. Carefully record all data as they are being collected, and check for accuracy.

r. After finishing with a grid, remove it from the microscope, and replace it in the appropriate grid hold. Sample grids must be stored for a minimum of 1 year from the date of the analysis; the sample cassette must be retained for a minimum of 30 days by the laboratory or returned at the client’s request.

H. Sample Analytical Sequence

1. Carry out visual inspection of work site prior to air monitoring.

2. Collect a minimum of five air samples inside the work site and five samples outside the work site. The indoor and outdoor samples shall be taken during the same time period.

3. Analyze the abatement area samples according to this protocol. The analysis must meet the 0.005 s/cm² analytical sensitivity.

4. Remaining steps in the analytical sequence are contained in Unit IV. of this Appendix.

I. Reporting

The following information must be reported to the client. See the following Table II:
TABLE II--EXAMPLE LABORATORY LETTERHEAD

<table>
<thead>
<tr>
<th>Laboratory I.D.</th>
<th>Client I.D.</th>
<th>FILTER MEDIA DATA</th>
<th>Analyzed Area, mm²</th>
<th>Sample Volume, cc</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Type</td>
<td>Diam. mm</td>
<td>Pore Size, µm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

INDIVIDUAL ANALYTICAL RESULTS

<table>
<thead>
<tr>
<th>Laboratory I.D.</th>
<th>Client I.D.</th>
<th># Asbestos Structures</th>
<th>Analytical Sensitivity, s/cc</th>
<th>CONCENTRATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Structures/mm²</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

The analysis was carried out to the approved TEM method. This laboratory is in compliance with the quality specified by the method.

Authorized Signature
1. Concentration in structures per square millimeter and structures per cubic centimeter.
2. Analytical sensitivity used for the analysis.
3. Number of asbestos structures.
4. Area analyzed.
5. Volume of all samples (which was initially provided by client).
6. Average grid size opening.
7. Number of grids analyzed.
8. Copy of the count sheet must be included with the report.
9. Signature of laboratory official to indicate that the laboratory met specifications of the AHERA method.
10. Report form must contain official laboratory identification (e.g., letterhead).
11. Type of asbestos.

J. Calibration Methodology

Note: Appropriate implementation of the method requires a person knowledgeable in electron diffraction and mineral identification by ED and EDXA. These inexperienced laboratories wishing to develop capabilities may acquire necessary knowledge through analysis of appropriate standards and by following detailed methods as described in References 8 and 10 of Unit III.

1. Equipment Calibration. In this method, calibration is required for the air-sampling equipment and the transmission electron microscope (TEM).

a. TEM Magnification. The magnification at the fluorescent screen of the TEM must be calibrated at the grid opening magnification (if used) and also at the magnification used for fiber counting. This is performed with a cross grating replica. A logbook must be maintained, and the dates of calibration dependant on the particular microscope no frequency is specified. After any maintenance of the microscope that involved adjustment of the power supplied to the lenses or the high-voltage system or the mechanical disassembly of the electron optical column apart from filament exchange, the magnification must be recalibrated. Before the TEM calibration is performed the analyst must ensure that the cross grating replica is placed at the same distance from the objective lens as the specimens are. For instruments that incorporate an eucentric tilting specimen stage, all specimens and the cross grating replica must be placed at the eucentric position.

b. Determination of the TEM magnification on the fluorescent screen.

i. Define a field of view on the fluorescent screen either by markings or physical boundaries. The field of view must be measurable or previously inscribed with a scale or concentric circles (all scales should be metric).

ii. Insert a diffraction grating replica (for example a grating containing 2,180 lines/mm) into the specimen holder and place into the microscope. Orient the replica so that the grating lines fall perpendicular to the scale on the TEM fluorescent screen. Ensure that the goniometer stage tilt is 0 degrees.

iii. Adjust microscope magnification to 10,000X or 20,000X. Measure the distance (mm) between two widely separated lines on the grating replica. Note the number of spaces between the lines. Take care to measure between the same relative positions on the lines (e.g., between left edges of lines).

Note: The more spaces included in the measurement, the more accurate the final calculation. On most microscopes, however, the magnification is substantially constant only within the central 8-10 cm diameter region of the fluorescent screen.

iv. Calculate the true magnification (M) on the fluorescent screen:

$$M = \frac{XG}{Y}$$

where:

- X = total distance (mm) between the designated grating lines;
- G = calibration constant of the grating replica (lines/mm);
- Y = number of grating replica spaces counted along X.

c. Calibration of the EDXA System. Initially, the EDXA system must be calibrated by using two reference elements to calibrate the energy scale of the instrument. When this has been completed in accordance with the manufacturer's instructions, calibration in terms of the different types of asbestos can proceed. The EDXA detectors vary in both solid angle of detection and in the relative X-ray peak voltages given in a specific dimensions of fiber will vary both in absolute X-ray count rate and in the relative X-ray peak heights for different elements. Only a few minerals are relevant for asbestos abatement work, and in this procedure the calibration is specified in terms of a "fingerprint" technique. The EDXA spectra must be recorded from individual fibers of the relevant minerals, and identifications are made on the basis of semiquantitative comparisons with these reference spectra.

d. Calibration of Grid Openings.

i. Measure 20 grid openings on each of 20 random 200-mesh copper grids by placing a grid on a glass slide and examining the stage on the PCM. Use a calibrated graticule to measure the average field diameter and use this number to calculate the field area for an average grid opening. Grids are to be randomly selected from batches up to 1,000.

Note: A grid opening is considered as one field.

- ii. The mean grid opening area must be measured for the "cups" of specimen grids in use. This can be accomplished on the TEM at a properly calibrated low magnification or on an optical microscope at a magnification of approximately 400X by using an eyepiece fitted with a scale that has been calibrated against a stage micrometer. Optical microscopy utilizing manual or automated procedures may be used providing instrument calibration can be verified.

e. Determination of Camera Constant and ED Pattern Analysis.

i. The camera length of the TEM in ED operating mode must be calibrated before ED patterns on unknown samples are observed. This can be achieved by using a carbon-coated grid on which a thin film of gold has been sputtered or evaporated. A thin film of gold is evaporated on the specimen TEM grid to obtain zone-axis ED patterns superimposed with a ring pattern from the polycrystalline gold film.

ii. In practice, it is desirable to optimize the thickness of the gold film so that only one or two sharp rings are obtained on the superimposed ED pattern. Thicker gold film would normally give multiple gold rings, but it will tend to mask weaker diffraction spots from the unknown fibrous particulates. Since the unknown d-spacings of most interest in asbestos analysis are those which lie closest to the transmitted beam, multiple gold rings are unnecessary on zone-axis ED patterns. An average camera constant using multi gold rings can be determined. The camera constant is one-half the diameter, D, of the rings times the interplanar spacing, d, of the ring being measured.

K. Quality Control/Quality Assurance Procedures (Data Quality Indicators)

Monitoring the environment for airborne asbestos requires the use of sensitive sampling and analysis procedures. Because the test is sensitive, it may be influenced by a variety of factors. These include the supplies used in the sampling operation, the performance of the sampling, the preparation of the grid from the filter and the actual examination of this grid in the microscope. Each of these unit operations must reduce a product of...
defined quality if the analytical result is to be a reliable and meaningful test result. Accordingly, a series of control checks and reference standards is performed along with the sample analysis as indicators that the materials used are adequate and the operations are within acceptable limits. In this way, the quality of the data is defined and the results are of known value. These checks and tests also provide timely and specific warning of any problems which might develop within the sampling and analysis operations. A description of these quality control/quality assurance procedures is summarized in the following Table III:

BILLING CODE 6360-50-M
### TABLE III--SUMMARY OF LABORATORY DATA QUALITY OBJECTIVES

<table>
<thead>
<tr>
<th>Unit Operation</th>
<th>QC Check</th>
<th>Frequency</th>
<th>Conformance Expectation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample receiving</td>
<td>Review of receiving report</td>
<td>Each sample</td>
<td>95% complete</td>
</tr>
<tr>
<td>Sample custody</td>
<td>Review of chain-of-custody record</td>
<td>Each sample</td>
<td>95% complete</td>
</tr>
<tr>
<td>Sample preparation</td>
<td>Supplies and reagents</td>
<td>On receipt</td>
<td>Meet specs or reject</td>
</tr>
<tr>
<td></td>
<td>Grid opening size</td>
<td></td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>Special clean area monitoring</td>
<td>After cleaning or service</td>
<td>Meet specs or reclean</td>
</tr>
<tr>
<td></td>
<td>Laboratory blank</td>
<td>1 per prep series or 10%</td>
<td>Meet specs or reanalyze series</td>
</tr>
<tr>
<td>Plasma etch blank</td>
<td></td>
<td>1 per 20 samples</td>
<td>75%</td>
</tr>
<tr>
<td>Multiple preps (3 per sample)</td>
<td></td>
<td>Each sample</td>
<td>One with cover of 15 complete grid sqs.</td>
</tr>
<tr>
<td>Sample analysis</td>
<td>System check</td>
<td>Each day</td>
<td>Each day</td>
</tr>
<tr>
<td></td>
<td>Alignment check</td>
<td>Each day</td>
<td>Each day</td>
</tr>
<tr>
<td></td>
<td>Magnification calibration with low and high standards</td>
<td>Each month or after service</td>
<td>95%</td>
</tr>
<tr>
<td></td>
<td>ED calibration by gold standard</td>
<td>Weekly</td>
<td>95%</td>
</tr>
<tr>
<td></td>
<td>EDS calibration by copper line</td>
<td>Daily</td>
<td>95%</td>
</tr>
<tr>
<td>Performance check</td>
<td>Laboratory blank (measure of cleanliness)</td>
<td>Prep 1 per series or 10% read 1 per 25 samples</td>
<td>Meet specs or reanalyze series</td>
</tr>
<tr>
<td></td>
<td>Replicate counting (measure of precision)</td>
<td>1 per 100 samples</td>
<td>1.5 x Poisson Std. Dev.</td>
</tr>
<tr>
<td></td>
<td>Duplicate analysis (measure of reproducibility)</td>
<td>1 per 100 samples</td>
<td>2 x Poisson Std. Dev.</td>
</tr>
<tr>
<td></td>
<td>Known samples of typical materials (working standards)</td>
<td>Training and for comparison with unknowns</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>Analysis of NBS SRM 1876 and/or RM 8410 (measure of accuracy and comparability)</td>
<td>1 per analyst per year</td>
<td>1.5 x Poisson Std. Dev.</td>
</tr>
<tr>
<td></td>
<td>Data entry review (data validation and measure of completeness)</td>
<td>Each sample</td>
<td>95%</td>
</tr>
<tr>
<td></td>
<td>Record and verify ID electron diffraction pattern of structure</td>
<td>1 per 5 samples</td>
<td>80% accuracy</td>
</tr>
<tr>
<td>Calculations and data reduction</td>
<td>Hand calculation of automated data reduction procedure or independent recalculation of hand-calculated data</td>
<td>1 per 100 samples</td>
<td>85%</td>
</tr>
</tbody>
</table>
1. When the samples arrive at the laboratory, check the samples and documentation for completeness and requirements before initiating the analysis.

2. Check all laboratory reagents and supplies for acceptable asbestos background levels.

3. Conduct all sample preparation in a clean room environment monitored by laboratory blanks and select testing after cleaning or servicing the room.

4. Prepare multiple grids of each sample.

5. Provide laboratory blanks with each sample batch. Maintain a cumulative average of these results. If this average is greater than 53 fibers/mm² per 10 200-mesh grid openings, check the system for possible sources of contamination.

6. Check for recovery of asbestos from cellulose ether filters submitted to plasma asher.

7. Check for asbestos carryover in the plasma asher by including a blank alongside the positive control sample.

8. Perform a systems check on the transmission electron microscope daily.

9. Make periodic performance checks of magnification, electron diffraction and energy dispersive X-ray systems as set forth in Table III of Unit III.K.

10. Ensure qualified operator performance by evaluation of replicate counting, duplicate analysis, and standard sample comparisons as set forth in Table III of Unit III.K.

11. Validate all data entries.

12. Recalculate a percentage of all computations and automatic data reduction steps as specified in Table III.

13. Record an electron diffraction pattern of one asbestos structure from every five samples that contain asbestos. Verify the identification of the pattern by measurement or comparison of the pattern with patterns collected from standards under the same conditions.

The outline of quality control procedures presented above is viewed as the minimum required to assure that quality data is produced for clearance testing of an asbestos abated area. Additional information may be gained by other control tests. Specifications on those control procedures and options available for environmental testing can be obtained by consulting References 6, 7, and 21 of Unit III.I.

L. References

For additional background information on this method the following references should be consulted:


IV. Mandatory Interpretation of Transmission Electron Microscopy Results to Determine Completion of Response Actions

A. Introduction

A response action is determined to be completed by TEM when the abatement area has been cleaned and the airborne asbestos concentration inside the abatement area is no higher than concentrations at locations outside the abatement area. "Outside" means outside the abatement area, but not necessarily outside the building. EPA reasons that an asbestos removal contractor cannot be expected to clean an abatement area to an airborne asbestos concentration that is lower than the concentration of air entering the abatement area from outdoors or from other parts of the building. After the abatement area has passed a thorough visual inspection, and before the outer containment barrier is removed, a minimum of five air samples inside the abatement area and a minimum of five air samples outside the abatement area must be collected. Hence, the response action is determined to be completed when the average airborne asbestos concentration measured inside the abatement area is not statistically different from the average airborne asbestos concentration measured outside the abatement area.

The inside and outside concentrations are compared by the Z-test, a statistical test that takes into account the variability in the measurement process. A minimum of five samples inside the abatement area and five samples outside the abatement area are required to control the false negative error rate, i.e., the probability of declaring the removal complete when, in fact, the air concentration inside the abatement area is significantly higher than outside the abatement area. Additional quality control is provided by requiring three blanks (filters through which no air has been drawn) to be analyzed to check for unusual high filter contamination that would distort the test results.

When volumes greater than or equal to 1,199 L for a 25 mm filter and 2,799 L for a 37 mm filter have been collected and the average number of asbestos structures on samples inside the abatement area is no greater than 70 fibers/mm² of filter, the response action may be considered complete without comparing the inside samples to the outside samples. EPA is permitting this initial screening test to save analysis costs in situations where the airborne asbestos concentration is sufficiently low so that it cannot be distinguished from the filter contamination/background level (fibers deposited on the filter that are unrelated to the air being sampled). The screening test cannot be used when volumes of less than 1,199 L for 25 mm filter or 2,799 L for a 37 mm filter are collected because the ability to distinguish levels significantly different from filter background is reduced at low volumes.

The initial screening test is expressible in structures per square millimeter of filter because filter background levels come from sources other than the air being sampled and cannot be meaningfully expressed as a concentration per cubic centimeter of air. The value of 70 fibers/mm² is based on the experience of the panel of microscopists who consider one structure in 10 grid openings (each grid opening with an area of 0.0057 mm²) to
be comparable with contamination/background levels of blank filters. The decision is based, in part, on Poisson statistics which indicate that four structures must be counted on a filter before the fiber count is statistically distinguishable from the count for one structure. As more information on the performance of the method is collected, this criterion may be modified. Since different combinations of the number and size of grid openings are permitted under the TEM protocol, the criterion is expressed in structures per square millimeter of filter to be consistent across all combinations. Four structures per 10 grid openings corresponds to approximately 70 s/mm².

B. Sample Collection and Analysis

1. A minimum of 13 samples is required: five samples collected inside the abatement area, five samples collected outside the abatement area, two field blanks, and one sealed blank.

2. Sampling and TEM analysis must be done according to either the mandatory or nonmandatory protocols in Appendix A. At least 0.057 mm² of filter must be examined on blank filters.

C. Interpretation of Results

1. The response action shall be considered complete if either:
   a. Each sample collected inside the abatement area consists of at least 1.199 L of air for a 25 mm filter, or 2,799 L of air for a 37 mm filter, and the arithmetic mean of their asbestos structure concentrations per square millimeter of filter is less than or equal to 70 s/mm²; or
   b. The three blank samples have an arithmetic mean of the asbestos structure concentration on the blank filter that is less than or equal to 70 s/mm² and the average airborne asbestos concentration measured outside the abatement area is not statistically higher than the average airborne asbestos concentration measured outside the abatement area as determined by the Z-test. The Z-test is carried out by calculating

\[
Z = \frac{\overline{Y}_1 - \overline{Y}_0}{0.8 \left( \frac{1}{n_1} + \frac{1}{n_0} \right)^{1/2}}
\]

where \(\overline{Y}_1\) is the average of the natural logarithms of the inside samples and \(\overline{Y}_0\) is the average of the natural logarithms of the outside samples, \(n_1\) is the number of inside samples and \(n_0\) is the number of outside samples. The response action is considered complete if \(Z\) is less than or equal to 1.65.

(Note.—When no fibers are counted, the calculated detection limit for that analysis is inserted for the concentration.)

2. If the abatement site does not satisfy either (1) or (2) above, the site must be re-cleaned and a new set of samples collected.

D. Sequence for Analyzing Samples

It is possible to determine completion of the response action without analyzing all samples. Also, at any point in the process, a decision may be made to terminate the analysis of existing samples, re-clean the abatement site, and collect a new set of samples. The following sequence is outlined to minimize the number of analyses needed to reach a decision.

1. Analyze the inside samples.
2. If at least 1.199 L of air for a 25 mm filter or 2,799 L of air for a 37 mm filter is collected for each inside sample and the arithmetic mean concentration of structures per square millimeter of filter is less than or equal to 70 s/mm², the response action is complete and no further analysis is needed.
3. If less than 1.199 L of air for a 25 mm filter or 2,799 L of air for a 37 mm filter is collected for any of the inside samples, or if the arithmetic mean concentration of structures per square millimeter of filter is greater than 70 s/mm², analyze the three blanks.
4. If the arithmetic mean concentration of structures per square millimeter on the blank filters is greater than 70 s/mm², terminate the analysis, identify and correct the source of blank contamination, and collect a new set of samples.
5. If the arithmetic mean concentration of structures per square millimeter on the blank filters is less than or equal to 70 s/mm², analyze the three blanks. The Z-test is complete. If the Z-statistic is less than or equal to 1.65, re-clean the abatement site and collect a new set of samples.

Appendix B to Subpart E—Work Practices and Engineering Controls for Small-Scale, Short-Duration Operations Maintenance and Repair (O&M) Activities Involving ACM

This appendix is not mandatory, in that LEAs may choose to comply with all the requirements of 40 CFR 763.121. Section 763.91(b) extends the protection provided by EPA in its 40 CFR 763.121 for worker protection during asbestos abatement projects to employees of local education agencies who perform small-scale, short-duration operations, maintenance and repair (O&M) activities involving asbestos-containing materials and are not covered by the OSHA asbestos construction standard at 29 CFR 1926.58 or an asbestos worker protection standard adopted by a State as part of a State plan approved by OSHA under section 18 of the Occupational Safety and Health Act. Employers wishing to be exempt from the requirements of § 763.121(e)(6) and (f)(2)(i) may instead comply with the provisions of this appendix when performing small-scale, short-duration O&M activities.

Definition of Small-Scale, Short-Duration Activities

For the purposes of this appendix, small-scale, short-duration maintenance activities are tasks such as but not limited to:

1. Removal of asbestos-containing insulation on pipes.
2. Removal of small quantities of asbestos-containing insulation on beams or above ceilings.
3. Replacement of an asbestos-containing gasket on a valve.
4. Installation of electrical conduits through or proximate to asbestos-containing materials.
5. Installation of electrical conduits through or proximate to asbestos-containing materials.
6. Removal of asbestos-containing thermal system insulation not to exceed amounts greater than those which can be contained in a single glove bag.
7. Minor repairs to damaged thermal system insulation which do not require removal.
8. Repairs to a piece of asbestos-containing wallboard.
9. Repairs, involving encapsulation, enclosure or removal, to small amounts of friable asbestos-containing material only if required in the performance of emergency or routine maintenance activity and not intended solely as asbestos abatement. Such work may not exceed amounts greater than those which can be contained in a single prefabricated enclosure. Such an enclosure shall conform spatially and geometrically to the localized work area. In order to perform its intended containment function.
OSHA concluded that the use of certain engineering and work practice controls is capable of reducing employee exposures to asbestos to levels below the final standard's action level (0.1 f/cm³). Several controls and work practices, used either singly or in combination, can be employed to effectively reduce asbestos exposures during small maintenance and renovation operations. These include:

1. Wet methods.
2. Removal methods.
   i. Use of glove bags.
   ii. Removal of entire asbestos insulated pipes or structures.
   iii. Use of miniclosures.
3. Enclosure of asbestos materials.
4. Maintenance programs.

This appendix describes these controls and work practices in detail.

Preparation of the Area Before Renovation or Maintenance Activities

The first step in preparing to perform a small-scale, short-duration asbestos renovation or maintenance task, regardless of the abatement method that will be used, is the removal of the work area of all objects that are movable to prevent them from asbestos contamination. Objects that cannot be removed must be covered completely with 6-mil-thick polyethylene plastic sheeting before the task begins. If objects have already been contaminated, they should be thoroughly cleaned with a High Efficiency Particulate Air (HEPA) filtered vacuum or be wet-wiped before they are removed from the work area or completely encased in the plastic.

Wet methods. Whenever feasible, and regardless of the abatement method to be used (e.g., removal, enclosure, use of glove bags), wet methods must be used during small-scale, short-duration maintenance and renovation activities that involve disturbing asbestos-containing materials. Handling asbestos materials wet is one of the most reliable methods of ensuring that asbestos fibers do not become airborne, and this practice should always be used whenever feasible. Wet methods can be used in the great majority of workplace situations. Only in cases where asbestos work must be performed on live electrical equipment, on live steam lines, or in other areas where water will seriously damage materials or equipment may dry removal be performed. Amended water or another wetting agent should be applied by means of an airless sprayer to minimize the extent to which the asbestos-containing material is disturbed.

Asbestos-containing material should be wetted from the initiation of the maintenance or renovation operation and wetting agents should be used continually throughout the work period to ensure that any dry asbestos-containing material exposed in the course of the work is wet and remains wet until final disposal.

Removal of small amounts of asbestos-containing materials. Several methods can be used to remove small amounts of asbestos-containing materials during small-scale, short-duration renovation or maintenance tasks. These include the use of glove bags, the removal of an entire asbestos-covered pipe or structure, and the construction of miniclosures. The procedures that employers must use for each of these operations if they wish to avoid themselves of the rule's exemptions are described in the following sections.

Glove bag. OSHA found that the use of glove bags to enclose the work area during small-scale, short-duration maintenance or renovation activities will result in employee exposure to asbestos that are below the rule's action level of 0.1 f/cm³. This appendix provides requirements for glove-bag procedures to be followed by employers wishing to avail themselves of the rule's exemption for each activity. OSHA has determined that the use of these procedures will reduce the 8-hour time weighted average (TWA) exposure of employees involved in these work operations to levels below the action level and will thus provide a degree of employee protection equivalent to that provided by compliance with all provisions of the rule.

Glove bag installation. Glove bags are approximately 40-inch-wide times 64-inch-long bags fitted with arms through which the work can be performed. When properly installed and used, they permit workers to remain completely isolated from the asbestos material removed or replaced inside the bag. Glove bags can thus provide a flexible, easily installed, and quickly dismantled temporary small work area enclosure that is ideal for small-scale asbestos renovation or maintenance jobs. These bags are single-use control devices that are disposed of at the end of each job.

Removal of small amount of asbestos-containing materials. Various methods used to dispose protective suits used in major asbestos removal, renovation, and demolition operations and in protective gloves. Glove bags are readily available from safety supply stores or specialty asbestos removal supply houses. Glove bags come pre-labelled with the asbestos warning label prescribed by OSHA and EPA for bags used to dispose of asbestos waste.

Glove bag equipment and supplies. Supplies and materials that are necessary to use glove bags effectively include:

1. Tape to seal glove bag to the area from which asbestos is to be removed.
2. Amended water or other wetting agents.
3. An airless sprayer for the application of the wetting agent.
4. Bridging encapsulant (a paste-like substance for coating asbestos) to seal the rough edges of any asbestos-containing materials that remain within the glove bag at the points of attachment after the rest of the asbestos has been removed.
5. Tools such as razor knives, nips, and wire brushes (or other tools suitable for cutting wires, etc.).
6. A HEPA filter-equipped vacuum for evacuating the glove bag (to minimize the release of asbestos fibers) during removal of the bag from the work area and for cleaning any material that may have escaped during the installation of the glove bag.
7. HEPA-equipped dual-cartridge or more protective respirators for use by the employees involved in the removal of asbestos with the glove bag.

Glove bag work practices. The proper use of glove bags requires the following steps:

1. Glove bags must be installed so that they completely cover the pipe or other structure where asbestos work is to be done. Glove bags are installed by cutting the sides of the glove bag to fit the size of the pipe from which asbestos is to be removed. The glove bag is attached to the pipe by folding the open edges together and securely sealing them with tape. All openings in the glove bag must be sealed with duct tape or equivalent material. The bottom seam of the glove bag must also be sealed with duct tape or equivalent to prevent any leakage from the bag that may result from a defect in the bottom seam.
2. The employee who is performing the asbestos removal with the glove bag must don at least a half mask dual-cartridge HEPA-equipped respirator; respirators should be worn by employees who are in close contact with the glove bag and who may thus be exposed as a result of small gaps in the.

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The removed asbestos material from the pipe or other surface that has fallen into the enclosed bag must be thoroughly wetted with a wetting agent (applied with an airless sprayer through the precut port provided in most gloves or applied through a small hole in the bag). 4. Once the asbestos material has been thoroughly wetted, it can be removed from the pipe, beam, or other surface. The choice of tool to use to remove the asbestos-containing material depends on the type of material to be removed. Asbestos-containing materials are generally covered with painted canvas and/or wire mesh. Painted canvas can be cut with a razor knife and peeled away from the asbestos-containing material underneath. Once the canvas has been peeled away, the asbestos-containing material underneath may be dry, in which case it should be resprayed with a wetting agent to ensure that it generates as little dust as possible when removed. If the asbestos-containing material is covered with wire mesh, the mesh should be cut with nips, tin snips, or other appropriate tool and removed.

A wetting agent must then be used to spray and soaks asbestos-containing material that is exposed beneath the mesh, the surface of the stripped underlying structure, and the inside of the glove bag.

5. After removal of the layer of asbestos-containing material, the pipe or surface from which asbestos has been removed must be thoroughly cleaned with a wire brush and wet-wiped with a wetting agent until no traces of the asbestos-containing material can be seen.

6. Any asbestos-containing insulation edges that have been exposed as a result of the removal or maintenance activity must be encapsulated with bridging encapsulant to ensure that the edges do not release asbestos fibers to the atmosphere after the glove bag has been removed.

7. When the asbestos removal and encapsulation have been completed, a vacuum hose from a HEPA filtered vacuum must be inserted into the glove bag through the port to remove any air in the bag that may contain asbestos fibers. When the air has been removed from the bag, the bag should be squeezed tightly (as close to the top as possible), twisted, and sealed with tape, to keep the asbestos materials safely in the bottom of the bag. The HEPA vacuum can then be removed from the bag and the glove bag itself can be removed from the work area to be disposed of properly.

**Miniclosures.** In some instances, such as removal of asbestos from a small ventilation system or from a short length of duct, a glove bag may not be either large enough or of the proper shape to enclose the work area. In such cases, a miniclosure can be built around the area where small-scale, short-duration asbestos maintenance or removal work can be performed. Such enclosures should be constructed of 6-mil-thick polyethylene plastic sheeting and can be small enough to restrict entry to the asbestos work area to one worker.

For example, a miniclosure can be built in a small utility closet when asbestos-containing duct covering is to be removed. The enclosure is constructed by:

1. Affixing plastic sheeting to the walls with spray adhesive and tape.
2. Covering the floor with plastic and sealing the plastic covering the floor to the plastic on the walls.
3. Sealing any penetrations such as pipes or electrical conduits with tape.
4. Constructing a small change room (approximately 3 feet square) made of 6-mil-thick polyethylene plastic supported by 2-inch by 4-inch lumber (the plastic should be attached to the lumber supports with staples or spray adhesive and tape).

The change room should be contiguous to the miniclosure, and it is necessary to allow the worker to vacuum off his protective coveralls and remove them before leaving the work area. While inside miniclosure, the worker should wear Tyvek disposable coveralls and use the appropriate HEPA-filtered dual-cartridge or more protective respiratory protection.

The advantages of miniclosures are that they limit the spread of asbestos contamination, reduce the potentiel exposure of bystanders and other workers who may be working in adjacent areas, and are quick and easy to install. The disadvantage of miniclosures is that they may be too small to contain the equipment necessary to create a negative pressure within the enclosure; however, the double layer of plastic sheeting will serve to restrict the release of asbestos fibers to the area outside the enclosure. **Removal of entire structures.** When pipes are insulated with asbestos-containing materials, removal of the entire pipe may be more protective, easier, and more cost-effective than stripping the asbestos insulation from the pipe. Before such a pipe is cut, the asbestos-containing insulation must be wrapped with 3-mil polyethylene plastic and securely sealed with duct tape or equivalent. This plastic covering will prevent asbestos fibers from becoming airborne at a result of the vibration created by the power saws used to cut the pipe. If possible, the pipes should be cut at locations that are not insulated to avoid disturbing the asbestos. If a pipe is completely insulated with asbestos-containing materials, small sections should be stripped using the glove-bag method described above, then the pipe is cut at the stripped sections.

**Enclosure.** The decision to enclose rather than to remove asbestos-containing material from an area depends on the building owner's preference, i.e., for removal or containment. Owners consider such factors as cost effectiveness, the physical configuration of the work area, and the amount of traffic in the area when determining which abatement method to use.

If the owner chooses to enclose the structure rather than to remove the asbestos-containing material insulating it, a solid structure (airtight walls and ceilings) must be built around the asbestos covered pipe or structure to prevent the release of asbestos-containing materials into the area bey-al' the enclosure and to prevent disturbing these materials by casual contact during future maintenance operations. Such a permanent (i.e., for the life of the building) enclosure should be built of new construction materials and should be impact resistant and airtight. Enclosure walls should be made of tongue-and-groove boards having taped seams with spine joints, or gypsum having taped seams. The underlying structure must be able to support the weight of the enclosure. (Suspended ceilings with laid-in panels do not make satisfactory airtight enclosures and should not be used to enclose structures covered with asbestos-containing materials.) All joints between the walls and ceiling of the enclosure should be caulked to prevent the escape of asbestos fibers. During the installation of enclosures, tools that are used (such as drills or rivet tools) should be equipped with HEPA-filtered vacuums. Before constructing the enclosure, all electrical conduits, telephone lines, HVAC ducts, and pipes in the area to be enclosed should be moved to ensure that the enclosure will not have to be reopened later for routine or emergency maintenance. If such lights or other equipment cannot be moved to a new location for logistic reasons, or if moving them will disturb the asbestos-containing materials, removal rather than enclosure of the asbestos-
contaminated materials is the appropriate control method to use.

**Maintenance program.** An asbestos maintenance program must be initiated in all facilities that have friable asbestos-containing materials. Such a program should include:

1. Development of an inventory of all asbestos-containing materials in the facility.
2. Periodic examination of all asbestos-containing materials to detect deterioration.
3. Written procedures for handling asbestos materials during the performance of small-scale, short-duration maintenance and renovation activities.
4. Written procedures for asbestos disposal.
5. Written procedures for dealing with asbestos-related emergencies.

Members of the building's maintenance engineering staff (electricians, heating/air conditioning engineers, plumbers, etc.) who may be required to handle asbestos-containing materials should be trained in safe procedures. Such training should include at a minimum:

1. Information regarding types of ACM and its various uses and forms.
2. Information on the health effects associated with asbestos exposure.
3. Descriptions of the proper methods of handling asbestos-containing materials.
4. Information on the use of HEPA-equipped dual-cartridge respirators and other personal protection during maintenance activities.

**Prohibited activities.** The training program for the maintenance engineering staff should describe methods of handling asbestos-containing materials as well as routine maintenance activities that are prohibited when asbestos-containing materials are involved. For example, maintenance staff employees should be instructed:

1. Not to drill holes in asbestos-containing materials.
2. Not to hang plants or pictures on structures covered with asbestos-containing materials.
3. Not to saw and asbestos-containing floor tile.
4. Not to damage asbestos-containing material's white or furniture or other objects.
5. Not to install curtains, drapes, or dividers in such a way that they damage asbestos-containing materials.
6. Not to dust floors, ceilings, moldings or other surfaces in asbestos-contaminated environments with a dry brush or sweep with a dry broom.

7. Not to use an ordinary vacuum to clean up asbestos-containing debris.
8. Not to remove ceiling tiles below asbestos-containing materials without wearing the proper respiratory protection, clearing the area of other people, and observing asbestos removal waste disposal procedures.
9. Not to remove ventilation system filters dry.
10. Not to shake ventilation system filters.

**Appendix D to Subpart E—Transport and Disposal of Asbestos Waste**

For the purposes of this appendix, transport is defined as all activities from receipt of the containerized asbestos waste at the generation site until it has been unloaded at the disposal site. Current EPA regulations state that there must be no visible emissions to the outside air during waste transport. However, recognizing the potential hazards and subsequent liabilities associated with exposure, the following additional precautions are recommended.

**Recordkeeping.** Before accepting wastes, a transporter should determine if the waste is properly wetted and containerized. The transporter should then require a chain-of-custody form signed by the generator. A chain-of-custody form may include the name and address of the generator, the name and address of the pickup site, the estimated quantity of asbestos waste, types of containers used, and the destination of the waste. The chain-of-custody form should then be signed over to a disposal site operator to transfer responsibility for the asbestos waste. A copy of the form signed by the disposal site operator should be maintained by the transporter as evidence of receipt at the disposal site.

**Waste handling.** A transporter should ensure that the asbestos waste is properly contained in leak-tight containers with appropriate labels, and that the outside surfaces of the containers are not contaminated with asbestos debris adhering to the containers. If there is reason to believe that the condition of the asbestos waste may allow significant fiber release, the transporter should not accept the waste. Improper containerization of wastes is a violation of the NESHAPs regulation and should be reported to the appropriate EPA-Regional Asbestos NESHAPs contact below:

**Region I**

Asbestos NESHAPs Contact, Air & Waste Management Division, USEPA, Region I, JFK Federal Building, Boston, MA 02203, (617) 223-3266.
utilize a canvas covering sufficient to cause the waste containers to rupture. The waste containers should not be used because these will cause the waste containers to rupture. Vacuum trucks used to transport waste slurry must be inspected to ensure that water is not leaking from the truck.

Disposal involves the isolation of asbestos waste material in order to prevent fiber release to air or water. Landfilling is recommended as an environmentally sound isolation method because asbestos fibers are virtually immobile in soil. Other disposal techniques such as incineration or chemical treatment are not feasible due to the unique properties of asbestos. EPA has established asbestos disposal requirements for active and inactive disposal sites under NESHAPs (40 CFR Part 87, Subpart M) and specifies general requirements for solid waste disposal under RCRA (40 CFR Part 257). Advance EPA notification of the intended disposal site is required by NESHAPs.

Selecting a disposal facility. An acceptable disposal facility for asbestos wastes must adhere to EPA's requirements of no visible emissions to the air during disposal, or minimizing emissions by covering the waste within 24 hours. The minimum required cover is 6 inches of nonasbestos material, normally soil, or a dust-suppressing chemical. In addition to these federal requirements, many state or local government agencies require more stringent handling procedures. These agencies usually supply a list of "approved" or licensed asbestos disposal sites upon request. Solid waste control agencies are listed in local telephone directories under state, county, or city headings. A list of state solid waste agencies may be obtained by calling the RCRA hotline: 1-800-424-9346 (382-3000 in Washington, DC).

Some landfill owners or operators place special requirements on asbestos waste, such as placing all bagged waste into 55-gallon drums. Therefore, asbestos removal contractors should contact the intended landfill before arriving with the waste.

Receiving asbestos waste. A landfill approved for receipt of asbestos waste should require notification, by the waste hauler that the load contains asbestos. The landfill operator should inspect the loads to verify that asbestos waste is properly contained in leak-tight containers and labeled appropriately. The appropriate EPA Regional Asbestos NESHAPs Contact should be notified if the landfill operator believes that the asbestos waste is in a condition that may cause significant fiber release during disposal. In situations when the wastes are not properly containerized, the landfill operator should thoroughly soak the asbestos with a water spray prior to unloading. Run out the truck, and immediately cover the wastes with nonasbestos material prior to compacting the waste in the landfill.

Waste deposition and covering. Recognizing the health dangers associated with asbestos exposure, the following procedures are recommended to augment current federal requirements:

- Designate a separate area for asbestos waste disposal. Provide a record for future landowners that asbestos waste has been buried there and that it would be hazardous to attempt to excavate that area. (Future regulations may require property deeds to identify the location of any asbestos wastes and warn against excavation.)

- Prepare a separate trench to receive asbestos wastes. The size of the trench will depend upon the quantity and frequency of asbestos waste delivered to the disposal site. The trenching technique allows application of soil cover without disturbing the asbestos waste containers. The trench should be ramped to allow the transport vehicle to back into it, and the trench should be as narrow as possible to reduce the amount of cover required. If possible, the trench should be aligned perpendicular to prevailing winds.

- Place the asbestos waste containers into the trench carefully to avoid breaking them. Be particularly careful with plastic bags because when they break under pressure asbestos particles can be emitted.

- Completely cover the containerized waste within 24 hours with a minimum of 6 inches of nonasbestos material. Improperly containerized waste is a violation of the NESHAPs and EPA should be notified.

- However, if improperly containerized waste is received at the disposal site, it should be covered immediately after unloading. Only after the wastes, including properly containerized wastes, are completely covered, can the wastes be compacted or otherwise handled. Run over it. During compacting, avoid exposing wastes to the air or tracking asbestos material away from the trench.

- For final closure of an area containing asbestos waste, cover with at least an additional 30 inches of compacted nonasbestos material to provide a 36-inch final cover. To control fiber release during disposal, it should be properly graded and vegetated. In areas of the United States where excessive soil erosion may occur or the frost line exceeds 3 feet, additional final cover is recommended. In desert areas where vegetation would be difficult to maintain, 3- to 6 inches of well graded crushed rock is recommended for placement on top of the final cover.

Controlling public access. Under the current NESHAPs regulation, EPA does not require that a landfill used for asbestos disposal use warning signs or fencing if it meets the requirements to cover asbestos wastes. However, under RCRA, EPA requires that access be controlled to prevent exposure of the public to potential health and safety hazards at the disposal site. Therefore, for liability protection of operators of landfills that handle asbestos, fencing and warning signs are recommended to control public access when natural barriers do not exist. Access to a landfill should be limited to one or two entrances with gates that can be locked when left unattended. Fencing should be installed around the perimeter of the disposal site in a manner adequate to deter access by the general public. Chain-link fencing, 6-ft high and topped with a barbed wire guard, should be used. More specific fencing requirements may be specified by local regulations. Warning signs should be displayed at all entrances and at intervals of 330 feet or less along the property line of the landfill or perimeter of the sections where asbestos waste is deposited. The sign should read as follows:

ASBESTOS WASTE DISPOSAL SITE

BREATHING ASBESTOS DUST MAY CAUSE LUNG DISEASE AND CANCER

Recordkeeping. For protection from liability, and considering possible future requirements for notification on disposal site deeds, a landfill owner should maintain documentation of the specific location and quantity of the buried asbestos wastes. In addition, the estimated depth of the waste below the surface should be recorded whenever a landfill section is closed. As mentioned previously, such information should be recorded in the deed or record along with a notice warning against excavation of the area.

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BILLING CODE 6560-50-M
ENVIRONMENTAL PROTECTION AGENCY
{OPTS-62055; FRL-3269-8}
Asbestos-Containing Materials in Schools; EPA Approved Courses Under the Asbestos Hazard Emergency Response Act (AHERA)
AGENCY: Environmental Protection Agency (EPA).

ACTION: Notice.

SUMMARY: In section 206(c)(3) of Title II, the Administrator, in consultation with affected organizations, was directed to publish (and revise as necessary) a list of asbestos courses and tests in effect before the date of enactment of this title which qualify for equivalency treatment for interim accreditation purposes and a list of asbestos courses and tests which the Administrator determines are consistent with the Model Plan and which will qualify a contractor for accreditation. This Federal Register notice includes the initial list of course approvals. In addition, the list includes State accreditation programs that EPA has approved as meeting the requirements of the Model Plan.


SUPPLEMENTARY INFORMATION: Section 206 of Title II of the Toxic Substances Control Act (TSCA), 15 U.S.C. 2646, required EPA to develop by April 20, 1987 a Model Contractor Accreditation Plan. The Plan was issued on April 20, 1987, as Appendix C to Subpart E, 40 CFR Part 783.

To conduct asbestos-related work in schools, persons must receive accreditation in order to inspect school buildings, asbestos abatement, management plans, and conduct response actions. Such persons can be accredited by States, which are required to adopt contractor accreditation plans at least as stringent as the Model Plan. Such States must include in their accreditation programs an examination and participate in annual re-training courses. A complete description of accreditation requirements can be found in the Model Accreditation Plan at 40 CFR Part 783.

Three types of EPA approvals are included in this Federal Register notice. Unit I discusses EPA approval of State accreditation programs. Unit II covers EPA approval of training courses. Unit III discusses EPA approval of training courses for interim accreditation. Lastly, Unit IV provides the list of State accreditation programs and training courses approved by EPA as of October 1987. Subsequent Federal Register notices will add other State programs and training courses to this initial list.

I. EPA Approval of State Accreditation Programs

As discussed in the Model Plan, EPA will approve State accreditation programs that the Agency determines are at least as stringent as the Model Plan. In addition, the Agency is able to approve individual disciplines within a State's accreditation program. For example, a State that currently only has an accreditation requirement for asbestos abatement can receive EPA approval for that discipline immediately rather than waiting to develop accreditation requirements for all disciplines in the Model Plan before seeking EPA approval.

As listed in Unit IV, New Jersey has received EPA approval for two accreditation disciplines. Any training courses in these two disciplines approved by New Jersey are EPA-approved courses for purposes of accreditation. In addition, New Jersey is the Agency's first State to have a Model Plan. The State is New Jersey's first State. The Agency is able to approve State accreditation programs that the Agency determines are at least as stringent as the Model Plan. In addition, the Agency is able to approve individual disciplines within a State's accreditation program. For example, a State that currently only has an accreditation requirement for asbestos abatement can receive EPA approval for that discipline immediately rather than waiting to develop accreditation requirements for all disciplines in the Model Plan before seeking EPA approval.

As listed in Unit IV, New Jersey has received EPA approval for two accreditation disciplines. Any training courses in these two disciplines approved by New Jersey are EPA-approved courses for purposes of accreditation. In addition, the Agency is able to approve State accreditation programs that the Agency determines are at least as stringent as the Model Plan. In addition, the Agency is able to approve individual disciplines within a State's accreditation program. For example, a State that currently only has an accreditation requirement for asbestos abatement can receive EPA approval for that discipline immediately rather than waiting to develop accreditation requirements for all disciplines in the Model Plan before seeking EPA approval.

II. EPA Approval of Training Courses

Training courses approved by EPA are listed under Unit IV. The examinations for these approved courses under Unit IV have also been approved by EPA. EPA has three categories of course approval: full, contingent, and approved for interim accreditation. Courses...
approved for interim accreditation will be discussed in Unit III.

Full approval means EPA has reviewed and found acceptable the course’s written submission seeking EPA approval and has conducted an on-site audit and determined that the training course meets or exceeds the Model Plan’s training requirements for the relevant discipline.

Contingent approval means the Agency has reviewed the course’s written submission seeking EPA approval and found the materials to be acceptable (i.e. the written course materials meet the Model Plan’s training course requirements). However, EPA has not yet conducted an on-site audit.

Successful completion of either a fully approved course or a contingently approved course provides full accreditation for course attendees. If EPA subsequently audits a contingently approved course and with-draws approval due to deficiencies discovered during the audit, future course offerings would no longer have EPA approval. However, withdrawal of EPA approval would not effect the accreditation of persons who took previously offered training courses including the course audited by EPA.

EPA-approved training courses listed under Unit IV are approved on a national basis. EPA has organized Unit IV by EPA Region to assist the public in locating those training courses that are offered nearby.

EPA-approved State accreditation programs have the authority to have more stringent accreditation requirements than the Model Plan. As a result, some EPA-approved training courses listed under Unit IV may not meet the requirements of a particular State’s accreditation program. Sponsors of training courses and persons who have received accreditation or are seeking accreditation should contact individual States to check on accreditation requirements.

A number of training courses offered by several universities before EPA issued the Model Plan equaled or exceeded the subsequently issued Model Plan’s training course requirements. These courses are listed under Unit IV as being fully approved. It should be noted that persons who successfully completed these courses are fully accredited; they are not limited only to being intermittently accredited.

III. EPA Approval of Training Courses for Interim Accreditation

TSCA Title II enables EPA to permit persons to be accredited on an interim basis if they have attended previously EPA-approved asbestos training courses and have passed (or pass) an asbestos exam. As a result, the Agency is approving training courses offered previously for purposes of persons on an interim basis. Only those persons who have taken training courses since January 1, 1985 will be considered under these interim accreditation provisions. In addition, EPA will not grant interim accreditation to any person who takes an equivalent training course after the date the asbestos-in-schools rule takes effect. This accreditation is interim since the person shall be considered accredited for only 1 year after the date on which the State where the person is employed establishes an accreditation program at least as stringent as the EPA Model Plan. If the State does not adopt an accreditation program within the time period required by Title II, persons with interim accreditation must become fully accredited within 1 year after the date the State was required to have established a program.

For purposes of the Model Plan, an equivalent training course is one that is essentially similar in length and content to the curriculum found in the Model Plan. In addition, an equivalent examination must be essentially similar to the examination requirement found in the Model Plan.

Persons who have taken equivalent courses in their discipline for purposes of interim accreditation, and can produce evidence that they have successfully completed the course by passing an examination, are accredited on an interim basis under TSCA Title II. Evidence of successful completion of a course would include a certificate or photo identification card that showed the person completed the training course on a certain date and passed the examination.

For persons who took one of the EPA-approved courses for interim accreditation listed under Unit IV, but did not take the course’s examination, these persons may become intermittently accredited by passing an examination at an EPA-funded training center. These EPA funded training centers are listed under Unit IV. Before taking the examination, persons must provide evidence to the EPA-funded center that they previously had taken one of the training courses listed under Unit IV that is approved by EPA for interim accreditation.

Courses approved by EPA as of October 17 for interim accreditation are listed under Unit IV. Examinations offered by these courses are also approved for purposes of interim accreditation. EPA expects to approve additional courses for intermittent accreditation purposes, and will list these courses in subsequent Federal Register notices. Training course vendors that believe their courses offered since January 1, 1985 are suitable sources for interim accreditation should contact their EPA Regional asbestos coordinator (See addresses in Unit IV).

IV. List of EPA-Approved State Accreditation Programs and Training Courses

Below is the first listing of EPA-approved State accreditation programs and training courses. As discussed above, periodic notifications of EPA approval of State accreditation programs and EPA approval of training courses will be published in subsequent Federal Register notices. The closing date for the acceptance of submissions to EPA for inclusion in this first notice was early October. Omission from this list does not imply disapproval by EPA. nor does the order of the courses reflect priority or quality. The format of the notification lists first the State accreditation programs approved by EPA, followed by EPA-approved training courses listed by Region. The name, address, phone number, and contact person is provided for each training provider followed by the names and type of course approved (i.e., full, contingent, or for interim purposes). Unless otherwise specified by an alternative date, interim approvals are issued from January 1, 1985.

All five of the EPA-funded asbestos information centers and the three EPA-funded satellite training centers will use the EPA model inspector and management planning courses offered since January 1, 1985. As a result, EPA anticipates that all of the EPA-funded training facilities will receive approvals for inspection and management planning courses offered beginning in October. Currently, the EPA-funded centers at the Georgia Institute of Technology and the University of Illinois at Chicago have received interim training service contracts. These centers have inspection and management planning courses that EPA has fully approved. The five centers are: The Georgia Institute of Technology; the Georgia Institute of Technology in Atlanta, Georgia; the University of Kansas in Overland Park, Kansas; Tufts University in Medford, Massachusetts; the University of Illinois at Chicago, and the University of California at Berkeley. The three satellite centers are: The University of Texas at Arlington; the Robert Wood Johnson Medical School in Piscataway, New Jersey; and Temple University in Philadelphia. Pennsylvania The University of Texas at Arlington has received continuer:
(b) Approved courses. Abatement Worker (full from beginning).
(b) Approved courses. Abatement Worker (full from beginning).
Region III—Philadelphia, PA
Regional asbestos coordinator.
List of approved courses. The following training courses have been approved by EPA. The courses are listed under (b). This approval is subject to the level of certification indicated after the course name. Courses are listed in alphabetical order and do not reflect a prioritization. Approvals for Region III training courses and contact points for each are as follows:
(b) Approved courses. Abatement Workers (contingent).
(b) Approved courses. Abatement Worker (full 5/19/87).
(3) Training provider. Biospherics, Inc., 12051 Indian Creek Court, Beltsville, MD 20705. Attn: Marian F. Meiselman (301) 369-3900.
(b) Approved courses. Abatement Worker (full 5/19/87).
(b) Approved courses. Abatement Worker (full from beginning).
(b) Approved courses. Abatement Worker (full from beginning).
Region II—Edison, NJ
Regional asbestos coordinator.
List of approved courses. The following training courses have been approved by EPA. The courses are listed under (b). This approval is subject to the level of certification indicated after the course name. Courses are listed in alphabetical order and do not reflect a prioritization. Approvals for Region II training courses and contact points for each are as follows:
(1) Training provider. UMDNJ Robert Wood Johnson Medical School, 775 Hoes Lane, Piscataway, NJ 08854-5635. Attn: Lee Lausteen (201) 469-4500.
(b) Approved courses. Abatement Worker (full from beginning).

(Eric)
List of approved courses. The following training courses have been approved by EPA. The courses are listed under (b). This approval is subject to the level of certification indicated after the course name. Courses are listed in alphabetical order and do not reflect a prioritization. Approvals for Region IV training courses and contact points for each are as follows:


(b) Approved courses. Abatement Workers (2 day) (interim from 10/87). Refresher Course for Abatement Worker (2 day course) (interim prior to 10/87). Abatement Worker (3 day course) (contingent).


(b) Approved courses. Contractor/Supervisor (full from beginning). Workers (full from beginning).

(3)(a) Training provider. Medical College of Virginia, Virginia Commonwealth University, Department of Preventive Medicine, P.O. Box 212, Richmond, VA 23298. Attn: Leonard Vance (804) 788-9785.

(b) Approved courses. Contractor/Supervisor (contingent).

(4)(a) Training provider. WACO, Inc., P.O. Box 836, 5450 Lewis Road, Sandston, VA 23210. Attn: William Bels.ich (804) 222-0440.

(b) Approved courses. Contractor/Supervisor (contingent). Abatement Workers (full from beginning).

Region IV--Atlanta, GA

Regional asbestos coordinator. Jim Littell. EPA Region IV, 345 Courtland St. NE, Atlanta, GA 30365. (404) 347-3864.

F(FTS) 257-3864.

List of approved courses. The following training courses have been approved by EPA. The courses are listed under (b). This approval is subject to the level of certification indicated after the course name. Courses are listed in alphabetical order and do not reflect a prioritization. Approvals for Region IV training courses and contact points for each are as follows:


(b) Approved courses. Contractor/Supervisor (full from 5/11/87).


(b) Approved courses. Contractor/Supervisor (full from 5/11/87).


(b) Approved courses. Contractor/Supervisor (full from beginning). Workers (full from beginning). Abatement Workers (3 day) (full from 7/67).

Region V--Chicago, IL

Regional asbestos coordinator. Anthony Resalino, EPA Region IV

Clark St., Chicago, IL 60604. (312) 666-6879. (FTS) 888-6879.

List of approved courses. The following training courses have been approved by EPA. The courses are listed under (b). This approval is subject to the level of certification indicated after the course name. Courses are listed in alphabetical order and do not reflect a prioritization. Approvals for Region VI training courses and contact points for each are as follows:


(b) Approved courses. Asbestos Workers (full from 8/28/87). Asbestos Workers (interim prior to 8/10/87).


(b) Approved courses. Asbestos Workers (full from 9/14/87). Abatement Worker (2 day course) (full from beginning). Worker refresher course (contingent).


(b) Approved courses. Contractor/Supervisor (full from beginning). Inspector/Management Planner (full from beginning).


(b) Approved courses. Contractor/Supervisor (full from 9/14/87). Abatement Worker (full from beginning). Inspector/Management Planner (full from beginning).

Region VII--Kansas City, KS

Regional asbestos coordinator. Wolfgang Brandner, EPA Region VII.

Wolfgang Brandner, EPA Region VII. 728 Minnesota Ave., Kansas City, KS 66101.

(913) 239-2834, (FTS) 757-2834.

List of approved courses.

The following training courses have been approved by EPA. The courses are listed under (b). This approval is subject to the level of certification indicated after the course name. Courses are listed in alphabetical order and do not reflect a prioritization.
approved by EPA. The courses are listed under (b). This approval is subject to the level of certification indicated after the course name. Courses are listed in alphabetical order and do not reflect a prioritization. Approvals for Region VII training courses and contact points for each, are as follows:

1(a) Training provider. Hall-Kimbrell Environmental Services, 4840 West 15th St., Lawrence, KS 66046. Attn: Alice Hart (913) 749-2361.
(b) Approved courses. Contractor/Supervisor (full from 8/17/87). Abatement Worker (full from 8/17/87). Project Designer (full from 8/17/87). Inspector/Management Planner (full from 8/17/87).

(b) Approved courses. Contractor/Supervisor (contingent). Abatement Worker (contingent).


Region VIII—Denver, CO
Regional asbestos coordinator. David Combs, [8AT-TS], EPA, Region VIII, 1 Denver Place, 999-18th St., Suite 1300, Denver, CO 80202-2413. (303) 564-1730, (FTS) 564-1742.
List of approved courses. The following training courses have been approved by EPA. The courses are listed under (b). This approval is subject to the level of certification indicated after the course name. Courses are listed in alphabetical order and do not reflect a prioritization. Approvals for Region VIII training courses and contact points for each, are as follows:

1(a) Training provider. Northern Engineering and Testing, Inc. 600 South 25th Street, P.O. Box 30615, Billings, MT 59107. Attn: Kathleen Smit (406) 248-9161.
(b) Approved courses. Asbestos Worker (contingent).

2(a) Training provider. Rocky Mountain Center for Occupational and Environmental Health, Building 512, University of Utah, Salt Lake City, UT 84112. Attn: Jeffery Lee (801) 581-5710.
(b) Approved courses. Contractor/Supervisor (contingent).

Region IX—San Francisco, CA
List of approved courses. The following training courses have been approved by EPA. The courses are listed under (b). This approval is subject to the level of certification indicated after the course name. Courses are listed in alphabetical order and do not reflect a prioritization. Approvals for Region IX training courses and contact points for each, are as follows:

(b) Approved courses. Inspector/Management Planner (full).

(b) Approved courses. Contractor/Supervisor (full from beginning).

Region X—Seattle, WA
List of approved courses. The following training courses have been approved by EPA. The courses are listed under (b). This approval is subject to the level of certification indicated after the course name. Courses are listed in alphabetical order and do not reflect a prioritization. Approvals for Region X training courses and contact points for each, are as follows:

No approvals for Region X.

Lee M. Thomas, Administrator.