AHERA Asbestos Management Plan
Self-Audit Checklist for Designated Persons

Ready, Set, Go!

- Inspections & Reinspections
- Response Actions
- Operations & Maintenance
- Other AHERA Activities

Healthy School Environments
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AHERA Asbestos Management Plan
Self-Audit Checklist for Designated Persons

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Introduction

Under the Asbestos Hazard Emergency Response Act (AHERA) of 1986, EPA published on October 30, 1987 the Asbestos-Containing Materials in Schools rule (hereinafter referred to as the AHERA rule), 40 CFR Part 763, Subpart E. The AHERA rule became effective on December 14, 1987 and applies to all non-profit elementary and secondary schools nationwide, both public and private. Local Education Agencies (LEAs) are responsible for ensuring compliance with the AHERA rule and are required, among other things, to develop and maintain an up-to-date Asbestos Management Plan (AMP), conduct training, inspections and sampling related to asbestos, manage asbestos properly and provide yearly notification to parents, teachers and employee organizations about the AMP and any asbestos-related activities.

LEAs are also responsible for designating a contact person known as the Designated Person (DP) to oversee asbestos-related activities in the school and ensure that the AHERA responsibilities of the LEA are met. The quality of a school's asbestos program depends heavily upon the dedication and work of the DP with the support of the LEA. The LEA and the DP work together to ensure that each school is in compliance with federal, state and local asbestos regulations and that there are no uncontrolled releases of asbestos fibers in the school which could pose a health threat to children and school workers.

Even though the AHERA rule has been in place for years, EPA and the states have found that compliance issues remain, particularly in the area of schools maintaining and updating their AMPs to reflect current reinspection information, operation and maintenance activities, periodic surveillance and response/post-response actions. An up-to-date compliant AMP is key to the success of a school's asbestos program and the protection of children's and school workers' health. In order to enhance compliance, EPA Region 2 has developed this “AHERA Asbestos Management Plan Self-Audit Checklist for Designated Persons” and a companion guidance document, a “Model AHERA Asbestos Management Plan for Local Education Agencies.” It is recommended that the Checklist be reviewed first in order to quickly identify any potential deficiencies in the school's AMP.

This AHERA Asbestos Management Plan Self Audit Checklist for Designated Persons is designed to help the DP determine whether or not the school has an up-to-date compliant AMP. The Checklist is divided into six sections: General Information, Inspections and Reinspections, Response Actions, Operations and Maintenance, Periodic Surveillance and Notification. Each section of the Checklist contains questions to guide the DP through a detailed compliance assessment of the school's AMP with check boxes for Yes, No or Not Applicable. Supporting regulatory citations are provided on the Checklist along with spaces for the DP to make notes. Following the Checklist is a Glossary and a list of Acronyms.
The companion guidance document, a Model AHERA Asbestos Management Plan for Local Education Agencies, provides step-by-step instructions for developing an AMP utilizing a suggested standardized format. This document contains suggested forms for including in the school's AMP and tracks the format of the Checklist: General Information, Inspections and Reinspections, Response Actions, Operations and Maintenance, Periodic Surveillance and Notification. Following the forms is a Glossary and a list of Acronyms. For convenience, tips are included in the Checklist which note the corresponding suggested forms that should be completed in the Model AHERA AMP.

Please note that the EPA Region 2 Model AMP forms and Checklist are not a substitute for the applicable legal requirements, are not regulations themselves, and are not required to be used/completed under AHERA. Rather, they are provided by EPA as guidance to enhance schools' compliance with EPA AHERA regulations regarding the required documentation that must be included in the AMP. These documents do not impose legally binding requirements on any party, including EPA, states, or the regulated community, and are not intended and cannot be relied upon to create any rights, substantive or procedural, enforceable by any party in litigation with the United States. Please contact your state asbestos coordinator for information on any applicable state regulations/AMP forms.

If you have any questions on these guidance documents, please call Deborah Craig, EPA Region 2 Asbestos Outreach Coordinator, at (212) 637-3521 or e-mail her at craig.deborah@epa.gov. These guidance documents are available on the EPA website at http://www.epa.gov/asbestos/pubs/asbestos_in_schools.html. For additional asbestos information, please contact the EPA Region 2 Asbestos Coordinator Gaetano LaVigna by phone at (212) 637-4069 or by e-mail at lavigna.gaetano@epa.gov. The EPA Region 2 Caribbean Asbestos Contact is Carlos M. Rivera and he can be reached by phone at (787) 977-5846 or by e-mail at rivera.carlos@epa.gov.

For any additional asbestos information, please contact your state/EPA asbestos coordinator or call EPA's Toxic Substances Control Act (TSCA) Hotline at (202) 554-1404 or the EPA Asbestos Ombudsman at (800) 368-5888, or visit EPA's website at http://www.epa.gov/asbestos/pubs/asbestos_in_schools.html. A list of state/EPA asbestos coordinators is provided on the EPA website.
# AHERA Asbestos Management Plan
## Self-Audit Checklist for Designated Persons

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<td>Date Checklist Completed by Designated Person:</td>
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### General Information

1. Has an Asbestos Management Plan been developed for your school?
   
   (40 CFR § 763.93)

2. Does the Local Education Agency (LEA) have a complete and up-to-date copy of the school's management plan in both the LEA’s administrative office and the school’s administrative office?
   
   (40 CFR § 763.93(g)(2)-(3))

3. Was the management plan developed by an accredited management planner?
   
   Did you know? Your LEA may require each management plan to contain a statement signed by an accredited management plan developer that he/she has prepared or assisted in the preparation of the plan or has reviewed the plan and that the plan is in compliance with 40 CFR 763, Subpart E. The management plan developer that signs the statement may not also implement the plan (40 CFR § 763.93(f)).
   
   (40 CFR § 763.93(e))

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*References to Model Asbestos Management Plan (AMP) forms are to the forms contained in EPA Region 2's guidance manual entitled: “Model AHERA Asbestos Management Plan for Local Education Agencies.” The Model AMP forms and this Self-Audit Checklist are not a substitute for the applicable legal requirements, are not regulations themselves, and are not required to be used/completed under AHERA. Rather, they are provided by EPA Region 2 as guidance to enhance schools’ compliance with EPA AHERA regulations regarding the required documentation that must be included in the AMP. These documents do not impose legally binding requirements on any party, including EPA, states, or the regulated community, and are not intended and cannot be relied upon to create any rights, substantive or procedural, enforceable by any party in litigation with the United States. Please contact your state asbestos coordinator for any applicable state regulations/AMP Forms.*

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4. For each consultant who contributed to the management plan, does the plan include the following:
   - consultant’s name?
   - a statement that he/she is accredited under the state accreditation program or another state’s accreditation program or an EPA-approved course?
   
   (40 CFR § 763.93 (e)(12)(i)-(ii))

Note: Although not required, EPA suggests including in the AMP the name of the training agency, the course name and date, and a copy of the accreditation certificate for each consultant.

*Tip: See suggested Model AMP Form 1 - Contact Information

5. Does the management plan include a list of the name and address of each building used as a school building and identify whether the school building has:
   - friable ACBM (asbestos-containing building material)?
   - non-friable ACBM?
   - friable and non-friable suspected ACBM assumed to be ACM (asbestos-containing material)?

   (40 CFR §§ 763.93(a)(1)-(2) and 763.93(e)(1))

*Tip: See Model AMP Form 2 - School Building List

6. If a new school building was constructed after October 12, 1988 and is asbestos-free, does the management plan include the following and has a copy of same been provided by the LEA to the EPA Regional Office:
   - a statement signed by an architect or project engineer responsible for the construction of the building, or by an accredited inspector, indicating that no ACBM was specified as a building material in any construction document for the building, or, to the best of his or her knowledge, no ACBM was used as a building material in the building?

   (40 CFR § 763.99(a)(7))

*Tip: See Model AMP Form 2 - School Building List

7. Does the management plan include a copy of any of the statements required under 40 CFR § 763.99(a)(1)-(7) to support an exclusion from inspection that the school may qualify for under 40 CFR § 763.99 and has a copy of any such statement been provided by the LEA to the Regional Office?

   (40 CFR § 763.99)

Note: The exclusion under 40 CFR § 763.99(a)(7) is also covered under Checklist question number 6.
8. Does the management plan include the following information about the LEA Designated Person (DP):
   - Name, address, and telephone number of the DP?
   - Course name, dates, and hours of training that the DP attended to carry out his or her AHERA duties?
   - Signed statement by the DP that the LEA’s general responsibilities under 40 CFR § 763.84 have been or will be met?

   (40 CFR § 763.93(c)(4) and (i))

   Note: Although not required, EPA suggests including in the AMP the name of the training agency and a copy of the DP's training certificates.

   *Tip: See Model AMP Form 1 - Contact Information and Form 3 - Designated Person Assurances

9. Does the management plan include the following recommendations:
   - A plan for reinspection required under 40 CFR § 763.85?
   - A plan for operations and maintenance activities (including initial cleaning) required under 40 CFR § 763.91?
   - A plan for periodic surveillance required under 40 CFR § 763.92?
   - A description of the management planner’s recommendation for additional cleaning under 40 CFR § 763.91(c)(2), as part of an operations and maintenance program, and the response of the LEA to that recommendation?

   (40 CFR § 763.93(e)(9))

   *Tip: See Model AMP Form 10 - Plan for Reinspection, Form 14 - Plan for Operations and Maintenance Activities, Form 18 - Periodic Surveillance Plan/Report, and Form 16 Cleaning Record

10. Does the management plan include an evaluation of resources needed to carry out response actions, reinspections, operations and maintenance, and periodic surveillance and training?

    (40 CFR § 763.93(e)(11))

    *Tip: See suggested Model AMP Form 4 - Evaluation of Resources

11. Does the management plan include a record of the minimum 2 hours of awareness training required under 40 CFR § 763.92(a)(1) for all maintenance and custodial staff who may work in a building that contains ACBM, whether or not they are required to work with ACBM, and does the record include the following information:
   - person’s name and job title?
   - date training was completed?
   - location of training?
   - number of hours completed?

    (40 CFR §§ 763.93(h) and 763.94(c))

    Did you know? New custodial and maintenance employees must be trained within 60 days after starting work (40 CFR §763.92(a)(1)).

    Note: Although not required, EPA suggests including in the AMP the name of the training agency, the course name, and a copy of the accreditation certificate for each staff person.

    *Tip: See Model AMP Form 5 - Training Record for Maintenance and Custodial Staff
12. Does the management plan include a record of the additional 14 hours of training required under 40 CFR § 763.92(a)(2) for maintenance and custodial staff who conduct any activities that will result in the disturbance of ACBM and does the record include the following information:

- person’s name and job title?
- date training was completed?
- location of training?
- number of hours completed?

(40 CFR §§ 763.93(h) and 763.94(c))

Note: Although not required, EPA suggests including in the AMP the name of the training agency, the course name, and a copy of the accreditation certificate for each staff person.

*Tip: See Model AMP Form 5 - Training Record for Maintenance and Custodial Staff

### Inspections and Reinspections

13. For inspections conducted before 12/14/87 (i.e., the effective date of the 10/30/87 EPA Asbestos-Containing Materials in Schools rule), does the management plan include the following information:

- date of inspection?
- blueprint, diagram or written description of each school building that identifies clearly each location and approximate square or linear footage of homogenous/sampling area sampled for ACM?
- if possible, the exact locations where the bulk samples were collected and the dates of collection?
- a copy of the analyses of any bulk samples, dates of analyses, and a copy of any other laboratory reports pertaining to the analyses.
- description of response actions or preventive measures taken, including, if possible, the names and addresses of all contractors, start and completion dates and air clearance sample results?
- description of assessments of material identified prior to 12/14/87 as friable ACBM or friable suspected ACBM assumed to be ACM, and the name, signature, state of accreditation and if, applicable, the accreditation number of the person making the assessments (i.e., inspector)?

(40 CFR § 763.93(e)(2)(i)-(v))

*Tip: See Model AMP Form 6 - Inspection Cover Sheet, Form 8 - Homogeneous Area/Bulk Sample Summary, Form 9 - Homogeneous Area/Bulk Sample Diagram, Form 12 - Implementation of Response Actions, and Form 7 - Room/Functional Space Assessment

14. Does the management plan include for each inspection and reinspection conducted under 40 CFR § 763.85 the following information:

- date of the inspection or reinspection?
- name, signature, state of accreditation, and, if applicable, the accreditation number for each accredited inspector performing the inspection or reinspection?

(40 CFR § 763.93(e)(3)(i))

Note: Although not required, EPA suggests including in the AMP the name of the training agency, the course name and date, and a copy of the accreditation certificate for each inspector.

*Tip: See Model AMP Form 6 - Inspection Cover Sheet
15. Does the management plan include for each inspection and reinspection conducted under 40 CFR § 763.85 the following sampling information:

- Blueprint, diagram, or written description of each school building that identifies clearly each location and approximate square or linear footage of homogeneous areas where material was sampled for ACM?
- Exact location where each bulk sample was collected and the date of collection of each bulk sample?
- Homogeneous areas where friable suspected ACBM is assumed to be ACM?
- Homogeneous areas where nonfriable suspected ACBM is assumed to be ACM?
- Description of the manner used to determine sampling locations?
- The name, signature, state of accreditation, and, if applicable, the accreditation number for each accredited inspector that collected samples?

(40 CFR § 763.93(e)(3)(ii)-(iii))

Note: For details on how to collect bulk samples, see 40 CFR § 763.86. Although not required, EPA suggests including in the AMP the name of the training agency, the course name and date, and a copy of the accreditation certificate for each inspector that collected the samples.

*Tip: See Model AMP Form 6 - Inspection Cover Sheet, Form 8 - Homogeneous Area/Bulk Sample Summary, and Form 9 - Homogeneous Area/Bulk Sample Diagram

16. Does the management plan include for each inspection and reinspection conducted under 40 CFR § 763.85 the following information on the analysis of the bulk samples and has it been submitted to the DP for inclusion in the plan within 30 days of the analysis:

- Copy of the analysis of any bulk samples collected and analyzed?
- Name and address of any laboratory that analyzed bulk samples?
- A statement that any laboratory used meets the applicable laboratory accreditation requirements of 40 CFR § 763.87(a)?
- Dates of any analyses performed?
- Name and signature of the person performing each analysis?

(40 CFR §§ 763.87(d) and 763.93(e)(3)(iv))

Note: For details on how to submit bulk samples for analysis, see 40 CFR § 763.87.

17. Does the management plan include for each inspection and reinspection conducted under 40 CFR § 763.85 the following assessment information and has it been submitted to the DP for inclusion in the plan within 30 days of the assessment:

- Written assessments (signed and dated) required to be made under 40 CFR § 763.88 of all ACBM and suspected ACBM assumed to be ACBM?
- Name, signature, state of accreditation, and, if applicable, the accreditation number of each accredited person making the assessment (i.e., inspector(s))

(40 CFR §§ 763.88(a)(2) and 763.93(e)(3)(v))

Note: Although not required, EPA suggests including in the AMP the name of the training agency, the course name and date, and a copy of the accreditation certificate for each inspector making the assessment.

*Tip: See Model AMP Form 6 - Inspection Cover Sheet and Form 7 - Room/Functional Space Assessment
18. Has the following information about the inspection been recorded and submitted to the DP for inclusion in the management plan within 30 days of the inspection:

- Inspection report with the date of inspection signed by each accredited inspector making the inspection, the state of accreditation, and if applicable, his/her accreditation number?
- 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?
- 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?
- List of whether the homogeneous areas identified under 40 CFR § 763.85(a)(4)(vi)(B) of this section, are surfacing material, thermal system insulation, or miscellaneous material?
- Assessments of friable material (signed and dated), the name and signature of each accredited inspector making the assessment, state of accreditation, and if applicable, his or her accreditation number?

(40 CFR §§ 763.85(a)(4)(vi)(A)-(E) and 763.88(a)(2))

Note: For further details on activities conducted during an inspection (e.g., visually inspect/touch material), see 40 CFR § 763.85(a)(4)(i)-(v)

*Tip: See Model AMP Form 6 - Inspection Cover Sheet, Form 7 - Room/Functional Space Assessment, Form 8 - Homogeneous Area/Bulk Sample Summary and Form 9 - Homogeneous Area/Bulk Sample Diagram

19. Has the following information about the reinspection been recorded and submitted to the DP for inclusion in the management plan within 30 days of the reinspection:

- Date of reinspection, 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 ACBM?
- Exact location where samples were 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?
- Any assessments or reassessments of friable material, date of the assessment or reassessment, the name and the signature of the accredited inspector making the assessments, state of accreditation, and if applicable, his or her accreditation number?

(40 CFR §§ 763.85(b)(3)(vii)(A) - (C) and 763.88(a)(2))

Note: At least once every 3 years after a management plan has been in effect, a reinspection must be conducted by an accredited inspector of all friable and nonfriable known or assumed ACBM in each school building that the LEA leases, owns, or otherwise uses as a school building (40 CFR § 763.85(b)(1)-(2)). For further details on activities conducted during a reinspection (e.g., visually reinspect/touch material), see 40 CFR § 763.85(b)(3)(i)-(vi).

*Tip: See Model AMP Form 6 - Inspection Cover Sheet, Form 7 - Room/Functional Space Assessment, Form 8 - Homogeneous Area/Bulk Sample Summary, Form 9 - Homogeneous Area/Bulk Sample Diagram
### Response Actions

|   | 20. Does the management plan include the recommendations made to the LEA regarding response actions under 40 CFR § 763.88(d) and the following information about the accredited management planner:  
|   | • name, signature, state of accreditation, and, if applicable, the accreditation number for each accredited management planner making the recommendations?  
|   |  
|   | (40 CFR §§ 763.88(d) and 763.93(e)(5))  
|   | Note: Although not required, EPA suggests including in the AMP the name of the training agency, the course name and date, and a copy of the accreditation certificate for each accredited person making the recommendations.  
|   | *Tip: See Model AMP Form 11 - Recommended Response Actions  

|   | 21. Does the management plan include a detailed description of preventive measures and response actions to be taken, including the following:  
|   | • Methods to be used for any friable ACBM?  
|   | • Locations where such measures and actions will be taken?  
|   | • Reasons for selecting the response action or preventive measure?  
|   | • Schedule for beginning and completing each preventive measure or response action?  
|   |  
|   | (40 CFR § 763.93(e)(6))  
|   | Note: For further details on how to conduct response actions, see 40 CFR § 763.90  
|   | *Tip: See Model AMP Form 11 - Recommended Response Actions  

|   | 22. Does the management plan include one of the following statements for the person or persons who inspected for ACBM and who will design or carry out response actions, except for operations and maintenance, with respect to the ACBM:  
|   | • statement that he/she is accredited under the state accreditation program, or that the LEA has used (or will use) persons accredited under another state’s accreditation program or an EPA-approved course?  
|   |  
|   | (40 CFR § 763.93(e)(7))  
|   | *Tip: See note on Model AMP Form 3 - Designated Persons Assurances
23. Does the management plan include a detailed written description of each preventive measure and response action taken for friable and nonfriable ACBM and friable and nonfriable suspected ACBM assumed to be ACM, including the following:

- Methods used?
- 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?
- If ACBM is removed, the name and location of storage or disposal site of the ACM?

(40 CFR § 763.94(b)(1))

Note: Although not required, EPA suggests including in the AMP a copy of the accreditation.

*Tip: See Model AMP Form 12 - Implementation of Response Actions

24. Does the management plan include the following sampling information required to be collected at the completion of certain response actions specified by 40 CFR § 763.90(i):

- Name and signature of any person collecting any air sample required to be collected?
- Locations where samples were collected?
- Date of collection?
- Name and address of the laboratory analyzing the samples?
- Date of analysis?
- Results of analysis?
- Method of analysis?
- Name and signature of the person performing the analysis?
- Statement that the laboratory meets the applicable laboratory accreditation requirements of 40 CFR § 763.90(i)(2)(ii)?

(40 CFR § 763.94(b)(2))

*Tip: See Model AMP Form 12 - Implementation of Response Actions

25. Does the management plan include a detailed description in the form of a blueprint, diagram, or written description, of any ACBM or suspected ACBM assumed to be ACM that remains in the school once response actions are undertaken under 40 CFR § 763.90 and is the description updated as response actions are completed?

(40 CFR § 763.93(e)(8))

26. For each homogeneous area where all ACBM has been removed, have records been retained in the management plan for at least 3 years after the next reinspection required under 40 CFR § 763.85(b)(1), or for an equivalent period?

Did you know? Significantly damaged friable surfacing ACM or significantly damaged friable miscellaneous ACM must be immediately isolated and access must be restricted unless isolation is not necessary to protect human health and the environment. Then, this material must be removed, or depending upon whether enclosure or encapsulation would be sufficient to protect human health and the environment, enclosed or encapsulated (40 CFR § 763.90(d)(1) - (2)).

(40 CFR §§ 763.93(b) and 763.94(a))
### Operations and Maintenance

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| 27. | Does the management plan include a record of each cleaning conducted under 40 CFR § 763.91(c), including the following:<br>• Name of each person performing the cleaning?<br>• Date of the cleaning?<br>• Locations cleaned?<br>• Methods used to perform the cleaning? | *(40 CFR §§ 763.93(h) and 763.94(e))*

Note: For details on initial cleaning after an inspection and before the initiation of any response action, other than O&M activities or repair, see 40 CFR § 763.91(c)(1) and for details on any additional cleaning recommended by the management planner and approved by the LEA, see 40 CFR § 763.91(c)(2).

*Tip: See Model AMP Form 16 - Cleaning Record*

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| 28. | Does the management plan include a record of each O&M activity and major asbestos activity, with the following information:<br>• Name of each person performing the activity?<br>• For a major asbestos activity, the name, signature, state of accreditation and, if applicable, the accreditation number of each person performing the activity?<br>• Start and completion date of each activity?<br>• Location of the activity?<br>• Description of the activity including preventative measures used?<br>• If ACBM is removed, the name and location of the storage and disposal site for the ACM? | *(40 CFR §§ 763.93(h) and 763.94(f) and(g))*

Note: The response actions for any maintenance activities disturbing friable ACBM, other than small-scale, short-duration maintenance activities, must be designed by persons accredited to design response actions and conducted by persons accredited to conduct response actions (40 CFR § 763.91(c)). Although not required, EPA suggests including in the AMP a copy of the accreditation.

*Tip: See Model AMP Form 15 - Operations and Maintenance Activities*

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| 29. | Does the management plan include a record of each fiber release episode, whether major or minor, with the following information:<br>• Date and location of the episode?<br>• Method of repair?<br>• Preventive measure or response action taken?<br>• Name of each person performing the work?<br>• If ACBM is removed, the name and location of the storage and disposal site of the ACM? | *(40 CFR §§ 763.93(h) and 763.94(h))*

Note: A major fiber release episode is the falling or dislodging of more than 3 square or linear feet of friable ACBM (40 CFR § 763.91(f)(2)). A minor fiber release episode is the falling or dislodging of 3 square or linear feet or less of friable ACBM (40 CFR § 763.91(f)(1)).

*Tip: See Model AMP Form 17 - Major/Minor Fiber Release Episode Log*
### Periodic Surveillance

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| 30. Does the management plan include a record of each periodic surveillance performed under 40 CFR § 763.92(b), with the following information:  
- Name of person performing the surveillance?  
- Date of the surveillance?  
- Any changes in the condition of the material?  
(40 CFR §§ 763.92(b)(2)(ii)-(iii), 763.93(b) and 763.94(d))  
Note: A periodic surveillance of each school building must be conducted at least once every 6 months after a management plan has been in effect (40 CFR § 763.92(b)).  
*Tip: See Model AMP Form 18 - Periodic Surveillance Plan/Report |

### Notification

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| 31. Does the management plan include the following notification information:  
- Description of the steps taken to notify, in writing, at least once a year, parent, teacher and employee organizations of the availability of the management plan for review?  
- Dated copies of all such management plan availability notifications (e.g., letter, newsletter)?  
- Description of the 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? (Under 40 CFR § 763.84(c), the LEA must inform them about these activities at least once each school year.)  
(40 CFR §§ 763.93(c)(10) and 763.93(g)(4))  
*Tip: See Model AMP Form 19 - Plan to Inform |
Appendix A - Glossary

Unless otherwise noted with an asterisk (*), the following definitions contained in this Glossary can be found under 40 CFR § 763.83:


*Accessible* when referring to asbestos-containing material means that the material is subject to disturbance by school building occupants or custodial or maintenance personnel in the course of their normal activities.

*Accredited* or *accreditation* when referring to a person or laboratory means that such person or laboratory is accredited in accordance with section 206 of Title II of the Act.

*Air erosion* means the passage of air over friable asbestos-containing building material (ACBM) which may result in the release of asbestos fibers.

*Asbestos* means the asbestiform varieties of: Chrysotile (serpentine); crocidolite (riebeckite); amosite (cummingtonite-grunerite); anthophyllite; tremolite; and actinolite.

*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, scrapes, gouges, mars 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, scrapes, gouges, mars 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.

*Designated Person* means a person appointed by the Local Education Agency (LEA), under 40 CFR § 763.84 (g), who is trained to ensure the proper implementation of AHERA in school buildings.

*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 \( \mu \text{m} \) 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.


*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.

Phase contrast microscopy (PCM) refers to the procedure outlined in NIOSH Method 7400 for the evaluation of fibers in air samples.*

Polarized light microscopy (PLM) refers to the method outlined in 40 CFR § 763, Appendix E to Subpart E, for the identification of asbestos in bulk samples.*

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, 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 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 means any elementary or secondary school as defined in section 198 of the Elementary and Secondary Education Act of 1965 (20 U.S.C. 2854).
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 (TSI) 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.

Transmission electron microscopy (TEM) refers to the method outlined in 40 CFR § 763, Appendix A to Subpart E, for the identification of asbestos in air samples.*

Vibration means the periodic motion of friable ACBM which may result in the release of asbestos fibers.
Appendix B - Acronyms

ACM - Asbestos-containing material
ACBM - Asbestos-containing building material
AHERA - Asbestos Hazard Emergency Response Act
DOT - Department of Transportation
DP - AHERA Designated Person
EPA - U.S. Environmental Protection Agency
HEPA - High-efficiency particulate air
LEA - Local Education Agency
NIOSH - National Institute for Occupational Safety and Health
NIST - National Institute of Standards and Technology
NVLAP - National Voluntary Laboratory Accreditation Program
O&M - Operations and maintenance
OSHA - Occupational Safety and Health Administration
PCM - Phase contrast microscopy
PLM - Polarized light microscopy
TEM - Transmission electron microscopy
TSI - Thermal system insulation
Buildings Covered by AHERA

Q: A school leases space in a building from a non-school group (a church, YMCA, etc.). Who is responsible for complying with the AHERA rule?

A: Leased buildings are covered under AHERA. For public school districts, the school district is responsible for AHERA compliance since the school district controls access to these buildings, how these buildings are used by the occupants, the furnishings and the scheduling of school activities. For private, non-profit schools, the owner of the building is responsible.

Q: If there are no buildings within a school district with asbestos containing building materials (ACBM), then does the school district need to have an AHERA Designated Person, retain management plans or provide notifications to the parents, teachers, or workers on management plan availability?

A: Yes.

Q: Are the school administrative offices, maintenance or storage facilities covered by AHERA, even if students never attend classes in these buildings?

A: Yes. In addition to classrooms, the definition of a school building includes any other facility used for the administration of educational or research programs, and any maintenance, storage, or utility facility, including hallways, essential to the operation of classrooms, libraries, gymnasiums, and administrative offices. A facility is deemed essential if it is being used. Vacant facilities which are no longer used by the school are exempt.

Q: If a school uses a single room in a nonschool building on a regular basis as a classroom, is the entire building covered by AHERA?

A: No, just the single room used by the school as a classroom is covered by the rule.

Q: If a school district obtains a building, how soon must it be inspected for asbestos-containing materials?

A: Prior to its use as a school building.

Q: A school burns down. The school district wants to use a local community center for six months due to the emergency. Does this temporary building have to be inspected?
A: In the event that emergency use of an uninspected building as a school building is required, such buildings must be inspected within 30 days after the school has begun using that building.

Q: Are private elementary and secondary schools required to comply with AHERA?

A: Only private, nonprofit elementary and secondary schools must comply with the AHERA requirements.

Q: Students take advanced placement classes at the State University, or put on a theater production at the local community center, or use the YMCA swimming pools for physical education. Must these buildings be inspected?

A: No

Q: When conducting an inspection, must the inspector undertake destructive steps, such as tearing down a wall, in an attempt to locate asbestos-containing building materials (ACBM)?

A: An AHERA-accredited inspector is expected to take reasonable steps to locate ACBM, including examining all concealed accessible areas (above drop ceilings, inside ventilation shafts, etc.), carefully reviewing building plans and using his or her knowledge to determine if ACBM was used in areas that are inaccessible. If the inspector has reason to suspect ACBM is present and believes that fibers could be released from ACBM and carried from the area, then the inaccessible area must be examined. If the inspector believes that ACBM is present but does not believe that fibers could be released from that area, then the material should be assumed ACBM and included in the inventory.

Q: Can an unaccredited person under the supervision of an accredited inspector collect samples and look in crawl spaces and other areas to locate ACBM?

A: No, an accredited inspector must conduct all necessary tasks in order to fulfill the inspection and reinspection requirements.

Q: If a school buys or leases a building, how soon must it be inspected? If a school must relocate temporarily, due to a flood or fire, must the temporary building be inspected?

A: Any building leased or acquired on or after October 12, 1988, that is to be used as a school building, must be inspected prior to its use as a school building. In the event that emergency use of an uninspected building must be used as a school, that building must be inspected within 30 days of use as a school.

Q: What asbestos containing building materials need to be assessed during an inspection?

A: The following must be assessed: friable miscellaneous and surfacing asbestos containing
building materials, thermal system insulation which is friable or with no damage but has potential for damage or potential for significant damage.

Q: Do the underside and roof of a covered exterior hallway or walkway need to be included in the inspection?

A: Just the underside of the hallway or walkway must be included.

Q: Can a building inspector use his or her own laboratory to analyze bulk asbestos samples?

A: Yes, if the laboratory has up-to-date and valid accreditation from the National Voluntary Laboratory Accreditation Program.

Q: Can all suspect materials in a school building be assumed to contain asbestos rather than taking samples?

A: Yes

Q: What are some typical suspect asbestos containing building materials covered by AHERA?

A: Spray-applied or troweled-on materials on walls and ceilings, gypsum wallboard, transite wallboard, thermal system insulation, corrugated-like paper product used for thermal system insulation, gaskets in heating or air-conditioning equipment, floor tiles and its adhesives, ceiling tiles and panels, cement asbestos water pipe, fire doors, fire brick for boilers, cloth adjoining air ducts, and sheeting in fume hood.

Q: The regulatory definition of homogenous area is being uniform in color or texture. What is meant by "homogeneous area" with respect to thermal system insulation having pipe lagging that has either been discolored or applied differently to give the appearance of possessing a different texture?

A: The accredited inspector must make a judgement on whether pipe lagging is indeed uniform in color and texture. If the suspect material looks darker due to water damage, then it is appropriate for the inspector to consider this as part of the same homogeneous area. If the suspect material has been applied differently, however, it probably would not be uniform in color and texture since there would be a noticeable difference in the suspect material’s appearance.

Reinspections

Q: What are the necessary components of an AHERA reinspection?

A: An accredited inspector must visually reinspect and reassess the condition of all known or assumed friable asbestos containing building materials (ACBM), visually inspect previously considered nonfriable ACBM and touch it to determine if it has become friable, identify homogeneous areas of material that have become friable since the last inspection developed required records and submit the records to the AHERA Designated Person within 30 days of reinspection.
**Q: How often must a reinspection be conducted at school buildings?**

A: Every three years.

**Q: What are the requirements for the persons involved in the reinspection?**

A: The person conducting the reinspection must be an accredited AHERA inspector. The management planner responsible for the review of the reinspection results and recommendations for response actions must be an accredited management planner.

**Q: Must encapsulated asbestos containing building materials be reassessed every three years during the reinspection?**

A: Yes. In addition to checking friability, encapsulated ACBM must be closely examined to determine whether the response action has failed.

**Q: If the 6-month periodic surveillance inspection coincides with the reinspection, can the reinspection count as a periodic surveillance?**

A: Yes.

**Q: If the original inspection overlooked some asbestos-containing building materials or if some areas of the building were not accounted for during the first inspection, must the reinspection include the inspection, assessment and documentation of these overlooked areas?**

A: Although it is not required by regulation, EPA strongly recommends that these areas are included during the reinspection.

**Q: Is reinspection required for buildings where no ACBM known or assumed was found in the original inspection or where abatement actions removed all ACBM?**

A: No. However, EPA recommends that schools that have conducted asbestos abatement to remove all ACBM should conduct a reinspection in case some ACBM was missed.

**Q: Must the school district reinspect a building that is no longer in use as a school?**

A: No.

**Q: Does an accredited management planner need to review the results of the inspection and assessment and the reinspection and reassessment?**

A: Yes. AHERA requires that an accredited management planner review the results of each inspection, reinspection and assessment for the school building and to conduct any other necessary activities in order to recommend in writing appropriate response actions. The review and response action recommendations are especially important if assessments of known or assumed ACBM have changed from the previous reinspection or if previously identified ACBM has become friable.

**Q: What reinspection records must be included in the management plan?**
A: The following records must be included:

- The date of the reinspection, the name and signature of the person making the reinspection, and accreditation documentation;
- Any changes in the condition of known or assumed asbestos containing building materials;
- Exact location where samples were 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, and accreditation documentation;
- Any assessments or reassessments made of friable material, the name and signature of the accredited inspector and accreditation documentation; and
- Written recommendations of the management planner.

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**Periodic Surveillance**

**Q: How should the results of the six-month periodic surveillance be recorded?**

**What is meant by "any change in condition" as it refers to the periodic (six-month) surveillance inspection?**

A: The following should be documented: the name of the person conducting the periodic surveillance, the date of the surveillance, and any changes in the condition of the asbestos-containing building materials (ACBM) (and if changes are noticed, then the comments must describe each change clearly). A maintenance person conducting the periodic surveillance would notice water damage, major delamination, a major fiber release, or even minor damage. For surfacing material, damage might include separation of asbestos-containing materials (ACM) from the substrate; flaking, blistering, or crumbling of ACM surface; and scrapes, gouges, mars, or other signs of physical injury. Asbestos debris may also indicate damage. For thermal system insulation, damage may include gouges, punctures, water damage, crushed areas and torn or missing coverings. The person conducting the periodic surveillance will have to be aware of the material's previous condition, documented in the management plan, in order to determine if any changes in the material's condition have occurred.

**Q: What is meant by "any change in condition” when it refers to the six-month periodic surveillance?**

A: First the person conducting the surveillance must be aware of the material's previous condition and then look for changes such as: water damage, major delamination, major fiber release, minor damage, separation of asbestos containing material (ACM) from the substrate, flaking, blistering, crumbling of the ACM surface; scrapes, gouges, mars, and other signs of physical injury, asbestos debris, punctures, water damage, crushed areas, and torn or missing coverings.

**Q: If during a periodic surveillance inspection, a custodian finds damaged thermal system insulation, what must be done?**

A: It is the responsibility of the school district or building owner (for private schools) to
maintain all thermal system insulation asbestos-containing materials and its covering in an intact state and undamaged condition. The school district or building owner should arrange to remove the damaged material. If removal is not feasible, due to technological factors, then the school or building owner must at least repair the damaged area.

Asbestos Management Plans

Q: Must a school develop a management plan for each school or can it have one large plan that covers all of its school buildings?

A: A separate management plan must be developed for each school. The administrative office of each school must maintain a complete and updated copy of the management plan for that school.

Q: If a school building is new and an architect or project engineer prepared a statement that no asbestos containing building materials were used in the design or construction of the building or an AHERA accredited inspector found no suspect materials, then must that school develop a management plan?

A: Yes, however, the management plan would simply contain the architect, project engineer or AHERA accredited inspector's statement, the Designated Person information and the notification to the parents, teachers and employees on the availability of the plan.

Q: If the buildings have been inspected by an accredited inspector, samples have been taken and analyzed, and no asbestos-containing building material (ACBM) has been found, must the school district still develop a management plan?

A: Yes. In this case, the management plan would simply include the inspection report (including sampling results), the AHERA Designed Person information and the notification to parents, teachers, and employees regarding the availability of the plan.

AHERA Training and Accreditation

Q: If a person failed to take the annual refresher course before the expiration date, must he or she retake the basic course?

A: The person cannot conduct asbestos work with an expired accreditation; however, if the person takes the refresher course within a year of the expiration date, then he or she does not need to retake the basic course (except in states where different rules may apply).

Q: What are the requirements for the persons involved in the reinspection?

A: The person conducting the reinspection must be an accredited AHERA inspector. The management planner responsible for the review of the reinspection results and recommendations for response actions must be an accredited management planner.

Q: What are the qualifications or exact training needed by an individual who
conducts the two-hour awareness training and the additional 14-hour training for the maintenance and/or custodial employees?

A: The regulations do not require specific qualifications for instructors who conduct this training. However, instructors should be selected who have professional or educational background in the asbestos field.

Q: When working on an asbestos job at a school building, public or commercial building, what is needed to show that I am accredited?

A: Accredited persons must have their initial and current accreditation certificates at the location where they are conducting work.

Q: Is an AHERA-accredited inspector required for the replacement of resilient floor covering?

A: An AHERA-accredited inspector is not required if the person is conducting a visual or physical examination as part of replacing the existing floor where the material has not been sanded, ground, mechanically chipped, drilled, abraded or cut. If a person is conducting a visual or physical examination to determine its friability, then the person must have AHERA inspector credentials.

Q: When is an AHERA-accredited Project Designer Needed?

A: Persons who design response actions in schools and public and commercial buildings must have AHERA Project Designer accreditation. Response actions are defined as a method---including removal, encapsulation, enclosure, repair, and operations and maintenance---that protects human health and the environment from friable asbestos-containing building material. Response actions do not include small scale, short duration maintenance activities or activities to address minor fiber episodes.

Q: If a person is conducting an environmental assessment which includes noting the presence and condition of possible asbestos containing materials but does not collect samples in a public or commercial building, does that person need AHERA accreditation?

A: Yes.

Q: What constitutes adequate training for the AHERA "Designated Person" responsible for implementing the management plan? Does he or she need to be accredited?

A: The AHERA Designated Person does not need to be accredited; however, he or she must have training which covers 1) health effects of asbestos; 2) detection, identification and assessment of asbestos-containing materials; 3) options for controlling asbestos containing building materials; asbestos management programs; and 4) relevant Federal and State regulations concerning asbestos. The management plan must include information on the course name, dates, and hours of training undertaken by the AHERA Designated Person.

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Asbestos Removal

Q: Phase Contract Microscopy (PCM) air clearance can be used for projects greater than small scale, short duration activities and less than 160 square feet or 260 linear feet. Transmission Electron Microscopy (TEM) air clearance monitoring must be used for projects greater than 160 square feet or 260 linear feet. How are the calculations on size of a project determined?

A: AHERA prohibits the artificial division of a large project or the removal of asbestos-containing building materials (ACBM) in stages over the course of a relatively short period of time from what normally would have been one large project in order to avoid the more costly TEM air clearance analysis. If the total area exceeds the 160/260 rule, then TEM must be used unless clear engineering reasons exist for dividing a project into smaller areas. If surfacing ACBM was removed in one area and then a few weeks later, adjacent surfacing ACBM was removed, EPA would consider both removals to be one project (since both removals occurred at approximately the same time) and require TEM if the amount exceeded 160 square feet or 260 linear feet.

Q: Would surfacing ACBM on the ceilings of two classrooms on two separate floors be viewed as contiguous areas?

A: No. Even if one classroom was directly beneath the other classroom, these would not be contiguous areas under the rule. Each floor would normally have its own containment barrier.

Q: Can someone collect more than five samples inside the abatement site and pick the best of the results for the clearance test?

A: No. An equal number of samples should be taken inside and outside the abatement site for clearance. The minimum number is five inside and five outside. The rule does not prohibit the collection of more than five samples inside and an equal number outside; however, collection of a higher number inside and then selecting only five of these values is not appropriate.

Q: When removing vinyl asbestos floor tiles, do I need to use an AHERA accredited project designer and supervisor/workers?

A: In July 1992, EPA published a policy clarification which described the circumstances under which the removal of vinyl asbestos tiles (VAT) would be considered a response action under AHERA therefore requiring accredited personnel for the removal. EPA has determined that removal of VAT (or other known or assumed asbestos-containing material flooring or its adhesive) which involves sanding, grinding, mechanical chipping, drilling, cutting or abrading the material has a high probability of rendering the material friable and capable of releasing asbestos fibers. Therefore, removal projects which employ any of these techniques (other than small-scale short duration) must be conducted as response actions. This would require use of a project design, accredited persons and air clearance.
Q: Which areas in school buildings must have warning labels?

A: AHERA requires warning labels immediately adjacent to any friable and non-friable asbestos-containing building materials (ACBM) and suspected ACBM assumed to be asbestos-containing located in routine maintenance areas in each school building. Routine means that a maintenance or custodial person frequents an area on a regular basis to perform maintenance activities. Examples are boiler rooms, equipment rooms, pipe tunnels, fan rooms, and air handling rooms.

Q: What are examples of routine maintenance areas that require warning labels? Do you have to label enclosed or encapsulated ACBM in routine maintenance areas?

A: Routine maintenance areas are boiler rooms, equipment rooms, pipe tunnels, fan rooms, air handling rooms and other areas which are used on a regularly scheduled or predictable basis to perform maintenance activities. Yes, warning labels must be placed on areas which are enclosed or encapsulated in the maintenance areas.

Q: If all asbestos-containing building materials (ACBM) have been removed from a school building, does the annual written notification requirement regarding the management plan availability and asbestos-related activities still apply?

A: Yes, since the purpose of the notification is to enable the public to determine if the LEA has implemented the management plan satisfactorily.

Q: What is meant by “. . . materials that are about to become friable . . . ?”

A: If a workman is about to sand nonfriable floor tiles, this material will shortly become friable.

Q: Must the AHERA Designated Person be an employee of the school district or need to be located on-site?

A: No and no.

Q: Who is the “local education agency” with respect to AHERA?

A: In a non-profit, private elementary or secondary school, the local education agency would be the owner of the school building. In a public elementary and secondary school, the local education agency would be the school district.

Q: What forms of written public notifications are acceptable?

A: A great deal of flexibility exists with respect to methods for notifying the parents, teachers, and employees. However, a copy of the notification must be kept in the management plan. This notification could be in the form of newspaper advertisement or article in the school district’s newsletter. A description of the steps taken to notify the parents, teachers, and employees, along with a copy of the notification, must be kept in the management plan.
Other Response Actions: Enclosures, Encapsulation, and Repair

Q: Is the installation of a carpet over damaged asbestos containing vinyl asbestos tiles an enclosure?

A: No. An enclosure is an airtight, impermeable, permanent barrier around asbestos containing building materials to prevent the release of asbestos fibers into the air. Carpeting is not impermeable, permanent or airtight.

Q: If during a periodic surveillance inspection, a custodian finds damaged thermal system insulation, what must be done?

A: It is the responsibility of the school district or building owner (for private schools) to maintain all thermal system insulation asbestos-containing materials and its covering in an intact state and undamaged condition. The school district or building owner should arrange to remove the damaged material. If removal is not feasible, due to technological factors, then the school or building owner must at least repair the damaged area so that it is in an intact state and undamaged condition.
Model AHERA Asbestos Management Plan for Local Education Agencies

Ready-to-Use Forms

- Inspections & Reinspections
- Response Actions
- Operations & Maintenance
- Other AHERA Activities

Healthy School Environments
Learn more at http://www.epa.gov/schools
# Model AHERA Asbestos Management Plan for Local Education Agencies

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Introduction

Under the Asbestos Hazard Emergency Response Act (AHERA) of 1986, EPA published on October 30, 1987, the Asbestos-Containing Materials in Schools rule (hereinafter referred to as the AHERA rule), 40 CFR Part 763, Subpart E. The AHERA rule became effective on December 14, 1987 and applies to all non-profit elementary and secondary schools nationwide, both public and private. Local Education Agencies (LEAs) are responsible for ensuring compliance with the AHERA rule and are required, among other things, to develop and maintain an up-to-date Asbestos Management Plan (AMP), conduct training, inspections, and sampling related to asbestos, manage asbestos properly and provide yearly notification to parents, teachers and employee organizations about the AMP and any asbestos-related activities.

LEAs are also responsible for designating a contact person known as the Designated Person (DP) to oversee asbestos-related activities in the school and ensure that the AHERA responsibilities of the LEA are met. The quality of a school's asbestos program depends heavily upon the dedication and work of the DP with the support of the LEA. The LEA and the DP work together to ensure that each school is in compliance with federal, state and local asbestos regulations and that there are no uncontrolled releases of asbestos fibers in the school which could pose a health threat to children and school workers.

Even though the AHERA rule has been in place for years, EPA and the states have found that compliance issues remain, particularly in the area of schools maintaining and updating their AMPs to reflect current reinspection information, operation and maintenance activities, periodic surveillance and response/post-response actions. An up-to-date compliant AMP is key to the success of a school's asbestos program and the protection of children's and school workers' health. In order to enhance compliance, EPA Region 2 has developed an “AHERA Asbestos Management Plan Self-Audit Checklist for Designated Person's” and this companion guidance document, a “Model AHERA Asbestos Management Plan for Local Education Agencies.” It is recommended that the Checklist be reviewed first in order to quickly identify any potential deficiencies in the school's AMP.

The AHERA Asbestos Management Plan Self-Audit Checklist for Designated Person's is designed to help the DP determine whether or not the school has an up-to-date compliant AMP. The Checklist is divided into six sections: General Information, Inspections and Reinspections, Response Actions, Operations and Maintenance, Periodic Surveillance and Notification. Each section of the Checklist contains questions to guide the DP through a detailed compliance assessment of the school's AMP with check boxes for Yes, No or Not Applicable. Supporting regulatory citations are provided on the Checklist along with spaces for the DP to make notes. Following the Checklist is a Glossary and a list of Acronyms.

This companion guidance document a “Model AHERA Asbestos Management Plan for Local Education Agencies” provides step-by-step instructions for developing an AMP utilizing a suggested standard format. This document contains suggested forms for including in the school's
AMP and tracks the format of the Checklist: General Information, Inspections and Reinspections, Response Actions, Operations and Maintenance, Periodic Surveillance and Notification. Following the forms is a Glossary and a list of Acronyms. For convenience, tips are included in the Checklist which note the corresponding suggested forms that should be completed in the Model AHERA AMP.

Please note that the EPA Region 2 Model AMP forms and Checklist are not a substitute for the applicable legal requirements, are not regulations themselves, and are not required to be used/completed under AHERA. Rather, they are provided by EPA as guidance to enhance schools' compliance with EPA AHERA regulations regarding the required documentation that must be included in the AMP. These documents do not impose legally binding requirements on any party, including EPA, states, or the regulated community, and are not intended and cannot be relied upon to create any rights, substantive or procedural, enforceable by any party in litigation with the United States. Please contact your state asbestos coordinator for information on any applicable state regulations/AMP forms.

If you have any questions on these guidance documents, please call Deborah Craig, EPA Region 2 Asbestos Outreach Coordinator, at (212) 637-3521 or e-mail her at craig.deborah@epa.gov. These guidance documents are available on the EPA website at http://www.epa.gov/asbestos/pubs/asbestos_in_schools.html. For additional asbestos information, please contact the EPA Region 2 Asbestos Coordinator Gaetano LaVigna by phone at (212) 637-4069 or by e-mail at lavigna.gaetano@epa.gov. The EPA Region 2 Caribbean Asbestos Contact, Carlos M. Rivera, can be reached by phone at (787) 977-5846 or by e-mail at rivera.carlos@epa.gov.

For any additional asbestos information, please contact your state/EPA asbestos coordinator or call EPA's Toxic Substances Control Act (TSCA) Hotline at (202) 554-1404 or the EPA Asbestos Ombudsman at (800) 368-5888, or visit EPA's website at http://www.epa.gov/asbestos/pubs/asbestos_in_schools.html. A list of state/EPA asbestos coordinators is provided on the EPA website.
Asbestos Management Plan Preparation Instructions

The following information provides step-by-step instructions for developing a school's Asbestos Management Plan (AMP) utilizing a suggested standardized format. The Model AMP forms are not a substitute for the applicable legal requirements, are not regulations themselves, and are not required to be used/completed under AHERA. Rather, they are provided by EPA Region 2 as guidance to enhance schools' compliance with EPA AHERA regulations regarding the required documentation that must be included in the AMP. These Model AMP forms do not impose legally binding requirements on any party, including EPA, states, or the regulated community, and are not intended and cannot be relied upon to create any rights, substantive or procedural, enforceable by any party in litigation with the United States.

Please contact your state Asbestos Coordinator for any applicable state regulations/AMP forms. Under 40 CFR § 763.93(a)-(b) of EPA's Asbestos-Containing Materials in Schools regulations, the initial AMPs were required to be submitted to the state for review and your state may require you to submit subsequent changes to your AMP.

Please be sure to read the instructions for each of the Model AMP forms. The information requested on the Model AMP forms is generally self-explanatory, however explanations have been provided in the instructions below for those items which may require further clarification. You may also wish to refer to the AHERA definitions provided in the Glossary, Appendix A, or the list of Acronyms provided in Appendix B.

AMP FORM 1 - CONTACT INFORMATION
Provide the requested contact information for the Local Education Agency (LEA) and the school.

Provide the Designated Person's (DP) name, address, telephone number and the course names, dates, and hours of asbestos-related training courses taken by the DP to carry out his or her duties. This information is required under 40 CFR § 763.93(e)(4) to be included in the AMP. Although not required, EPA suggests that the name of the training agency be provided on this form and that copies of the DP's training certificates be attached to this form.

Provide the requested contact and accreditation information for each Management Planner who contributed to the AMP. Under 40 CFR § 763.93(e)(12)(i)-(ii), the consultant's name and a statement that he/she is accredited under the state accreditation program or another state's accreditation program or an EPA-approved course must be included in the AMP. Although not required, EPA suggests that the name of the training agency and the course name and date be provided on this form and that a copy of the accreditation certificate for each Management Planner be attached to this form.

AMP FORM 2 - SCHOOL BUILDING LIST
Provide the name and address of each building used as a school building for this school (e.g., on-site administration building, maintenance building, storage building and any off-site building used for classrooms). Place an “X” in the appropriate column to note whether the building has friable
asbestos-containing material (ACBM), non-friable ACBM, friable and non-friable suspected ACBM assumed to be asbestos-containing material (ACM), or no ACBM (i.e., no ACBM at the time of construction). If there is no ACBM in the building as a result of a removal action, note “removal” and insert the date (e.g., removal - 2/10/04) in the no ACBM column.

All of the aforementioned information is required to be included in the AMP under 40 CFR § 763.93(e)(1) except for the “no ACBM” related information which EPA suggests including in the AMP for clarification. Although not required, EPA also suggests that the following information be included on this form: original date of the building construction and the date of any new additions. The suggested additions to the School Building List will provide an enhanced “snapshot” overview of the status changes that have occurred in the school buildings over time.

Note, as required under 40 CFR § 763.93(a)(1)-(2), the AMP developed for each school must include all of the buildings that are owned, leased or otherwise used by the LEA as school buildings for that school. Therefore, the School Building List must include all of these buildings even if they are located off-site from the main school campus.

AMP FORM 3 - DESIGNATED PERSON ASSURANCES
Provide the name of the DP and have the DP sign and date this form which lists the LEA’s general responsibilities under 40 CFR § 763.84. Under 40 CFR § 763.93(i), the AMP must contain a true and correct statement signed by the DP which certifies that the LEA’s general responsibilities under 40 CFR § 763.84 have been or will be met.

AMP FORM 4 - EVALUATION OF RESOURCES
Describe the resources needed (e.g., financial, personnel and equipment) to complete response actions successfully and carry out reinspection, operations and maintenance activities, periodic surveillance, and training. This evaluation of resources is required to be included in the AMP under 40 CFR § 763.93(e)(11).

AMP FORM 5 - TRAINING RECORD FOR MAINTENANCE & CUSTODIAL STAFF
Provide the following training information for maintenance and custodial staff required to be included in the AMP under 40 CFR §§ 763.93(h) and 763.94(c): person’s name and job title, date training was completed, location of training and number of hours completed. Although not required, EPA suggests that the name of the training agency and the course name be provided on this form and that a copy of the training certificate be attached to this form.

Under 40 CFR § 763.92(a)(1), every member of the maintenance and custodial staff who works in a building that contains ACBM must receive awareness training of at least 2 hours whether or not they are required to work with ACBM. Under 40 CFR § 763.92(a)(2), maintenance and custodial staff who conduct any activities that will result in the disturbance of ACBM must receive an additional 14 hours of training.

AMP FORM 6 - INSPECTION COVER SHEET
If your school is comprised of more than one building, each building inspection or reinspection
should be summarized on a separate form. (Note, under 40 CFR § 763.85(b)(1), a reinspection must be conducted at least once every three years after a management plan is in effect.) Provide the requested cover sheet information about the accredited inspector(s) and the inspection or reinspection of each school building. Although not required by EPA, it is suggested that the name of the training agency and the course name and date be provided on this form and that a copy of the accreditation certificate for each inspector be attached to this form.

If this inspection report cover sheet is not used for the AMP, ensure that the inspection report for each inspection or reinspection includes the following information as required under 40 CFR § 763.93(e)(3)(i): date of the inspection, and the name, signature, state of accreditation, and, if applicable, the accreditation number of each accredited inspector performing the inspection. Attach a copy of the signed inspection report.

A copy of the signed inspection report, along with other related documentation, must be provided to the DP and included as a record in the AMP within 30 days of the inspection under 40 CFR § 763.85(a)(4)(vi) or reinspection under 40 CFR § 763.85(b)(3)(vii). See these cites and 40 CFR § 763.93(e)(3) for details on required AMP documentation. For inspections conducted before December 14, 1987 (i.e., the effective date of the October 30, 1987 EPA Asbestos-Containing Materials in Schools rule), see also 40 CFR § 763.93(e)(2)(i)-(v).

The AMP instructions/forms for inspections and reinspections are as follows: Form 6 - Inspection Cover Sheet, Form 7 - Room/Functional Space Assessment, Form 8 - Homogeneous Area/Bulk Sample Summary and Form 9 - Homogeneous Area/Bulk Sample Diagram.

**AMP FORM 7 - ROOM/FUNCTIONAL SPACE ASSESSMENT**

Written assessments are required to be made for each inspection and reinspection under 40 CFR § 763.88 of all ACBM and suspected ACBM assumed to be ACM in a building by an accredited inspector. This form may be used to provide the assessment information for an inspection or reinspection. The inspector must sign and date the written assessment, provide his or her state of accreditation, and, if applicable, accreditation number, and provide a copy of the assessment to the DP for inclusion in the AMP within 30 days of the assessment (40 CFR §§ 763.88(a)(2) and 763.93(e)(3)(v)). Although not required, EPA suggests that the name of the training agency and the course name and date be provided on this form and that a copy of the accreditation certificate for the inspector be attached to this form.

Fill out a separate form for each specific type of ACBM or suspected ACBM assumed to be ACM for each room/functional space. For example, if a room/functional space contains two types of thermal system insulation, one type of surfacing material, and one miscellaneous material (requiring four unique homogeneous area numbers), then four separate forms should be completed for that particular room/functional space. Homogeneous area (HA) numbers should be assigned to each specific homogeneous material identified as ACBM or suspected ACBM assumed to be ACM within a building. These HA numbers can be used to identify homogeneous materials on a blueprint or diagram.
Identify the type of material as thermal, surfacing, or miscellaneous by checking the appropriate box and then describe the material in the space provided. Be sure to include such factors as color, texture, thickness, and method of application, if applicable (e.g., sprayed on or trowelled on). The amount of each material should be recorded, both in total quantity and as a percentage of the functional space (40 CFR § 763.88(c)(1)). For example, if there are 200 linear feet of various pipe runs in a room with 50 linear feet covered by air cell insulation, it should be noted that there are 50 linear feet of that particular homogeneous material in a room and that it covers 25% of the area (50/200).

Complete the “Damage Assessment” section for all friable materials. The amount of each specific type of damage should be noted. Information regarding the causes and severity of damage should be recorded in the comment section (40 CFR § 763.88(c)(2)(i)-(ii) and (c)(5)).

Note if there is an accumulation of powder/dust/debris similar in appearance to the material being assessed and its location (e.g., beneath the pipe, boiler, or duct). This information can be used as evidence to confirm damage.

Note if the material is in a supply or a return air plenum. If asbestos fibers are released from the ACBM into the ventilation air stream they have the potential to be transported to locations where people are present. The location of any asbestos fibers in a supply air plenum is usually more significant than in a return plenum since the distance of transport to the occupied room/functional space is typically shorter and the dilution by makeup air is less significant.

Note the extent or spread of damage over large areas or large percentages of the homogeneous area (40 CFR § 763.88(c)(2)(iii)).

Complete the “Potential for Contact with the Material” section and note whether or not the material is accessible (40 CFR § 763.88(c)(3)).

Note the potential for disturbance of this material (40 CFR § 763.88(c)(4)). The potential for disturbance can be directly related to accessibility or other factors such as proposed renovations, vibrations, air erosion, etc.

Circle the appropriate classification from the “Assessment Category” and give the reason for the classification (40 CFR § 763.88(b)).

Note the preventative measures which might eliminate the reasonable likelihood of undamaged ACM from becoming significantly damaged (40 CFR § 763.88(c)(6)).

**AMP FORM 8 - HOMOGENEOUS AREA/BULK SAMPLE SUMMARY**

Provide the requested homogeneous area/bulk sample summary information for each inspection or reinspection and fill out a separate form for each school building.

For each inspection and reinspection conducted under 40 CFR § 763.85 the AMP must include a
blueprint, diagram, or written description of each school building that identifies clearly each location
and approximate square or linear footage of homogeneous areas where material was sampled for
ACM, the exact location where each bulk sample was collected, date of collection, homogeneous
areas where friable suspected ACBM is assumed to be ACM, and where nonfriable suspected
ACBM is assumed to be ACM. In addition, a description of the manner used to determine sampling
locations must be included in the AMP. See 40 CFR § 763.93(e)(3)(ii)-(iii) for these
inspection/reinspection requirements and for inspections conducted before December 14, 1987 (i.e.,
the effective date of the October 30, 1987 EPA Asbestos-Containing Materials in Schools rule), see
also 40 CFR § 763.93(e)(2)(ii)). For details on how to collect bulk samples, see 40 CFR § 763.86.

For each inspection and reinspection conducted under 40 CFR § 763.85 the AMP must also include
the following information about the accredited inspector that collected the samples: name, signature,
state of accreditation and, if applicable, the accreditation number of the inspector, as required under
40 CFR § 763.93(e)(3)(iii). Although not required, EPA suggests that the name of the training
agency and the course name and date be provided on this form and that a copy of the accreditation
certificate for the inspector be attached to this form.

To provide a blueprint or diagram in lieu of the aforementioned written description, see Form 9 -
Homogeneous Area/Bulk Sample Diagram. Note, a written description and a blueprint or diagram
may be provided, but is not required by EPA.

AMP FORM 9 - HOMOGENEOUS AREA/BULK SAMPLE DIAGRAM
For each inspection and reinspection conducted under 40 CFR § 763.85 provide one blueprint or
diagram for each HA that identifies clearly each location and approximate square or linear footage of
homogeneous areas where material was sampled for ACM. See also the instructions for Form 8 -
Homogeneous Area/Bulk Sample Summary for further details regarding the required documentation
of homogeneous areas/bulk samples in the AMP and the supporting regulatory cites for
inspections/reinspections.

As also discussed in the instructions for Form 8, a blueprint or diagram may be included in the AMP
in lieu of a written description of the homogeneous areas where material was sampled for ACM.
Note, a written description and a blueprint or diagram may be provided, but is not required by EPA.

AMP FORM 10 - PLAN FOR REINSPECTION
Under 40 CFR § 763.93(e)(9), a plan for reinspection under 40 CFR § 763.85 must be included in
the AMP. Use this form to provide the plan. Note, at least once every three years after a
management plan has been in effect, a reinspection must be made by an accredited inspector of all
friable and nonfriable known or assumed ACBM in each school building that the LEA leases, owns,
or otherwise uses as a school building (40 CFR § 763.85(b)(1)-(2)).

AMP FORM 11 - RECOMMENDED RESPONSE ACTIONS
Provide the requested information about the recommendations made by the accredited Management
Planner to the LEA regarding response actions.
Under 40 CFR § 763.93(e)(5), the AMP must include the recommendations made by the accredited Management Planner to the LEA regarding response actions under 40 CFR § 763.88(d) along with the following information about the Management Planner: name, signature, state of accreditation, and, if applicable, the accreditation number for each accredited Management Planner making the recommendations. Under 40 CFR § 763.88(d), the Management Planner(s) must sign and date the recommendation, provide the aforementioned accreditation information and submit a copy of the recommendation to the DP for inclusion in the AMP. Although not required, EPA suggests that the name of the training agency and the course name and date be provided on this form and that a copy of the accreditation certificate for each Management Planner be attached to this form.

In addition, under 40 CFR § 763.93(e)(6), the AMP must include a detailed description of preventive measures and response actions to be taken, including methods to be used, for any friable ACBM, 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.

**AMP FORM 12 - IMPLEMENTATION OF RESPONSE ACTIONS**

Provide the requested information regarding the response actions taken that were approved by the LEA.

Under 40 CFR § 763.94(b)(1), the AMP must include a detailed written description of each preventive measure and response action taken for friable and nonfriable ACBM and friable and nonfriable suspected ACBM assumed to be ACM, including: methods used, 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 ACBM is removed, the name and location of the storage or disposal site of the ACM. Although not required, EPA suggests that copies of accreditations for personnel conducting any abatement activities be attached to this form.

**AMP FORM 13 - DESCRIPTION/DIAGRAM OF ACBM TO REMAIN**

Provide the requested information regarding ACBM to remain.

Under 40 CFR § 763.93(e)(8), the AMP must include a detailed description in the form of a blueprint, diagram, or written description of any ACBM or suspected ACBM assumed to be ACM that remains in the school once response actions are undertaken under 40 CFR § 763.90 and the description must be updated as response actions are completed. Note, a written description and a blueprint or diagram may be provided, but is not required by EPA.

**AMP FORM 14 - PLAN FOR OPERATIONS AND MAINTENANCE ACTIVITIES**

Under 40 CFR § 763.93(e)(9), the plan for operations and maintenance activities required under 40 CFR § 763.91 must be included in the AMP. Use this form to provide the plan and include the following elements: worker protection under 40 CFR § 763.91(b) (e.g., training, respiratory protection, and medical surveillance program), cleaning procedures/equipment/accreditation under 40 CFR § 763.91(c), operations and maintenance procedures, work practices and equipment under
40 CFR § 763.91(d), use of accredited personnel to design and conduct response actions for any maintenance activities disturbing friable ACBM (other than small-scale, short duration maintenance activities) under 40 CFR § 763.91(e), procedures for minor and major fiber release episodes under 40 CFR § 763.91(f), and use of accredited personnel to design and conduct response actions for any major fiber release episodes under 40 CFR § 763.91(f)(2)(iii).

AMP FORM 15 - OPERATIONS AND MAINTENANCE ACTIVITIES
Provide the requested information on operations and maintenance activities conducted under 40 CFR § 763.91(d) and, under 40 CFR § 763.94(g), any major asbestos activity conducted under 40 CFR § 763.91(e).

Under 40 CFR § 763.94(f) and (g), a record of the following information must be provided in the AMP regarding the aforementioned activities: name of each person performing the activity, for a major activity, the name, 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 ACBM is removed, the name and location of the storage or disposal site of the ACM. Although not required, EPA suggests that copies of accreditations for personnel be attached to this form.

AMP FORM 16 - CLEANING RECORD
Provide the requested information regarding the initial cleaning after an inspection (i.e., before the initiation of a response action other than operation and maintenance activities or repair) and any additional cleaning recommended by the Management Planner. Complete one form for each activity.

Under 40 CFR § 763.94(e), the AMP must include a record of each cleaning conducted under 40 CFR § 763.91(c), including the following information: name of each person performing the cleaning, date of the cleaning, locations cleaned, and the methods used to perform the cleaning.

AMP FORM 17 - MAJOR/MINOR FIBER RELEASE EPISODE
Provide the requested information regarding major and minor fiber release episodes.

Under 40 CFR § 763.94(h), for each major and minor fiber release episode occurring as a result of operations and maintenance activities under 40 CFR § 763.91(f), the AMP must include a record of the following information: date and location of the episode, method of repair, preventive measure or response action taken, and if ACBM is removed, the name and location of the storage and disposal site of the ACM.

AMP FORM 18 - PERIODIC SURVEILLANCE PLAN/REPORT
Provide the requested information regarding the periodic surveillance plan and report (i.e., the two periodic surveillance inspections per school year).

Under 40 CFR § 763.93(e)(9), a plan for periodic surveillance under 40 CFR § 763.92 must be included in the AMP. At least once every 6 months after the AMP has been in effect, a periodic surveillance must be conducted in each building that the LEA leases, owns, or otherwise uses as a
school building that contains ACBM or is assumed to contain ACBM. The periodic surveillance report under 40 CFR § 763.92 (b)(2) must include a record of the person's name performing the surveillance, the date of the surveillance and any changes in the condition of the material.

**AMP FORM 19 - PLAN TO INFORM**

Provide the requested notification information about the AMP and any asbestos-related activities.

Under 40 CFR § 763.93(g)(4), at least once each school year, the LEA must notify in writing parent, teacher, and employee organizations of the availability of the AMP and must include in the AMP, a description of the steps taken to notify such organizations, and a dated copy of the notification. In the absence of any such organizations for parents, teachers, or employees, the LEA must provide written notice to that relevant group of the availability of the AMP and must include in the AMP a description of the steps taken to notify such groups, and a dated copy of the notification.

Under 40 CFR § 763.93(e)(10), the AMP must include a description of the steps taken to inform workers and building occupants, or their legal guardians, about inspections, reinspections, response actions, and post-response action activities, including periodic reinspection and surveillance activities that are planned or in progress. Under 40 CFR § 763.84(c), the LEA must inform them about these activities at least once each school year.
AHERA Asbestos Management Plan

School Name: ________________________________________________

School Address: ____________________________________________

A complete, up-to-date copy of this Asbestos Management Plan must be maintained in both the Local Education Agency's administrative office and the school's administrative office (40 CFR § 763.93(g)(2)-(3)). For more information, please contact the Designated Person for this school.
### AMP FORM 1 - CONTACT INFORMATION

#### Local Education Agency and School Information

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#### Management Planner(s)

The following management planner(s) has developed/contributed to this plan and is accredited under the state accreditation program or another state’s accreditation program or an EPA-approved course.

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**ATTACHMENTS**

- Copy of Designated Person’s asbestos-related training certificates suggested, but not required by EPA
- Copy of accreditation certificate for Management Planner(s) suggested, but not required by EPA
AMP FORM 2 - SCHOOL BUILDING LIST

List each building used as a school building for this school (e.g., on-site administration building, maintenance building, storage building and any off-site building used for classrooms, etc.). List the date of the original construction and any subsequent additions. Place an “X” in the appropriate column to note whether the building has friable ACBM, non-friable ACBM, friable and non-friable suspected ACBM assumed to be ACM or no ACBM (i.e., no ACBM at the time of construction). If there is no ACBM in the building as a result of a removal action, note “removal” and insert the date (e.g., removal - 2/10/04) in the “No ACBM” column.

<table>
<thead>
<tr>
<th>Name of Building</th>
<th>Address</th>
<th>Construction Date(s)</th>
<th>Friable ACBM*</th>
<th>Non-Friable ACBM</th>
<th>Friable and Non-Friable Suspected ACBM Assumed to be ACM**</th>
<th>No ACBM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

*ACBM - Asbestos-Containing Building Material  
**ACM - Asbestos-Containing Material

DATE: _______________________

ATTACHMENT

If a new school building was constructed after October 12, 1988 and is asbestos-free, attach a signed statement from an architect or project engineer responsible for the construction of the building, or by an accredited inspector, indicating that no ACBM was specified as a building material in any construction document for the building, or, to the best of his or her knowledge, no ACBM was used as a building material. Provide a copy of this statement to the EPA Regional Office. This information is required under 40 CFR § 763.99 (a)(7)). Provide the state/license number for the architect/project engineer or, for the inspector, provide the state of accreditation, and, if applicable, the accreditation number for the inspector. Although not required, EPA suggests attaching to this statement a copy of the licensing document for the architect/project engineer, or for the inspector, a copy of the inspector’s accreditation certificate.
AMP FORM 3 - DESIGNATED PERSON ASSURANCES

In accordance with 40 CFR § 763.93(i) of the Environmental Protection Agency Asbestos-Containing Material in Schools regulation, the undersigned Local Education Agency (LEA) Designated Person (DP) hereby certifies that the following general responsibilities of the LEA under 40 CFR § 763.84 have been or will be met:

1. 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 Part 763, Subpart E.

2. Ensure that all custodial and maintenance employees are properly trained as required by Part 763, 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).

3. 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 reinspection and surveillance activities that are planned or in progress.

4. 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 for Asbestos-Containing Building Materials (ACBM) and suspected ACBM assumed to be Asbestos-Containing Materials (ACM).

5. Ensure that warning labels are posted in accordance with § 40 CFR 763.95.

6. Ensure that management plans are available for inspection and notification of such availability has been provided as specified in the management plan under § 40 CFR 763.93(g).

7. Designate a person to ensure that requirements under § 763.84 are properly implemented and ensure that the designated person receives adequate training to perform duties assigned under § 763.84. Such training shall provide, as necessary, basic knowledge of: health effects of asbestos; detection, identification, and assessment of ACM; options for controlling ACBM; asbestos management programs; relevant Federal and State regulations concerning asbestos, including those in Part 763, Subpart E and those of the Occupational Safety and Health Administration, U.S. Department of Transportation and the U.S. Environmental Protection Agency.

8. Consider whether any conflict of interest may arise from the inter-relationship among accredited personnel and whether that should influence the selection of accredited personnel to perform activities under Part 763, Subpart E.

<table>
<thead>
<tr>
<th>Name of Designated Person:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Designated Person’s Signature:</td>
</tr>
</tbody>
</table>

**Note**

- The AMP must also include, as required under 40 CFR § 763.93 (e)(7), one of the following statements for the person or persons who inspected for ACBM and who will design or carry out response actions, except for operations and maintenance, with respect to the ACBM: a statement that he/she is accredited under the state accreditation program, or that the LEA has used or will use persons accredited under another state’s accreditation program or an EPA-approved course.
Every member of the maintenance and custodial staff who works in a building that contains ACBM must receive awareness training of at least 2 hours whether or not they are required to work with ACBM. Maintenance and custodial staff who conduct any activities that will result in the disturbance of ACBM must receive an additional 14 hours of training (total 16 hours of training). A record of the aforementioned training is required to be included in the AMP under 40 CFR §§ 763.93(h) and 763.94(c) of the EPA Asbestos-Containing Materials in Schools regulation, 40 CFR Part Subpart E.

<table>
<thead>
<tr>
<th>Employee Name (Please Print)</th>
<th>Job Title</th>
<th>Course Name</th>
<th>Training Agency</th>
<th>Date</th>
<th>Location of Training</th>
<th>Number of Hours Completed</th>
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</thead>
<tbody>
<tr>
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**ATTACHMENT**

- Copies of training certificates suggested, but not required by EPA
AMP FORM 6 - INSPECTION COVER SHEET

Type of Inspection:  [  ] Initial Inspection  [  ] Reinspection

Date of Inspection:

Building Assessed:  Telephone Number:

Address:

Date of Original Building Construction:

Provide the date, description, and location of additions/renovations for this building e.g., new structural additions or application of surfacing material or fireproofing insulation. (Provide all heating system information in next section.)

Type of heating system:

Has any part of the heating system, including boiler(s), hot water pipes, water heater, etc., been renovated or replaced?  
[  ] Yes  [  ] No

Provide date, description and location of heating system renovations/replacements for this building:

The following inspector(s) conducted the inspection and is accredited under the state accreditation program, or another state’s accreditation program or an EPA-approved course.

<table>
<thead>
<tr>
<th>1</th>
<th>Name</th>
<th>State of Accreditation/Acc. No.</th>
<th>Signature</th>
<th>Date</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Firm</td>
<td>Address</td>
<td>Telephone Number</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Course Name</td>
<td>Date</td>
<td>Training Agency</td>
<td></td>
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</tbody>
</table>

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<thead>
<tr>
<th>2</th>
<th>Name</th>
<th>State of Accreditation/Acc. No.</th>
<th>Signature</th>
<th>Date</th>
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</thead>
<tbody>
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<td></td>
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<td>Address</td>
<td>Telephone Number</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Course Name</td>
<td>Date</td>
<td>Training Agency</td>
<td></td>
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</tbody>
</table>

ATTACHMENTS

- Copy of inspection report
- Copy of inspector’s accreditation certificate suggested, but not required by EPA
AMP FORM 7 - ROOM/FUNCTIONAL SPACE ASSESSMENT*

<table>
<thead>
<tr>
<th>Type of Inspection:</th>
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</thead>
<tbody>
<tr>
<td>( ] Initial Inspection</td>
<td></td>
<td></td>
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<tr>
<td>( ] Reinspection</td>
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</table>

<table>
<thead>
<tr>
<th>Date of Inspection:</th>
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<table>
<thead>
<tr>
<th>Building Assessed/Address:</th>
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<table>
<thead>
<tr>
<th>Room/Functional Space:</th>
<th>Date of Original Building Construction:</th>
</tr>
</thead>
</table>

Date and description of additions or renovations for this room/functional space:

<table>
<thead>
<tr>
<th>Type of Material</th>
<th>Surfacing</th>
<th>Thermal</th>
<th>Miscellaneous</th>
</tr>
</thead>
<tbody>
<tr>
<td>( ] Surfacings</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ] Thermal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ] Miscellaneous</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Material:</th>
<th>[ ] Friable</th>
<th>[ ] Non-Friable</th>
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</thead>
</table>

<table>
<thead>
<tr>
<th>Description:</th>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Amount of Material (Note Linear or Square Feet)</th>
<th>Percent of Area</th>
<th>Homogeneous Area No.</th>
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</thead>
</table>

<table>
<thead>
<tr>
<th>Damage Assessment</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Type of Damage</th>
<th>YES</th>
<th>NO</th>
<th>Amount of Material (Note Linear or Square Feet)</th>
<th>Comments (Severity, Cause)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deterioration (e.g., crumbled, blistered, or loss of adhesion)</td>
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<tr>
<td>Physical Damage (e.g., scrape or gouge)</td>
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<tr>
<td>Water Damage (e.g., water stains)</td>
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<tr>
<td>Air Erosion (e.g., elevator shaft, fan room, or ventilator air stream)</td>
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<tr>
<td>Vibration (e.g., music room, motor/engine, or ducts vibrating but no fan in area)</td>
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<tr>
<td>Other</td>
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<table>
<thead>
<tr>
<th>Is powder, dust or debris present?</th>
<th>Location:</th>
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<table>
<thead>
<tr>
<th>Is this material in a supply or return air plenum?</th>
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</table>

<table>
<thead>
<tr>
<th>Note the extent or spread of damage over large areas or large percentages of the homogeneous area:</th>
</tr>
</thead>
</table>

*Form 7 continued on next page
AMP FORM 7 CONTINUED - ROOM/FUNCTIONAL SPACE ASSESSMENT

<table>
<thead>
<tr>
<th>Potential for Contact with Material</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ ] High - Workers in vicinity more than once/week or material is in a public area accessible to building occupants (e.g., hallway or auditorium)</td>
<td></td>
</tr>
<tr>
<td>[ ] Moderate - Workers in vicinity once/month - once/week or material is in a room/office accessible to building occupants</td>
<td></td>
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<tr>
<td>[ ] Low - Workers in vicinity less than once/month or material is visible but not within reach of building occupants</td>
<td></td>
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</tbody>
</table>

Note the potential for disturbance of the material:

Assessment Category (Circle One)

1. Damaged/Significantly damaged TSI
2. Damaged friable SURFACING ACBM
3. Significantly damaged friable SURFACING ACBM
4. Damaged or significantly damaged friable MISCELLANEOUS ACBM
5. ACBM with potential for damage
6. ACBM with potential for significant damage
7. Any remaining friable ACBM or friable suspected ACBM

Reason for classification:

Preventative measures which might eliminate the reasonable likelihood of undamaged ACM from becoming significantly damaged:

The following inspector conducted the assessment and is accredited under the state accreditation program, or another state’s accreditation program or an EPA-approved course

<table>
<thead>
<tr>
<th>Name</th>
<th>State of Accreditation/Acc. No.</th>
<th>Signature</th>
<th>Date</th>
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</thead>
<tbody>
<tr>
<td>Firm</td>
<td>Address</td>
<td>Telephone Number</td>
<td></td>
</tr>
<tr>
<td>Course Name</td>
<td>Date</td>
<td>Training Agency</td>
<td></td>
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</tbody>
</table>

ATTACHMENT

- Copy of inspector’s accreditation certificate suggested, but not required by EPA
AMP FORM 8 - HOMOGENEOUS AREA/BULK SAMPLE SUMMARY

<table>
<thead>
<tr>
<th>Location Homogeneous Area (HA) (HA No. &amp; Room/Functional Space)</th>
<th>HA Linear or Square Ft. (L or S)</th>
<th>Material Type (T, S, M)*</th>
<th>Friable or NonFriable (F or NF)</th>
<th>Sampled or Assumed ACBM (S or A)</th>
<th>Exact Sample Location</th>
<th>Inspector's Sample No.</th>
<th>Date Collected</th>
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*Material Type: T - Thermal System Insulation, S - Surfacing, and M - Miscellaneous

Manner used to determine sampling locations:

The following inspector conducted the sampling and is accredited under the state accreditation program, or another state's accreditation program or an EPA-approved course.

<table>
<thead>
<tr>
<th>Name</th>
<th>State of Accreditation/Acc. No.</th>
<th>Signature</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm</td>
<td>Address</td>
<td>Telephone Number</td>
<td></td>
</tr>
<tr>
<td>Course Name</td>
<td>Date</td>
<td>Training Agency</td>
<td></td>
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</tbody>
</table>

ATTACHMENTS

- Copy of inspector's accreditation certificate suggested, but not required by EPA
- Lab report, including a copy of bulk sample analyses (and any other lab report pertaining to the analyses), name and address of lab, date of analysis, name and signature of person performing analysis, and a statement that the lab meets the applicable requirements of 40 CFR § 763.87(a) as required under 40 CFR § 763.93(c)(2)(iii) and (3)(iv)). Copy of the NIST NVLAP lab accreditation certificate for PLM method suggested, but not required by EPA.

(Number __ of __, make copies as necessary)
AMP FORM 9 - HOMOGENEOUS AREA/BULK SAMPLE DIAGRAM

<table>
<thead>
<tr>
<th>Type of Inspection:</th>
<th>[ ] Initial Inspection</th>
<th>[ ] Reinspection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of inspection:</td>
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<td></td>
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<tr>
<td>Building Assessed/Address:</td>
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<td></td>
</tr>
<tr>
<td>Room/Functional Space:</td>
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<tr>
<td>Prepared by:</td>
<td>Date:</td>
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</table>

(Number ___ of___, make copies as necessary)
AMP FORM 10 - PLAN FOR REINSPECTION
AMP FORM 11 - RECOMMENDED RESPONSE ACTIONS

Building Assessed/Address:

Room Functional Space:

Provide a detailed description of the recommended preventive measures and response actions to be taken, including methods to be used for any friable ACBM, and the locations (list all HA’s) where measures and actions will be taken:

Provide the reason for selecting the preventive measure or response action:

Provide the projected schedule for beginning and completing each preventive measure and response action:

Management Planner
The following management planner has provided the aforementioned recommended response actions and is accredited under the state accreditation program or another state's accreditation program or an EPA-approved course.

<table>
<thead>
<tr>
<th>Name</th>
<th>State of Accreditation/Acc. No.</th>
<th>Signature</th>
<th>Date</th>
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<tbody>
<tr>
<td>Firm</td>
<td>Address</td>
<td>Telephone Number</td>
<td></td>
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<tr>
<td>Course Name</td>
<td>Date</td>
<td>Training Agency</td>
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</table>

**ATTACHMENT**

- Copy of accreditation certificate for Management Planner suggested, but not required by EPA
AMP FORM 12 - IMPLEMENTATION OF RESPONSE ACTIONS

<table>
<thead>
<tr>
<th>Building Assessed/Address:</th>
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<tbody>
<tr>
<td>Room Functional Space:</td>
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</table>

Provide a detailed description of each preventive measure and response action taken for friable and nonfriable ACBM and friable and nonfriable suspected ACBM assumed to be ACM, including methods used, and the location (list all HA’s) where the measure or action was taken:

Provide the reason for selecting the preventative measure or response action:

Provide the actual start and completion dates for each preventative measure and response action:

Provide the names and addresses of all contractors involved and, if applicable, their state of accreditation and accreditation numbers:

If ACBM is removed, provide the name and location of the storage or disposal site of the ACM:

**ATTACHMENTS**

- Copy of accreditation suggested, but not required by EPA
- Air sampling documentation required under 40 CFR § 763.94(b)(2) at the completion of certain response actions specified under 40 CFR § 763.90(i): name and signature of person collecting any air sample required to be collected, locations where samples were collected, date of collection, name and address of the lab analyzing the samples, date of analysis, results of analysis, method of analysis, name and signature of the person performing the analysis, and a statement that the lab meets the applicable requirements of 40 CFR § 763.90(i)(2)(ii). Copy of the NIST NVLAP lab accreditation certificate for the TEM method suggested, but not required by EPA. Where the PCM method is permitted, under 40 CFR § 763.90(i)(2)(ii), a lab enrolled in the American Industrial Hygiene Association Proficiency Analytical Testing Program must be used.
AMP FORM 13 - DESCRIPTION/DIAGRAM OF ACBM TO REMAIN

<table>
<thead>
<tr>
<th>Building Assessed/Address:</th>
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<tbody>
<tr>
<td>Room/Functional Space:</td>
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<tr>
<td>Date:</td>
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</table>

Provide detailed description of any ACBM or suspected ACBM assumed to be ACM that remains in the school once response actions are undertaken and update the description as response actions are completed:

**NOTE**

Blueprint or diagram of any ACBM or suspected ACBM assumed to be ACM that remains in the school once response actions are undertaken under 40 CFR § 763.90 and an updated description as response actions are completed may be provided in the AMP in lieu of the above written description (see instructions for Form 13). A written description and a blueprint or diagram may be included in the AMP, but is not required by EPA.
AMP FORM 14 - PLAN FOR OPERATIONS AND MAINTENANCE ACTIVITIES
AMP FORM 15 - OPERATIONS AND MAINTENANCE ACTIVITIES

<table>
<thead>
<tr>
<th>Building Assessed/Address:</th>
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</thead>
<tbody>
<tr>
<td>Room/Functional Space:</td>
</tr>
</tbody>
</table>

Provide the description of the activity, including preventive measures used, and the location where the activity occurred for those operation and maintenance activities specified under 40 CFR § 763.91(d) and, under 40 CFR § 763.94(g), for any major asbestos activity conducted under 40 CFR § 763.91(e):

Provide the start and completion dates of the activity:

Provide the name of each person performing the activity and for a major asbestos activity, provide the name, signature, state of accreditation and, if applicable, the accreditation number of each person performing the activity:

If ACBM is removed, provide the name and location of the storage or disposal site of the ACM:

**ATTACHMENT**

- Copy of accreditation suggested, but not required by EPA
AMP FORM 16 - CLEANING RECORD

Cleaning: [ ] Cleaning after initial inspection [ ] Additional cleaning approved by the LEA and conducted as part of an O&M program

Date of Cleaning:

Location Cleaned:

Cleaning methods used:

Names of persons performing the cleaning:

ATTACHMENT

- Copy of accredited Management Planner’s recommendation for additional cleaning under 40 CFR § 763.91(c)(2), as part of an O&M program, and the response of the LEA to that recommendation. This information is required to be included in the AMP under 40 CFR § 763.93(c)(9).
AMP FORM 17 - MAJOR/MINOR FIBER RELEASE EPISODE

<table>
<thead>
<tr>
<th>Type of episode:</th>
<th>[ ] Major Fiber Release</th>
<th>[ ] Minor Fiber Release</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of episode:</td>
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</tbody>
</table>

Describe the fiber release episode, including the location, type of ACBM, method of repair, and preventive measure or response action taken:

Provide the names of each person performing the work:

If ACBM is removed, the name and location of the storage and disposal site for the ACM:
AMP FORM 18 - PERIODIC SURVEILLANCE PLAN/REPORT

Periodic Surveillance Plan: At least once every six months after the AMP is in effect, periodic surveillance will be conducted in each building that the LEA leases, owns, or otherwise uses as a school building that contains ACBM or is assumed to contain ACBM. At a minimum, surveillance is planned to be conducted during the fall and spring (insert alternate time frames and other details, as needed). Each person performing periodic surveillance must: visually inspect all areas that are identified in the AMP as ACBM or assumed ACBM, record the date of the surveillance, his or her name, and any changes in the condition of the materials, and submit a copy of the record to the DP for inclusion in the AMP.

<table>
<thead>
<tr>
<th>HA No.</th>
<th>Description of ACBM</th>
<th>Area Inspected</th>
<th>1st six months Date________</th>
<th>2nd six months Date________</th>
<th>ACBM Condition*</th>
<th>ACBM Condition*</th>
<th>Date ACBM Removed</th>
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* If no change in condition, write N/C

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Dated copies of all management plan availability notifications distributed to parents, teachers and employee organizations (e.g., letter, newsletter). This information is required under 40 CFR § 763.93(e)(10).
Appendix A - Glossary

Unless otherwise noted with an asterisk (*), the following definitions contained in this Glossary can be found under 40 CFR § 763.83:


Accessible when referring to asbestos-containing material (ACM) means that the material is subject to disturbance by school building occupants or custodial or maintenance personnel in the course of their normal activities.

Accredited or accreditation when referring to a person or laboratory means that such person or laboratory is accredited in accordance with section 206 of Title II of the Act.

Air erosion means the passage of air over friable asbestos-containing building material (ACBM) which may result in the release of asbestos fibers.

Asbestos means the asbestiform varieties of: Chrysotile (serpentine); crocidolite (riebeckite); amosite (cummingtonite-grunerite); anthophyllite; tremolite; and actinolite.

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, scrapes, gouges, mars 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, scrapes, gouges, mars 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.

**Designated Person** means a person appointed by the Local Education Agency (LEA), under 40 CFR § 763.84 (g), who is trained to ensure the proper implementation of AHERA in school buildings. *

**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 \(\mu m\) 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.


**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.

Phase contrast microscopy (PCM) refers to the procedure outlined in NIOSH Method 7400 for the evaluation of fibers in air samples.*

Polarized light microscopy (PLM) refers to the method outlined in 40 CFR § 763, Appendix E to Subpart E, for the identification of asbestos in bulk samples.*

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, 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 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 means any elementary or secondary school as defined in section 198 of the Elementary and Secondary Education Act of 1965 (20 U.S.C. 2854).

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 (TSI) 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.

Transmission electron microscopy (TEM) refers to the method outlined in 40 CFR § 763, Appendix A to Subpart E, for the identification of asbestos in air samples.*

Vibration means the periodic motion of friable ACBM which may result in the release of asbestos fibers.
Appendix B - Acronyms

ACM - Asbestos-containing material
ACBM - Asbestos-containing building material
AHERA - Asbestos Hazard Emergency Response Act
DOT - Department of Transportation
DP - AHERA Designated Person
EPA - U.S. Environmental Protection Agency
HEPA - High-efficiency particulate air
LEA - Local Education Agency
NIOSH - National Institute for Occupational Safety and Health
NIST - National Institute of Standards and Technology
NVLAP - National Voluntary Laboratory Accreditation Program
O&M - Operations and maintenance
OSHA - Occupational Safety and Health Administration
PCM - Phase contrast microscopy
PLM - Polarized light microscopy
TEM - Transmission electron microscopy
TSI - Thermal system insulation
Asbestos Survey Guidance for AHERA Building Inspectors

Introduction

This document was developed to provide guidance on scope, structure, and content of an Asbestos Survey. It is intended for use by providers of Asbestos Surveys. This document is not intended to be a substitute for applicable regulations.

Purpose of an Asbestos Survey

Asbestos Surveys are project-specific. It is important that an Asbestos Survey be used only for its intended purpose. For example, a limited survey conducted as part of a pre-purchase inspection or in response to an insurance claim is not likely to meet the requirements of an Asbestos Survey and thus would not suffice for renovation or demolition projects.

The purpose and limitations of any Asbestos Survey should be clearly identified. Confirm with the Owner or Owner’s Representative the exact area under investigation, exact nature of renovation and demolition, and identify all materials that may be disturbed and those that will be disturbed.

Field Procedures

1. Review existing information about the structure, design drawings, as-built drawings, project specifications, and any existing survey and/or laboratory information.
2. Use equipment that will allow visual examination of all accessible spaces (i.e. ladders, flashlights).
3. Determine the extent to which the building will be renovated and/or demolished.
4. Determine and investigate each building’s structural, mechanical, electrical and roofing systems.
5. Perform a comprehensive investigation of areas to identify materials to be sampled and/or assumed to contain asbestos.
6. Clearly note uninspected areas and explain why they were not surveyed (i.e. “confined space,” buried materials, restrictions generated by the property owner, etc.)
7. Create sampling plan based on suspect materials present and the requirements of an AHERA Asbestos Survey.
8. Collect bulk samples of all suspect materials that will be disturbed and submit those not assumed to be asbestos to a NVLAP laboratory for analysis.
10. Document where asbestos-containing materials exist and record their location, condition, and quantity. “Location” shall include a schematic and/or other description showing the locations where each bulk asbestos sample was taken.

Destructive Investigation

Many asbestos containing materials are located in concealed areas such as wall cavities, below ground level, and other hidden spaces. The agency expects destructive investigation, as
necessary, to gain access to hidden spaces and to inspect them for suspect asbestos-containing materials.

The following guidelines constitute reasonable criteria for locating concealed materials:

1. Identify the different building systems which may involve concealed asbestos materials such as the heating/cooling system, domestic water lines, roof drainage lines, miscellaneous piping lines, underlay roofing, etc.
2. Open hidden areas and inspect each system in at least three (3) locations for each area of construction.
3. Focus the inspection on likely areas for suspect materials (i.e. where insulated pipe enters wall or ceiling, behind heating units, etc.).
4. Examine additional areas if results of inspection are inconsistent.

Survey Report Content (See Checklist)

- Site/Bldg Description (Owner, Address, Type of structure, Condition of structure, etc.)
- Summary and results (What is Positive, Negative, Assumed, Not Tested)
- Asbestos Sampling Methodology (List the sampling method, how many samples taken, what category of material: TSI, Surfacing or Misc.)
- Limitations (What could not be tested and why - describe any concealed areas that were not surveyed that may contain undiscovered asbestos-containing materials. Clearly list all hidden areas and list all potential asbestos-containing materials that may be found.)
- Result Documentation:
  - Lab Analysis
  - Chain of Custody
- Asbestos Building Inspection Certificate

Pictures help a lot. (Streetshots, interior rooms, sample areas, inaccessible areas)
Sample Asbestos-Containing Material List

- Acoustical ceiling texture (“popcorn”)
- Asphalt flooring
- Base flashing
- Blown-in insulation
- Boiler/tank insulation
- Breaching insulation
- Brick mortar
- Built-up roofing
- Caulking/putties
- Ceiling tiles/panels/mastic
- Cement board/transite
- Cement pipes
- Cement roofing shingles
- Chalkboards
- Construction mastics
- Duct tape/paper
- Ductwork flexible connections
- Electrical cloth
- Electrical panel partitions
- Electrical wiring insulation
- Elevator brake shoes
- Fire blankets
- Fire curtains/hose
- Fire doors
- Fireproofing
- Furnace insulation
- Gray roofing paint
- High temperature gaskets
- HVAC duct insulation
- Incandescent light fixture backing
- Joint compound/wallboard
- Laboratory hoods/table tops
- Laboratory fume hood
- Mudded pipe elbow insulation
- Nicolet (white) roofing paper
- Packing materials
- Paper fire box in walls
- Paper on backside of fiberglass insulation
- Pipe insulation/fittings
- Plaster/ wall joints
- Poured flooring
- Rolled/hot mopped roofing
- Roofing shingles
- Sink insulation
- Spray-applied insulation
- Stucco
- Sub flooring slip sheet
- Textured paints/coatings
- Vapor barrier
- Vinyl floor tile/mastic
- Vinyl sheet flooring/mastic
- Vinyl wall coverings
- Window glazing

Note: This list does not include every product that may contain asbestos. It is intended as a general guide to show which types of materials may contain asbestos.
Checklist

The following is a checklist to help an AHERA Building Inspector perform a thorough Asbestos Survey. The checklist is not intended to be a substitute for applicable regulations (Rule 6.3 of ORCAA Regulations). Olympic Region Clean Air Agency requires that the Asbestos Survey report include the information listed below.

- The purpose of the inspection (e.g., survey for planned demolition of west wing).
- Survey limitations such as uninspected areas (e.g., Building was occupied and destructive sampling techniques could not be performed. Destructive sampling techniques should be performed prior to demolition). If there were no uninspected areas, it should be noted.
- Any supporting information used for preparing the Asbestos Survey, including a review of any existing information about the structure(s) such as design drawings, as-built drawings, project specifications, existing survey, or laboratory information, etc.
- Date that the inspection was performed.
- Building use.
- Name of the structure, if applicable (e.g., Amazon Retirement Center).
- Address of the structure.
- Name, address and telephone number of the building owner(s) and contact person(s).
- Description of the structure(s) inspected (e.g., gasoline station canopy, 2 story house, commercial warehouse, etc.). This is where pictures really help.
- Special building features.
- Approximate age of structure(s).
- Dimensions of the structure(s) and the building areas inspected.
- List of outbuildings or rooms within the structure that were not accessed.
- Description of the inspection procedures used to identify the locations of all suspect ACM (e.g., a visual inspection performed during an initial building walk-through that included collecting bulk samples of suspect ACM in accordance with EPA protocol, including destructive sampling techniques).
- Identification and location of all homogeneous areas of suspect ACM.
- Indication of whether the suspect ACM is surfacing material, TSI, or miscellaneous material.
- Indicate whether the material is in layers.
- For each homogeneous area that is not assumed to be ACM, collect and submit bulk samples for analysis in accordance with the sampling protocol in 40 CFR Part 763.86 and 763.87. Must be a NVLAP Lab.
- List of all suspect ACM materials not sampled and state why they were not sampled.
- For asbestos-containing materials, the following information is required:
  - Describe the color of each asbestos-containing material.
  - Identify the location of each asbestos-containing material.
  - Provide the approximate quantity of each asbestos-containing material.
- Identification of ACM as friable or nonfriable.
- AHERA Building Inspector certificate.
- A summary page of results at the front of the survey report to help communicate results with the client.
- Laboratory results that show bulk sample numbers, sample descriptions, and asbestos content.
contaminated surface used in the validation study. Record and keep the results of the validation study as an appendix to the SOP. Include in this appendix, the solvent used to make the spiking solution, the PCB concentration of the spiking solution used to contaminate the surfaces in the validation study, and all of the validation study testing parameters and experimental conditions.

PART 763—ASBESTOS

Subparts A–D [Reserved]

Subpart E—Asbestos-Containing Materials in Schools

Sec.
763.80 Scope and purpose.
763.83 Definitions.
763.84 General local education agency responsibilities.
763.85 Inspection and reinspections.
763.86 Sampling.
763.87 Analysis.
763.88 Assessment.
763.90 Response actions.
763.91 Operations and maintenance.
763.92 Training and periodic surveillance.
763.93 Management plans.
763.94 Recordkeeping.
763.95 Warning labels.
763.96 Compliance and enforcement.
763.98 Waiver; delegation to State.
763.99 Exclusions.

APPENDIX A TO SUBPART E—INTERIM TRANSITION ELECTRON MICROSCOPY ANALYTICAL METHODS—MANDATORY AND NONMANDATORY—AND MANDATORY SECTION TO DETERMINE COMPLETION OF RESPONSE ACTIONS

APPENDIX B TO SUBPART E [RESERVED]

APPENDIX C TO SUBPART E—ASBESTOS MODEL ACCREDITATION PLAN

APPENDIX D TO SUBPART E—TRANSPORT AND DISPOSAL OF ASBESTOS WASTE

APPENDIX E TO SUBPART E—INTERIM METHOD OF THE DETERMINATION OF ASBESTOS IN BULK INSULATION SAMPLES

Subpart F [Reserved]

Subpart G—Asbestos Worker Protection

763.120 What is the purpose of this subpart?
763.121 Does this subpart apply to me?
763.122 What does this subpart require me to do?
763.123 May a State implement its own asbestos worker protection plan?

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:


Accessible when referring to ACM means that the material is subject to disturbance by school building occupants or custodial or maintenance personnel in the course of their normal activities.

Accredited or accreditation when referring to a person or laboratory means that such person or laboratory is accredited in accordance with section 206 of Title II of the Act.

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: Chrysotile (serpentine); crocidolite (riebeckite); amosite (cummingtonite-grunerite); anthophyllite; tremolite; and actinolite.

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, scrapes, gouges, mars 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, if applicable, which has delaminated such that its bond to the substrate (adhesion) is inadequate or, which for any other reason, lacks fiber cohesion or adhesion qualities. Such damage or deterioration may be illustrated by the separation of ACM into layers; separation of ACM from the substrate; flaking, blistering, or crumbling of the ACM surface; water damage; significant or repeated water stains, scrapes, gouges, mars or other signs of physical injury on the ACM. Asbestos debris originating from the 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
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 0.3μm 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:

(2) The owner of any nonpublic, non-profit elementary, or secondary school building.

(3) The governing authority of any school operated under the defense dependent’s 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, 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 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.
§ 763.84 General local education agency responsibilities.

Each local education agency shall:
(a) Ensure that the activities of any persons who perform inspections, re-inspections, 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 laws and regulations.
Environmental Protection Agency

§ 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 ACBM.

(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 30 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 §763.99, 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 ACBM, 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)(4)(vi)(B) 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 assessments, 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 ACBM 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 ACBM.

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

(iii) Identify any homogeneous areas 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 ACBM, 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 ACBM.

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

(vii) 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 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.

(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.

(c) 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) Surfacing 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...
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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 §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 patched 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 §763.87(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.

(d) Nonfriable suspected ACBM. If any homogeneous area of nonfriable suspected ACBM is not assumed to be ACM, then an accredited inspector shall collect, in a manner sufficient to determine whether the material is ACM or not ACM, bulk samples from the homogeneous area of nonfriable suspected ACBM that is not assumed to be ACM.

§ 763.87 Analysis.

(a) 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 E to subpart E of this part.

(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 that 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(a) and (c) and previous inspections specified under §763.99, the local education agency shall have an accredited inspector provide a written assessment of all friable known or assumed ACBM 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 suspected ACBM 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) ACBM with potential for damage.
(6) ACBM 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) Severity 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.
(3) Whether the material is accessible.
(4) The material's potential for disturbance.
(5) Known or suspected causes of damage or significant damage (e.g., air erosion, vandalism, vibration, water).
   (c)(3) 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 assessment for the school building and to conduct any other necessary activities in order to recommend in writing to the local education agency appropriate response actions. The accredited person shall sign and date the recommendation, provide his or her State of accreditation, and, if applicable, provide his or her accreditation number, and submit a copy of the recommendation to the person designated under §763.84 for inclusion in the management plan.

§763.90 Response actions.

(a) The local education agency shall select and implement in a timely manner the appropriate response actions in this section consistent with the assessment conducted in §763.88. The response actions selected shall be sufficient to protect human health and the environment. The local education agency may then select, from the response actions which protect human health and the environment, that action which is the least burdensome method. Nothing in this section shall be construed to prohibit removal of ACBM from a school building at any time, should removal be the preferred response action of the local education agency.

(b) If damaged or significantly damaged thermal system insulation ACM is present in a building, the local education agency shall:
   (1) At least repair the damaged area.
   (2) Remove the damaged material if it is not feasible, due to technological factors, to repair the damage.
   (3) Maintain all thermal system insulation ACM and its covering in an intact state and undamaged condition.

(c)(3) If damaged friable surfacing ACM or damaged friable miscellaneous ACM is present in a building, the local education agency shall select from among the following response actions: encapsulation, enclosure, removal, or repair of the damaged material.

(d) If significantly damaged friable surfacing ACM or significantly damaged friable miscellaneous ACM is present in a building 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 enclosure or encapsulation would be sufficient to protect human health and the environment, enclose or encapsulate.

(e) If any friable surfacing ACM, thermal system insulation ACM, or friable miscellaneous ACM that has potential for damage is present in a building, the local education agency shall at least implement an operations and maintenance (O&M) program, 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) Institute preventive measures appropriate to eliminate the reasonable likelihood that the ACM or its covering will become significantly damaged, deteriorated, or delaminated.

(3) Remove the material as soon as possible if appropriate preventive measures cannot be effectively implemented, or unless other response actions are determined to protect human health and the environment. Immediately isolate the area and restrict access if necessary to avoid an imminent and substantial endangerment to human health or the environment.

(g) Response actions including removal, encapsulation, enclosure, or repair, other than small-scale, short-duration repairs, shall be designed and conducted by persons accredited to design and conduct response actions.

(h) The requirements of this subpart E in no way supersede the worker protection and work practice requirements under 29 CFR 1926.58 (Occupational Safety and Health Administration (OSHA) asbestos worker protection standards for construction), 40 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 ACBM, a 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 collect air samples using aggressive 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.

(ii) Local education agencies shall have air samples collected under this section analyzed for asbestos using laboratories accredited by the National Bureau of Standards to 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), and (i)(5), 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 asbestos concentration 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).
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, as defined in appendix A, 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)(3) or (i)(5), of this section are met.

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 160 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 (0.01 f/cm³) of air). The method is available for public inspection at the Non-Confidential Information Center (NCIC) (7407), Office of Pollution Prevention and Toxics, U.S. Environmental Protection Agency, Room B-607 NEM, 401 M St., SW., Washington, DC 20460, between the hours of 12 p.m. and 4 p.m. weekdays excluding legal holidays or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202-741-6030, or go to: http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html. 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.

To determine the amount of ACBM affected under paragraph (i)(5) of this section, the local education agency shall add the total square or linear footage of ACBM within the containment barriers used to isolate 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 paragraph (i)(5), 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. Local education agencies must comply with either the OSHA Asbestos Construction Standard at 29 CFR 1926.1101, or the Asbestos Worker Protection Rule at 40 CFR 763.120, whichever is applicable.

(c) Cleaning—(1) Initial cleaning. Unless the building has been cleaned using equivalent methods within the previous 6 months, all areas of a school building where friable ACBM, damaged
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or significantly damaged thermal system insulation ACM, or friable suspected ACBM 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 planner 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.

(d) 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 ACBM:

(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.

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

(3) Shut off or temporarily modify the air-handling system and restrict other sources of air movement.

(4) Use work practices or other controls, such as, wet methods, protective clothing, HEPA-vacuums, mini-enclosures, glove bags, as necessary to inhibit the spread of any released fibers.

(5) Clean all fixtures or other components in the immediate work area.

(6) Place the asbestos debris and other cleaning materials in a sealed, leak-tight container.

(f) 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 ACBM):

(i) Thoroughly saturate the debris using wet methods.

(ii) Clean the area, as described in paragraph (e) of this section.

(iii) Place the asbestos debris in a sealed, leak-tight container.

(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 §763.90.

(2) 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 ACBM):

(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 ACBM receive awareness training of at least 2 hours, whether or not they are required to work with ACBM. 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.

(iii) Locations of ACBM identified throughout each school building in which they work.

(iv) Recognition of damage, deterioration, and delamination of ACBM.

(v) Name and telephone number of the person designated to carry out general local education agency responsibilities under §763.84 and the availability and location of the management plan.

(2) The local education agency shall ensure that all members of its maintenance and custodial staff who conduct any activities that will result in the disturbance of ACBM shall receive training described in paragraph (a)(1) of this section and 14 hours of additional training. Additional training shall include, but not be limited to:

(i) Descriptions of the proper methods of handling ACBM.


(iii) The provisions of this section and §763.91, Appendices A, C, and D of this subpart E of this part, EPA regulations contained in 40 CFR part 763 subpart G, and in 40 CFR part 61, subpart M, and OSHA regulations contained in 29 CFR 1926.58.

(iv) Hands-on training in the use of respiratory protection, other personal protection measures, and good work practices.

(3) Local education agency maintenance and custodial staff who have attended EPA-approved asbestos training or received equivalent training for O&M and periodic surveillance activities involving asbestos shall be considered trained for the purposes of this section.

(b) Periodic surveillance. (1) At least once every 6 months after a management plan is in effect, each local education agency shall conduct periodic surveillance in each building that it leases, owns, or otherwise uses as a school building that contains ACBM or is assumed to contain ACBM.

(2) Each person performing periodic surveillance shall:

(i) Visually inspect all areas that are identified in the management plan as ACBM or assumed ACBM.

(ii) Record the date of the surveillance, his or her name, and any changes in the condition of the materials.

(iii) Submit to the person designated to carry out general local education agency responsibilities under §763.84 a copy of such record for inclusion in the management plan.

the Governor prior to its use as a school.

(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 must begin implementation of its management plan on or before July 9, 1989, and complete implementation in a timely fashion.

(d) 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.

(e) The management plan shall be developed by 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 ACBM, nonfriable ACBM, and friable and nonfriable suspected ACBM 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 homogeneous or sampling area where material was sampled for ACM, the exact location where each bulk sample was collected, date of collection, homogeneous areas where friable suspected ACBM is assumed to be ACM, and where nonfriable suspected ACBM is assumed to be ACM.

(iii) 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, his or her accreditation number.

(iv) A copy of the analyses of any bulk samples collected and analyzed, the name and address of any laboratory that analyzed bulk samples, a statement that the laboratory meets the applicable requirements of § 763.87(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 ACBM and suspected ACBM assumed to be ACM, and the name, signature, State of accreditation, and if applicable, accreditation number of each accredited person making the assessments.

(3) For each inspection conducted under § 763.85:

(i) The date of the inspection or reinspection and the name and signature, State of accreditation and, if applicable, the accreditation number of each accredited inspector performing the inspection or reinspection.

(ii) A blueprint, diagram, or written description of each school building that identifies clearly each location and approximate square or linear footage of homogeneous areas where material was sampled for ACM, the exact location where each bulk sample was collected, date of collection, homogeneous areas where friable suspected ACBM is assumed to be ACM, and where nonfriable suspected ACBM is assumed to be ACM.

(iii) 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, his or her accreditation number.

(iv) A copy of the analyses of any bulk samples collected and analyzed, the name and address of any laboratory that analyzed bulk samples, a statement that the laboratory meets the applicable requirements of § 763.87(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 ACBM and suspected ACBM assumed to be ACM, and the name, signature, State of accreditation, and if applicable, accreditation number of each accredited person making the assessments.

(4) 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 course name, and dates and hours of training taken by that person to carry out the duties.

(5) The recommendations made to the local education agency regarding response actions, under §763.88(d), the name, signature, State of accreditation of each person making the recommendations, and if applicable, his or her accreditation number.

(6) A detailed description of preventive measures and response actions to be taken, including methods to be used, for any friable ACBM, 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 ACBM and who will design or carry out response actions, except for operations and maintenance, with respect to the ACBM, 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 developed under section 206(c) of Title II of the Act.

(f) 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.

(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.

10 A description of steps taken to inform workers and building occupants, or their legal guardians, about inspections, reinspections, response actions, and post-response action activities, including periodic reinspecion 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 consultant 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.

(f) 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.
(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 receiving a request for inspection. The school may charge a reasonable cost to make copies of the management plan.

(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.

(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 §763.84, 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 ACBM 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 ACBM and friable and nonfriable suspected ACBM 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 ACBM 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(i)(2)(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 locations cleaned, and the methods used to perform such cleaning.

(f) For each time that operations and maintenance activities under § 763.91(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 ACBM 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 ACBM 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 ACBM 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)

§ 763.97 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 to:

(i) Fail to conduct inspections pursuant to section 203(b) of Title II of the Act, including failure to follow procedures and failure to use accredited personnel and laboratories.

(ii) Knowingly submit false information to the Governor regarding any inspection pursuant to regulations under section 203(i) of Title II of the Act.

(iii) Fail to develop a management plan pursuant to regulations under section 203(i) of Title II of the Act.

(b) Compliance with Title I of the Act.

(1) Section 15(1)(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 II or any rule promulgated or order issued under Title II. Therefore, any person who violates any requirement of this subpart is in violation of section 15 of Title I of the Act.

(2) Section 15(3) 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 II or any rule promulgated or order issued under Title II. Therefore, any person who violates any requirement of this subpart is in violation of section 15 of Title I of the Act.

§ 763.95 Warning labels.

(a) The local education agency shall attach a warning label immediately adjacent to any friable or 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) ACBM 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 ACBM 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.

(Approved by the Office of Management and Budget under control number 2070–0091)
(3) Section 15(4) (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 section 11 of Title I of the Act.

(4) Section 16(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 such a 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 respond to a hazard which poses an imminent and substantial endangerment to human health or the environment or section 17 (15 U.S.C. 2616) of Title I of the Act to restrain any violation of section 15 of Title I of the Act or to compel the taking of any 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, 1200 Pennsylvania Ave., NW., 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. In addition, if the state chooses to receive electronic documents, the state program must include, at a minimum, the requirements of 40 CFR part 3—(Electronic reporting).

(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
will 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 Subpart E of this part, and that, if the state chooses to receive electronic documents, the state program includes, at a minimum, the requirements of 40 CFR part 3—(Electronic reporting).

(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 State 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, EPA will determine the completeness of the request. If 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 and any electronic reporting requirements are at least as stringent as 40 CFR part 3—(Electronic reporting).

(4) The lead agency and any cooperating agencies have or will have qualified personnel to carry out the program described in 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.

(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 and resources 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.

(3) 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.

(4) 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) Rescission. (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.

§ 763.99 Exclusions.

(a) A local education agency shall not be required to perform an inspection under § 763.85(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 § 763.84 for inclusion in the management plan.

(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 §763.84 for inclusion in the management plan. However, an accredited inspector shall identify whether material that was nonfriable has become friable since that previous inspection and shall assess the newly-friable ACBM under §763.88.

(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 §763.85(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 the homogeneous or sampling area determined not to be ACBM was sampled in substantial compliance with §763.85(a).

(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.

(4) The lead agency responsible for asbestos inspection in a State that has been granted a waiver from §763.85(a) has determined that, based on sampling records and inspection records, 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 §763.85(a). Such determination shall be included in the management plan for that school.

(5) An accredited inspector has determined that, based on records of an inspection conducted before December 14, 1987, suspected ACBM identified in that homogeneous or sampling area is assumed to be ACM. 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 of such determination, submit a copy of the statement to the person designated under §763.84 for inclusion in the management plan. However, an accredited inspector shall identify whether material that was nonfriable suspected ACBM assumed to be ACM has become friable since the previous inspection and shall assess the newly friable material and previously identified friable suspected ACBM assumed to be ACM under §763.88.

(6) Based on inspection records and contractor and clearance records, an accredited inspector has determined that no ACBM is present in the homogeneous or sampling area where asbestos removal operations have been conducted before December 14, 1987, and shall sign and date a statement to that effect and include his or her State of accreditation and, if applicable, accreditation number. 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.

(7) An architect or project engineer responsible for the construction of a new school building built after October 12, 1988, or an accredited inspector signs a statement that no ACBM was specified as a building material in any construction document for the building, or, to the best of his or her knowledge, no ACBM was used as a building material in the building. The local education agency shall submit a copy of the signed statement to the EPA Regional Office and shall include the statement in the management plan for that school.

(b) The exclusion, under paragraphs (a) (1) through (4) of this section, from conducting the inspection under §763.85(a) shall apply only to homogeneous or sampling areas of a school building that were inspected and sampled before October 17, 1987. The local
APPENDIX A TO SUBPART E OF PART 763—I NTERIM 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 fibrocity 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.

7. ED—Electron diffraction.

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 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.
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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/cm³—Structures per cubic centimeter.
23. S/mm²—Structures per square millimeter.
24. TEM—Transmission electron microscope.

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:
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 transference 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:

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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 I--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>
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<tr>
<td>385 sq mm</td>
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<td>560</td>
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Note minimum volumes required:
- 25 mm: 560 liters
- 37 mm: 1,250 liters

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

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.

   ii. Measure 20 grid openings on each of 20 random 200-mesh copper grids by placing a grid on a glass and examining it under the PCM. Use a calibrated graticule to measure the average field diameters. From the data, calculate the field area for an average grid opening.

   iii. Measurements can also be made 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.

   b. TEM specimen preparation from polycarbonate (PC) filters. Procedures as described in Unit III.G. or other equivalent methods may be used.

   c. TEM specimen preparation from mixed cellulose ester (MCE) filters.

   i. 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 performances 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. 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 particular 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.

F. TEM Method

1. 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 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 for magnification and camera constant.

2. 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 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. 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.

3. 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 a eucentric tilting specimen stage, all specimens and the cross grating replica must be placed at the eucentric position.

4. 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.

5. Microscope settings: 80–120 kV, grid assessment 250–1,000X, then 15,000–20,000X screen magnification for analysis.

6. 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.
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.
i. 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.

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.

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

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

d. 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.)

e. 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.

f. 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 4 amphiboles would require EDXA.)

g. If the number of fibers in the non-asbestos 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.

h. 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 after 70 s/mm² have been exceeded for a particular sample.

i. Fibers classified as amphiboles must be identified by X-ray analysis and electron diffraction and recorded on a count sheet. X-ray analysis alone can be used only after 70 s/mm² have been exceeded for a particular sample.

j. If a diffraction pattern was recorded on film, record the micrograph number on the count sheet.

k. If an electron diffraction was attempted but no pattern was observed, record N on the count sheet.

l. If an EDXA spectrum was attempted but not observed, record N on the count sheet.

m. If an X-ray analysis spectrum is stored, record the file and disk number on the count sheet.

10. Classification Rules.

a. 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.

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

c. 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.

d. 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.

11. After finishing with a grid, remove it from the microscope, and replace it in the appropriate grid holder. 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.

G. Sample Analytical Sequence

1. Under the present sampling requirements a minimum of 13 samples is to be collected for the clearance testing of an abatement site. These include five abatement area samples, five ambient samples, two field blanks, and one sealed blank.

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

3. Collect a minimum of 5 air samples inside the work site and 5 samples outside the work site. The indoor and outdoor samples shall be taken during the same time period.

4. 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 sampled (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 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 are to be performed along with the sample analysis as indicators that the materials used are adequate and the
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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>
<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 each 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 ED 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. 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 magnification, electron diffraction and energy dispersive X-ray systems as set forth in Table III under Unit II.1.

8. Ensure qualified operator performance by evaluation of replicate analysis and standard sample comparisons as set forth in Table III under Unit II.1.

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.1.

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 the mandatory quality assurance procedures.

J. References

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


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


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/cm³.

2. Asbestiform—A specific type of mineral fibrous 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 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.

7. ED—Electron diffraction.

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/cm³**—Structures per cubic centimeter.

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

24. **TEM**—Transmission electron microscope.

**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 cowl or a filter-retaining middle piece. Conductive material may reduce the potential for particulates to adhere to the walls of the cowl.

   c. Cassette filters 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.
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.
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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 6 of Unit III.L.).
   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:
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.
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 resealed 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.L.)
   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.
   e. Prior to air monitoring, floors, ceiling and walls shall be swept with the exhaust of a minimum one (1) horsepower leaf blower.
   f. Stationary fans are placed in locations which will not interfere with air monitoring equipment. Fan air is directed toward the ceiling. One fan shall be used for each 10,000 ft² of worksite.
   g. 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.
   h. 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.
   i. After 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.
   j. 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.
   k. Sample a volume of air sufficient to ensure the minimum quantitation limits. (See Table I of Unit III.B.5.j.)
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 same 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 wrap. 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 data, shipper’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, choose 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 the package description, shipment mode, and anticipated arrival as part of the chain of custody and sample tracking procedures. This will also help the laboratory schedule timely 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/mm² 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 transferal 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 _________________________

<table>
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</tr>
</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.
Environmental Protection Agency

NOTE: The person breaking the chain-of-custody seal and itemizing the contents assumes responsibility for the shipment and signs documents accordingly.

4. Assign a laboratory number and schedule an analysis sequence.

5. Manage all chain-of-custody samples within the laboratory such that their integrity can be ensured and documented.

F. Sample Preparation

1. Personnel not affiliated with the Abatement Contractor shall be used to prepare samples and conduct TEM analysis. 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 positive pressure with make-up air being HEPA filtered. The cumulative analytical blank concentration must average less than 18 s/mm² in an area of 0.057 s/mm² (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 8. 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 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.8.

e. Prepare multiple grids for each sample.

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

5. 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 disposable 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 for carbon 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 asher. This is used to etch the surface of collapsed mixed cellulose ester (MCE) filters. The asher 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 ashers 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.

v. Polyurethane foam, 6 mm thickness.

w. Gold wire for evaporation.

6. Reagents.

a. General. A supply of ultra-clean, fiber-free water must be available for washing of all components used in the analysis. Water
that has been distilled in glass or filtered or deionized water is satisfactory for this purpose. Reagents must be fiber-free.


c. Mixed Cellulose Ester (MCE) preparation method—acetone or the Burdette procedure (Ref. 7 of Unit III.L.).

7. TEM specimen preparation from polycarbonate filters.

a. Specimen preparation laboratory. It is most important to ensure that contamination of TEM specimens by extraneous asbestos fibers is minimized during preparation.

b. Cleaning of sample cassettes. Upon receipt at the analytical laboratory and before they are taken into the clean facility or laminar flow hood, the sample cassettes must be cleaned of any contamination adhering to the outside surfaces.

c. Preparation of the carbon evaporator. If the polycarbonate filter has already been carbon-coated prior to receipt, the carbon coating step will be omitted, unless the analyst believes the carbon film is too thin. If there is a need to apply more carbon, the filter will be treated in the same way as an uncoated filter. Carbon coating must be performed with a high-vacuum coating unit.

Units that are based on evaporation of carbon filaments in a vacuum generated only by an oil rotary pump have not been evaluated for this application, and must not be used. The carbon rods should be sharpened by a carbon rod sharpener to necks of about 4 mm long and 1 mm in diameter. The rods are installed in the evaporator in such a manner that the points are approximately 10 to 12 cm from the surface of a microscope slide held in the rotating and tilting device.

d. Selection of filter area for carbon coating. Before preparation of the filters, a 75 mm×50 mm microscope slide is washed and dried. This slide is used to support strips of filter during the carbon evaporation. Two parallel strips of double-sided adhesive tape are applied along the length of the slide. Polycarbonate filters are easily stretched during handling, and cutting of areas for further preparation must be performed with great care. The filter and the MCE backing filter are removed together from the cassette and placed on a cleaned glass microscope slide. The filter can be cut with a curved scalpel blade by rocking the blade from the 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 with 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 on the rotation-tilting device, 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 Jaffé washer. The precise design of the Jaffé 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×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 Jaffé 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 scalpel 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 Jaffé 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.

8. TEM specimen preparation from MCE filters.
   a. 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.
   b. 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.
   c. Remove a section from any quadrant of the sample and blank filters.
   d. Place the section on a clean microscope slide. Affix the filter section to the slide with a gummed paged reinforcement or other suitable means. Label the slide with a water-solvent-proof marking pen.
   e. Place the slide in a petri dish which contains several paper filters soaked with 2 to 3 mL acetone. Cover the dish. Wait 2 to 4 minutes for the sample filter to fuse and clear.
   f. Plasma etching of the collapsed filter is required.
   i. 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, and too much etching may result in 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.
   j. Place the slide containing the collapsed filters into a low-temperature plasma asher, and etch the filter.
   g. 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.
   h. Prepare a second petri dish as a Jaffe washer with the wicking substrate prepared 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 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.
   i. Place carbon-coated TEM grids face up on the filter or lens paper. Label the grids by marking with a pencil on the petri paper or by putting registration 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 gradations. 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
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.
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 re-

loaded 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:
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.
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.
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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.

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

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

Structure Measurement.

1. Recognize the structure that is to be sized.

2. Memorize its location in the “window” relative to the sides, inscribed square and to other particulates in the field so this exact location can be found again when scanning is resumed.

3. Measure the structure using the scale on the screen.

4. Record the length category and 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.

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 belonging to one of the following classifications: chrysotile, amphibole, or nonasbestos.

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), (130) diffraction maxima; distances and geometry should match a chrysotile pattern and be measured semiquantitatively.

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.

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

i. Required of all amphiboles which would cause the analysis results 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 asbestiform structures are counted in a particular grid opening, the analysis may be terminated.

ii. After having counted 50 asbestiform 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.

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\(\mu\)m or greater than or equal to 5\(\mu\)m.

(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 sheet. X-ray analysis alone can be used as sole identification only after 70\(s/mm^2\) have been exceeded for a particular sample.

(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\(s/mm^2\) 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.

i. Fiber. A structure having a minimum length greater than or equal to 0.5\(\mu\)m 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.

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

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

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

p. 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/cm\(^3\) 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>
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<td></td>
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<td>Type</td>
<td>Diameter (um)</td>
<td>Effective Area (mm²)</td>
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### Individual Analytical Results

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<tr>
<th>Laboratory I.D.</th>
<th>Client I.D.</th>
<th># Asbestos Structures</th>
<th>Analytical Sensitivity, 1/sec</th>
<th>CONCENTRATION</th>
<th>Structures/mm²</th>
<th>Structures/cc</th>
</tr>
</thead>
</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 air 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. Those 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.L.

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 depend on the past history of 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 eccentric tilting specimen stage, all specimens and the cross grating replica must be placed at the eccentric 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 2,160 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 \( X \).

2. 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 window thickness. Therefore, at a particular accelerating voltage in use on the TEM, the count rate obtained from 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.


a. 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 window thickness. Therefore, at a particular accelerating voltage in use on the TEM, the count rate obtained from 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.

b. Determination 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 it under 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 type 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 40X 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.

4. 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 multiple 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 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 following Table III:
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 special 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 f/mm² per 10 200-mesh grid openings, check the system for possible sources of contamination.
6. Check for recovery of asbestos from cellulose ester filters submitted to plasma ash.
7. Check for asbestos carryover in the plasma asher by including a blank alongside the positive control sample.

<table>
<thead>
<tr>
<th>Unit Operation</th>
<th>QC Check</th>
<th>Frequency</th>
<th>Conformance Expression</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 reclin</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 prep (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 Poison Std. Dev.</td>
</tr>
<tr>
<td></td>
<td>Duplicate analysis (measure of reproducibility)</td>
<td>1 per 100 samples</td>
<td>2 x Poison 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 Poison 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 1D 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>
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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. Specifics on those control procedures and options available for environmental testing can be obtained by consulting References 6, 7, and 11 of Unit III.L.

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 unusually 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 s/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 expressed 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 s/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 inside 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

\[
Z = \frac{\bar{Y}_1 - \bar{Y}_0}{0.8 \left( \frac{1}{n_1} + \frac{1}{n_0} \right)^{1/2}}
\]

where \(Y_1\) is the average of the natural logarithms of the inside samples and \(Y_0\) 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.

2. If the abatement area does not satisfy either (1) or (2) of this Section C, the site must be recleaned 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, reclean 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 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 outside samples and perform the Z-test.
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6. If the Z-statistic is less than or equal to 1.65, the response action is complete. If the Z-statistic is greater than 1.65, recline the abatement site and collect a new set of samples.

52 FR 41857, Oct. 30, 1987

APPENDIX B TO SUBPART E OF PART 763

APPENDIX C TO SUBPART E OF PART 763—ASBESTOS MODEL ACCREDITATION PLAN

I. Asbestos Model Accreditation Plan for States

The Asbestos Model Accreditation Plan (MAP) for States has eight components:

(A) Definitions

(B) Initial Training

(C) Examinations

(D) Continuing Education

(E) Qualifications

(F) Recordkeeping Requirements for Training Providers

(G) Deaccreditation

(H) Reciprocity

1. Definitions

For purposes of Appendix C:

1. "Friable asbestos-containing material (ACM)" means any material containing more than one percent asbestos which has been applied to ceilings, walls, structural members, piping, duct work, or any other part of a building, which when dry, may be crumbled, pulverized, or reduced to powder by hand pressure. The term includes non-friable asbestos-containing material after such previously non-friable material becomes damaged to the extent that when dry it may be crumbled, pulverized, or reduced to powder by hand pressure.

2. "Friable asbestos-containing building material (ACBM)" means any friable ACM that is in or on interior structural members or other parts of a school or public and commercial building.

3. "Inspection" means an activity undertaken in a school building, or a public and commercial building, to determine the presence or location, or to assess the condition of, friable or non-friable asbestos-containing building material (ACBM) or suspected ACBM, whether by visual or physical examination, or by collecting samples of such material. This term includes re-inspections of friable and non-friable known or assumed ACBM. The term does not include the following:

   a. Periodic surveillance of the type described in 40 CFR 763.92(b) solely for the purpose of determining completion of response actions.

   b. Inspections performed by employees or agents of Federal, State, or local government solely for the purpose of determining compliance with applicable statutes or regulations; or

   c. Visual inspections of the type described in 40 CFR 763.90(i) solely for the purpose of determining completion of response actions.

4. "Major fiber release episode" means any uncontrolled or unintentional disturbance of ACBM, resulting in a visible emission, which involves the falling or dislodging of more than 3 square or linear feet of friable ACBM.

5. "Minor fiber release episode" means any uncontrolled or unintentional disturbance of ACBM, resulting in a visible emission, which involves the falling or dislodging of 3 square or linear feet or less of friable ACBM.

6. "Public and commercial building" means the interior space of any building which is not a school building, except that the term does not include any residential apartment building of fewer than 10 units or detached single-family homes. The term includes, but is not limited to: industrial and office buildings, residential apartment buildings and condominiums of 10 or more dwelling units, government-owned buildings, colleges, universities, airports, hospitals, churches, preschools, stores, warehouses and factories. Interior space includes exterior hallways connecting buildings, porticos, and mechanical systems used to condition interior space.

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

8. "Small-scale, short-duration activities (SSSD)" are tasks such as, but not limited to:

   a. Removal of asbestos-containing insulation on pipes.

   b. Removal of small quantities of asbestos-containing insulation on beams or above ceilings.

   c. Replacement of an asbestos-containing gasket on a valve.

   d. Installation or removal of a small section of drywall.

   e. Installation of electrical conduits through or proximate to asbestos-containing materials.

SSSD can be further defined by the following considerations:

f. Removal of small quantities of ACM only if required in the performance of another maintenance activity not intended as asbestos abatement.

g. Removal of asbestos-containing thermal system insulation not to exceed amounts greater than those which can be contained in a single glove bag.

h. Minor repairs to damaged thermal system insulation which do not require removal.

i. Repairs to a piece of asbestos-containing wallboard.
j. Repairs, involving encapsulation, enclosure, or removal, to small amounts of friable ACM 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 mini-enclosure. Such an enclosure shall conform spatially and geometrically to the localized work area, in order to perform its intended containment function.

B. Initial Training

Training requirements for purposes of accreditation are specified both in terms of required aspects of instruction and in terms of length of training. Each initial training course has a prescribed curriculum and number of days of training. One day of training equals 8 hours, including breaks and lunch. Course instruction must be provided by EPA or State-approved instructors. EPA or State instructor approval shall be based upon a review of the instructor’s academic credentials and/or field experience in asbestos abatement.

Beyond the initial training requirements, individual States may wish to consider requiring additional days of training for purposes of supplementing hands-on activities or for reviewing relevant state regulations. States also may wish to consider the relative merits of a worker apprenticeship program. Further, they might consider more stringent minimum qualification standards for the approval of training instructors. EPA recommends that the enrollment in any given course be limited to 25 students so that adequate opportunities exist for individual hands-on experience.

States have the option to provide initial training directly or approve other entities to offer training. The following requirements are for the initial training of persons required to have accreditation under TSCA Title II.

Training requirements for each of the five accredited disciplines are outlined below. Persons in each discipline perform a different job function and distinct role. Inspectors identify and assess the condition of ACBM, or suspect ACBM. Management planners use data gathered by inspectors to assess the degree of hazard posed by ACBM in schools to determine the scope and timing of appropriate response actions needed for schools. Project designers determine how asbestos abatement work should be conducted. Lastly, workers and contractor/supervisors carry out and oversee abatement work. In addition, a recommended training curriculum is also presented for a sixth discipline, which is not federally-accredited, that of “Project Monitor.” Each accredited discipline and training curriculum is separate and distinct from the others. A person seeking accreditation in any of the five accredited MAP disciplines cannot attend two or more courses concurrently, but may attend such courses sequentially.

In several instances, initial training courses for a specific discipline (e.g., workers, inspectors) require hands-on training. For asbestos abatement contractor/supervisors and workers, hands-on training should include working with asbestos-substitute materials, fitting and using respirators, use of glovebags, donning protective clothing, and constructing a decontamination unit as well as other abatement work activities.

1. Workers

A person must be accredited as a worker to carry out any of the following activities with respect to friable ACBM in a school or public and commercial building: (1) A response action other than a SSSD activity, (2) a maintenance activity that disturbs friable ACBM other than a SSSD activity, or (3) a response action for a major fiber release episode. All persons seeking accreditation as asbestos abatement workers shall complete at least a 4-day training course as outlined below. The 4-day worker training course shall include lectures, demonstrations, at least 14 hours of hands-on training, individual respirator fit testing, course review, and an examination.

Hands-on training must permit workers to have actual experience performing tasks associated with asbestos abatement. A person who is otherwise accredited as a contractor/supervisor may perform in the role of a worker without possessing separate accreditation as a worker. Because of cultural diversity associated with the asbestos workforce, EPA recommends that States adopt specific standards for the approval of foreign language courses for abatement workers. EPA further recommends the use of audio-visual materials to complement lectures, where appropriate.

The training course shall adequately address the following topics:

(a) Physical characteristics of asbestos. Identification of asbestos, aerodynamic characteristics, typical uses, and physical appearance, and a summary of abatement control options.

(b) Potential health effects related to asbestos exposure. The nature of asbestos-related diseases; routes of exposure; dose-response relationships and the lack of a safe exposure level; the synergistic effect between cigarette smoking and asbestos exposure; the latency periods for asbestos-related diseases; a discussion of the relationship of asbestos exposure to asbestosis, lung cancer, mesothelioma, and cancers of other organs.

(c) Employee personal protective equipment. Classes and characteristics of respirator
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2. CONTRACTOR/SUPERVISORS

A person must be accredited as a contractor/supervisor to supervise any of the following activities with respect to friable ACBM in a school or public and commercial building: (1) A response action other than a SSSD activity, (2) a maintenance activity that disturbs friable ACBM other than a SSSD activity, or (3) a response action for a major fiber release episode. All persons seeking accreditation as asbestos abatement contractor/supervisors shall complete at least a 5-day training course as outlined below. The training course must include lectures, demonstrations, at least 14 hours of hands-on training, individual respirator fit testing, course review, and a written examination. Hands-on training must permit supervisors to have actual experience performing tasks associated with asbestos abatement.

EPA recommends the use of audiovisual materials to complement lectures, where appropriate.

Asbestos abatement supervisors include those persons who provide supervision and direction to workers performing response actions. Supervisors may include those individuals with the position title of foreman, working foreman, or leadman pursuant to collective bargaining agreements. At least one supervisor is required to be at the worksite at all times while response actions are being conducted. Asbestos workers must have access to accredited supervisors throughout the duration of the project.

The contractor/supervisor training course shall adequately address the following topics:

(a) The physical characteristics of asbestos and asbestos-containing materials. Identification of asbestos, aerodynamic characteristics, typical uses, physical appearance, a review of hazard assessment considerations, and a summary of abatement control options.

(b) Potential health effects related to asbestos exposure. The nature of asbestos-related diseases; routes of exposure; dose-response relationships and the lack of a safe exposure level; synergism between cigarette smoking and asbestos exposure; and latency period for diseases.

(c) Employee personal protective equipment. Classes and characteristics of respirator types; limitations of respirators; proper selection, inspection, donning, use, maintenance, and storage procedures for respirators; methods for field testing of the facepiece-to-face seal (positive and negative-pressure fit checks); qualitative and quantitative fit testing procedures; variability between field and laboratory protection factors that alter respiratory fit (e.g., facial hair); the components of a proper respiratory protection program; selection and use of personal protective clothing; and use, storage, and handling of non-disposable clothing; and regulations covering personal protective equipment.

(d) State-of-the-art work practices. Proper work practices for asbestos abatement activities, including descriptions of proper containment, maintenance of barriers and de-contamination enclosure systems; positioning of warning signs; lock-out of electrical and ventilation systems; proper working techniques for minimizing fiber release; use of wet methods; use of negative pressure exhaust ventilation equipment; use of high-efficiency particulate air (HEPA) vacuums; proper clean-up and disposal procedures; work practices for removal, encapsulation, enclosure, and repair of ACM; emergency procedures for sudden releases; potential exposure situations; transport and disposal procedures; and recommended and prohibited work practices.

(e) Personal hygiene. Entry and exit procedures for the work area; use of showers; avoidance of eating, drinking, smoking, and chewing (gum or tobacco) in the work area; and potential exposures, such as family exposure.

(f) Additional safety hazards. Hazards encountered during abatement activities and how to deal with them, including electrical hazards, heat stress, air contaminants other than asbestos, fire and explosion hazards, scaffold and ladder hazards, slips, trips, and falls, and confined spaces.

(g) Medical monitoring. OSHA and EPA Worker Protection Rule requirements for physical examinations, including a pulmonary function test, chest X-rays, and a medical history for each employee.

(h) Air monitoring. Procedures to determine airborne concentrations of asbestos fibers, focusing on how personal air sampling is performed and the reasons for it.

(i) Relevant Federal, State, and local regulatory requirements, procedures, and standards. With particular attention directed at relevant EPA, OSHA, and State regulations concerning asbestos abatement workers.

(j) Establishment of respiratory protection programs.

(k) Course review. A review of key aspects of the training course.
and handling of non-disposable clothing; and regulations covering personal protective equipment.

(d) State-of-the-art work practices. Proper work practices for asbestos abatement activities, including descriptions of proper construction and maintenance of barriers and decontamination enclosure systems; positioning of warning signs; lock-out of electrical and ventilation systems; proper working techniques for minimizing fiber release; use of wet methods; use of negative pressure exhaust ventilation equipment; use of HEPA vacuums; and proper clean-up and disposal procedures. Work practices for removal, encapsulation, enclosure, and repair of ACM; emergency procedures for unplanned releases; potential exposure situations; transport and disposal procedures; and recommended and prohibited work practices.

New abatement-related techniques and methodologies may be discussed.

(e) Personal hygiene. Entry and exit procedures for the work area; use of showers; and avoidance of eating, drinking, smoking, and chewing (gum or tobacco) in the work area. Potential exposures, such as family exposure, shall also be included.

(f) Additional safety hazards. Hazards encountered during abatement activities and how to deal with them, including electrical hazards, heat stress, air contaminants other than asbestos, fire and explosion hazards, scaffold and ladder hazards, slips, trips, and falls, and confined spaces.

(g) Medical monitoring. OSHA and EPA Worker Protection Rule requirements for physical examinations, including a pulmonary function test, chest X-rays and a medical history for each employee.

(h) Air monitoring. Procedures to determine airborne concentrations of asbestos fibers, including descriptions of aggressive air sampling, sampling equipment and methods, reasons for air monitoring, types of samples and interpretation of results.

EPA recommends that transmission electron microscopy (TEM) be used for analysis of final air clearance samples, and that sample analyses be performed by laboratories accredited by the National Institute of Standards and Technology's (NIST) National Voluntary Laboratory Accreditation Program (NVLAP).

(i) Relevant Federal, State, and local regulatory requirements, procedures, and standards, including:

(i) Requirements of TSCA Title II.

(ii) National Emission Standards for Hazardous Air Pollutants (40 CFR part 60), Subparts A (General Provisions) and M (National Emission Standard for Asbestos).

(iii) OSHA standards for permissible exposure to airborne concentrations of asbestos fibers and respiratory protection (29 CFR 1910.134).


(v) EPA Worker Protection Rule, (40 CFR part 763, Subpart G).

(j) Respiratory Protection Programs and Medical Monitoring Programs.

(k) Insurance and liability issues. Contractor issues; worker's compensation coverage and exclusions; third-party liabilities and defenses; insurance coverage and exclusions.

(l) Recordkeeping for asbestos abatement projects. Records required by Federal, State, and local regulations; records recommended for legal and insurance purposes.

(m) Supervisory techniques for asbestos abatement activities. Supervisory practices to enforce and reinforce the required work practices and discourage unsafe work practices.

(n) Contract specifications. Discussions of key elements that are included in contract specifications.

(o) Course review. A review of key aspects of the training course.

3. INSPECTOR

All persons who inspect for ACBM in schools or public and commercial buildings must be accredited. All persons seeking accreditation as an inspector shall complete at least a 3-day training course as outlined above. The course shall include lectures, demonstrations, 4 hours of hands-on training, individual respirator fit-testing, course review, and a written examination.

EPA recommends the use of audiovisual materials to complement lectures, where appropriate. Hands-on training should include conducting a simulated building walk-through inspection and respirator fit testing. The inspector training course shall address the following topics:

(a) Background information on asbestos.

Identification of asbestos, and examples and discussion of the uses and locations of asbestos in buildings; physical appearance of asbestos.

(b) Potential health effects related to asbestos exposure. The nature of asbestos-related diseases; routes of exposure; dose-response relationships and the lack of a safe exposure level; the synergistic effect between cigarette smoking and asbestos exposure; the latency periods for asbestos-related diseases; a discussion of the relationship of asbestos exposure to asbestosis, lung cancer, mesothelioma, and cancers of other organs.

(c) Functions, qualifications and role of inspectors. Discussions of prior experience and qualifications for inspectors and management planners; discussions of the functions of an accredited inspector as compared to those of an accredited management planner; discussion of inspection process including inventory of ACM and physical assessment.

(d) Legal liabilities and defenses. Responsibilities of the inspector and management
planner; a discussion of comprehensive general liability policies, claims-made, and occurrence policies, environmental and pollution liability policy clauses; state liability issues; insuring and understanding the relationship of insurance availability to bond availability.

(e) Understanding building systems. The interrelationship between building systems, including: an overview of common building physical plan layout; heat, ventilation, and air conditioning (HVAC) system types, physical organization, and where asbestos is found on HVAC components; building mechanical systems, their types and organization, and where to look for asbestos on such systems; inspecting electrical systems, including appropriate safety precautions; reading blueprints and as-built drawings.

(f) Public/employee/building occupant relations. Notifying employee organizations about the inspection; signs to warn building occupants; tact in dealing with occupants and the press; scheduling of inspections to minimize disruptions; and education of building occupants about actions being taken.

(g) Pre-inspection planning and review of previous inspection records. Scheduling the inspection and obtaining access; building record review; identification of probable homogeneous areas from blueprints or as-built drawings; consultation with maintenance or building personnel; review of previous inspection, sampling, and abatement records of a building; the role of the inspector in exclusions for previously performed inspections.

(h) Inspecting for friable and non-friable ACM and assessing the condition of friable ACM. Procedures to follow in conducting visual inspections for friable and non-friable ACM; types of building materials that may contain asbestos; touching materials to determine friability; open return air plenums and their importance in HVAC systems; assessing damage, significant damage, potential significant damage; amount of suspected ACM, both in total quantity and as a percentage of the total area; type of damage; accessibility; material's potential for disturbance; known or suspected causes of damage or significant damage; and deterioration as assessment factors.

(i) Bulk sampling/documentation of asbestos. Detailed discussion of the “Simplified Sampling Scheme for Friable Surfacing Materials (EPA 560/5-85-030a October 1985); techniques to ensure sampling in a randomly distributed manner for other than friable surfacing materials; sampling of non-friable materials; techniques for bulk sampling; inspector's sampling and repair equipment; patching or repair of damage from sampling; discussion of polarized light microscopy; choosing an accredited laboratory to analyze bulk samples; quality control and quality assurance procedures. EPA's recommendation that all bulk samples collected from school or public and commercial buildings be analyzed by a laboratory accredited under the NVLAP administered by NVLAP operated by NVLAP.

(j) Inspector respiratory protection and personal protective equipment. Classes and characteristics of respirator types; limitations of respirators; proper selection, inspection, donning, use, maintenance, and storage procedures for respirators; methods for field testing of the facepiece-to-face seal (positive and negative-pressure fit checks); qualitative and quantitative fit testing procedures; variability between field and laboratory protection factors that affect respiratory fit (e.g., facial hair); the components of a proper respiratory protection program; selection and use of personal protective clothing; use, storage, and handling of non-disposable clothing.

(k) Recordkeeping and writing the inspection report. Labeling of samples and keying sample identification to sampling location; recommendations on sample labeling; detailing of ACM inventory; photographs of selected sampling areas and examples of ACM condition; information required for inclusion in the management plan required for school buildings under TSCA Title II, section 203 (i)(l). EPA recommends that States develop and require the use of standardized forms for recording the results of inspections in schools or public or commercial buildings, and that the use of these forms be incorporated into the curriculum of training conducted for accreditation.

(l) Regulatory review. The following topics should be covered: National Emission Standards for Hazardous Air Pollutants (NESHAP; 40 CFR part 61, Subparts A and M); EPA Worker Protection Rule (40 CFR part 763, Subpart G); OSHA Asbestos Construction Standard (29 CFR 1926.58); OSHA respirator requirements (29 CFR 1910.134); the Asbestos-Containing Materials in School Rule (40 CFR part 763, Subpart E); applicable State and local regulations, and differences between Federal and State requirements where they apply, and the effects, if any, on public and nonpublic schools or commercial or public buildings.

(m) Field trip. This includes a field exercise, including a walk-through inspection; on-site discussion about information gathering and the determination of sampling locations; on-site practice in physical assessment; classroom discussion of field exercise.

(n) Course review. A review of key aspects of the training course.

4. MANAGEMENT PLANNER

All persons who prepare management plans for schools must be accredited. All person seeking accreditation as management planners shall complete a 3-day inspector training course as outlined above and a 2-day
management planner training course. Possession of current and valid inspector accreditation shall be a prerequisite for admission to the management planner training course. The management planner course shall include lectures, demonstrations, course review, and a written examination.

EPA recommends the use of audiovisual materials to complement lectures, where appropriate.

TSCA Title II does not require accreditation for persons performing the management planner role in public and commercial buildings. Nevertheless, such persons may find this training and accreditation helpful in preparing them to design or administer asbestos operations and maintenance programs for public and commercial buildings.

The management planner training course shall adequately address the following topics:

(a) Course overview. The role and responsibilities of the management planner; operations and maintenance programs; setting work priorities; protection of building occupants.

(b) Evaluation/interpretation of survey results. Review of TSCA Title II requirements for inspection and management plans for school buildings as given in section 203(i)(1) of TSCA Title II; interpretation of field data and laboratory results; comparison of field inspector's data sheet with laboratory results and site survey.

(c) Hazard assessment. Amplification of the difference between physical assessment and hazard assessment; the role of the management planner in hazard assessment; explanation of significant damage, damage, potential significant damage, and use of a description (or decision tree) code for assessment of ACM; assessment of friable ACM; relationship of accessibility, vibration sources, use of adjoining space, and air plenums and other factors to hazard assessment.

(d) Legal implications. Liability; insurance issues specific to planners; liabilities associated with interim control measures, in-house maintenance, repair, and removal; use of results from previously performed inspections.

(e) Evaluation and selection of control options. Overview of encapsulation, enclosure, interim operations and maintenance, and removal; advantages and disadvantages of each method; response actions described via a decision tree or other appropriate method; work practices for each response action; staging and prioritizing of work in both vacant and occupied buildings; the need for containment barriers and decontamination in response actions.

(f) Role of other professionals. Use of industrial hygienists, engineers, and architects in developing technical specifications for response actions; any requirements that may exist for architect sign-off of plans; team approach to design of high-quality job specifications.

(g) Developing an operations and maintenance (O&M) plan. Purpose of the plan; discussion of applicable EPA guidance documents; what actions should be taken by custodial staff; proper cleaning procedures; steam cleaning and HEPA vacuuming; reducing disturbance of ACM; scheduling O&M for off-hours; rescheduling or canceling renovation in areas with ACM; boiler room maintenance; disposal of ACM; in-house procedures for ACM—bridging and penetrating encapsulants; pipe fittings; metal sleeves; polyvinyl chloride (PVC), canvas, and wet wraps; muslin with straps, fiber mesh cloth; mineral wool, and insulating cement; discussion of employee protection programs and staff training; case study in developing an O&M plan (development, implementation process, problems, and points that have been experienced).

(h) Regulatory review. Focusing on the OSHA Asbestos Construction Standard found at 29 CFR 1926.58; the National Emission Standard for Hazardous Air Pollutants (NESHAP) found at 40 CFR part 61, Subparts A (General Provisions) and M (National Emission Standard for Asbestos); EPA Worker Protection Rule found at 40 CFR part 763, subpart G; TSCA Title II; applicable State regulations.

(i) Recordkeeping for the management planner. Use of field inspector's data sheet along with laboratory results; ongoing recordkeeping as a means to track asbestos disturbance; procedures for recordkeeping. EPA recommends that States require the use of standardized forms for purposes of management plans and incorporate the use of such forms into the initial training course for management planners.

(j) Assembling and submitting the management plan. Plan requirements for schools in TSCA Title II section 203(i)(1); the management plan as a planning tool.

(k) Financing abatement actions. Economic analysis and cost estimates; development of cost estimates; present costs of abatement versus future operation and maintenance costs; Asbestos School Hazard Abatement Act grants and loans.

(l) Course review. A review of key aspects of the training course.

5. Project Designer

A person must be accredited as a project designer to design any of the following activities with respect to friable ACBM in a school or public and commercial building: (1) A response action other than a SSSD maintenance activity, (2) a maintenance activity that disturbs friable ACBM other than a SSSD maintenance activity, or (3) a response action for a major fiber release episode. All persons seeking accreditation as a project designer shall complete at least a minimum
The abatement project designer training course shall adequately address the following topics:

(a) Background information on asbestos. Identification of asbestos; examples and discussion of the uses and locations of asbestos in buildings; physical appearance of asbestos.

(b) Potential health effects related to asbestos exposure; nature of asbestos-related diseases; routes of exposure; dose-response relationships and the lack of a safe exposure level; the synergistic effect between cigarette smoking and asbestos exposure; the latency period of asbestos-related diseases; a discussion of the relationship between asbestos exposure and asbestosis, lung cancer, mesothelioma, and cancers of other organs.

(c) Overview of abatement construction projects. Abatement as a portion of a renovation project; OSHA requirements for notification of other contractors on a multi-employer site (29 CFR 1926.58).

(d) Safety system design specifications. Design, construction, and maintenance of containment barriers and decontamination enclosure systems; positioning of warning signs; electrical and ventilation system lock-out; proper working techniques for minimizing fiber release; entry and exit procedures for the work area; use of wet methods; proper techniques for initial cleaning; use of negative-pressure exhaust ventilation equipment; use of HEPA vacuums; proper clean-up and disposal of asbestos; work practices as they apply to encapsulation, enclosure, and repair; use of glove bags and a demonstration of glove bag use.

(e) Field trip. A visit to an abatement site or other suitable building site, including on-site discussions of abatement design and building walk-through inspection. Include discussion of rationale for the concept of functional spaces during the walk-through.

(f) Employee personal protective equipment. Classes and characteristics of respirator types; limitations of respirators; proper selection, inspection, donning, use, maintenance, and storage procedures for respirators; methods for field testing of the facepiece-to-face seal (positive and negative-pressure fit checks); qualitative and quantitative fit testing procedures; variability between field and laboratory protection factors that alter respiratory fit (e.g., facial hair); the components of a proper respiratory protection program; selection and use of personal protective clothing; use, storage, and handling of non-disposable clothing.

(g) Additional safety hazards. Hazards encountered during abatement activities and how to deal with them, including electrical hazards, heat stress, air contaminants other than asbestos, fire, and explosion hazards.

(h) Fiber aerodynamics and control. Aerodynamic characteristics of asbestos fibers; importance of proper containment barriers; settling time for asbestos fibers; wet methods in abatement; aggressive air monitoring following abatement; aggressive air movement and negative-pressure exhaust ventilation as a clean-up method.

(i) Designing abatement solutions. Discussions of removal, enclosure, and encapsulation methods; asbestos waste disposal.

(j) Final clearance process. Discussion of the need for a written sampling rationale for aggressive final air clearance; requirements of a complete visual inspection; and the relationship of the visual inspection to final air clearance.

EPA recommends the use of TEM for analysis of final air clearance samples. These samples should be analyzed by laboratories accredited under the NIST NVLAP.

(k) Budgeting/cost estimating. Development of cost estimates; present costs of abatement versus future operation and maintenance costs; setting priorities for abatement jobs to reduce costs.

(l) Writing abatement specifications. Preparation of and need for a written project design; means and methods specifications versus performance specifications; design of abatement in occupied buildings; modification of guide specifications for a particular building; worker and building occupant health/medical considerations; replacement of ACM with non-asbestos substitutes.

(m) Preparing abatement drawings. Significance and need for drawings; use of as-built drawings as base drawings; use of inspection photographs and on-site reports; methods of preparing abatement drawings; diagramming containment barriers; relationship of drawings to design specifications; particular problems related to abatement drawings.

(n) Contract preparation and administration.

(o) Legal/liabilities/defenses. Insurance considerations; bonding; hold-harmless clauses; use of abatement contractor's liability insurance; claims made versus occurrence policies.

(p) Replacement. Replacement of asbestos with asbestos-free substitutes.

(q) Role of other consultants. Development of technical specification sections by industrial hygienists or engineers; the multi-disciplinary team approach to abatement design.

(r) Occupied buildings. Special design procedures required in occupied buildings; education of occupants; extra monitoring recommendations; staging of work to minimize occupant exposure; scheduling of renovation to minimize exposure.
(s) Relevant Federal, State, and local regulatory requirements, procedures and standards, including, but not limited to:

(i) Requirements of TSCA Title II.


(iv) EPA Worker Protection Rule found at 40 CFR part 763, subpart G.

(v) OSHA Asbestos Construction Standard found at 29 CFR 1926.58.


(t) Course review. A review of key aspects of the training course.

6. PROJECT MONITOR

EPA recommends that States adopt training and accreditation requirements for persons seeking to perform work as project monitors. Project monitors observe abatement activities performed by contractors and generally serve as a building owner's representative to ensure that abatement work is completed according to specification and in compliance with all relevant statutes and regulations. They may also perform the vital role of air monitoring for purposes of determining final clearance. EPA recommends that a State seeking to accredit individuals as project monitors consider adopting a minimum 5-day training course covering the topics outlined below. The course outlined below consists of lectures and demonstrations, at least 6 hours of hands-on training, course review, and a written examination. The hands-on training component might be satisfied by having the student simulate participation in or performance of any of the relevant job functions or activities (or by incorporation of the workshop component described in item “n” below of this unit).

EPA recommends that the project monitor training course adequately address the following topics:

(a) Roles and responsibilities of the project monitor. Definition and responsibilities of the project monitor, including regulatory/specification compliance monitoring, air monitoring, conducting visual inspections, and final clearance monitoring.

(b) Characteristics of asbestos and asbestos-containing materials. Typical uses of asbestos; physical appearance of asbestos; review of asbestos abatement and control techniques; presentation of the health effects of asbestos exposure, including routes of exposure, dose-response relationships, and latency periods for asbestos-related diseases.


(d) Understanding building and building systems. Building construction basics; building physical plan layout; understanding building systems (HVAC, electrical, etc.); layout and organization, where asbestos is likely to be found on building systems; renovations and the effect of asbestos abatement on building systems.

(e) Asbestos abatement contracts, specifications, and drawings. Basic provisions of the contract; relationships between principle parties, establishing chain of command; types of specifications, including means and methods, performance, and proprietary and nonproprietary; reading and interpreting records and abatement drawings; discussion of change orders; common enforcement responsibilities and authority of project monitor.

(f) Response actions and abatement practices. Pre-work inspections; pre-work considerations, precleaning of the work area, removal of furniture, fixtures, and equipment; shutdown/modification of building systems; construction and maintenance of containment barriers, proper demarcation of work areas; work area entry/exit, hygiene practices; determining the effectiveness of air filtration equipment; techniques for minimizing fiber release, wet methods, continuous cleaning; abatement methods other than removal; abatement area clean-up procedures; waste transport and disposal procedures; contingency planning for emergency response.

(g) Asbestos abatement equipment. Typical equipment found on an abatement project; air filtration devices, vacuum systems, negative pressure differential monitoring; HEPA filtration units, theory of filtration, design/construction of HEPA filtration units, qualitative and quantitative performance of HEPA filtration units, sizing the ventilation requirements, location of HEPA filtration units, qualitative and quantitative tests of containment barrier integrity; best available technology.

(h) Personal protective equipment. Proper selection of respiratory protection; classes and characteristics of respirator types, limitations of respirators; proper use of other safety equipment, protective clothing selection, use, and proper handling, hard/bump hats, safety shoes; breathing air systems, high pressure v. low pressure, testing for Grade D air, determining proper backup air volumes.

(i) Air monitoring strategies. Sampling equipment, sampling pumps (low v. high volume), flow regulating devices (critical and
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limiting orifices), use of fibrous aerosol monitors on abatement projects; sampling media, types of filters, types of cassettes, filter orientation, storage and shipment of filters; calibration techniques, primary calibration standards, secondary calibration standards, temperature/pressure effects, frequency of calibration, recordkeeping and field work documentation, calculations; air sample analysis, techniques available and limitations of AHERA on their use, transmission electron microscopy (background to sample preparation and analysis, air sample conditions which prohibit analysis, EPA's recommended technique for analysis of final air clearance samples), phase contrast microscopy (background to sample preparation, and AHERA's limits on the use of phase contrast microscopy), what each technique measures; analytical methodologies, AHERA TEM protocol, NIOSH 7400, OSHA method (non clearance), EPA recommendation for clearance (TEM); sampling strategies for clearance monitoring, types of air samples (personal breathing zone v. fixed-station area) sampling location and objectives (pre-abatement, during abatement, and clearance monitoring), number of samples to be collected, minimum and maximum air volumes, clearance monitoring (post-visual inspection) (number of samples required, selection of sampling locations, period of sampling, aggressive sampling, interpretations of sampling results, calculations), quality assurance; special sampling problems, crawl spaces, acceptable samples for laboratory analysis, sampling in occupied buildings (barrier monitoring).

(l) Safety and health issues other than asbestos. Confined-space entry, electrical hazards, fire and explosion concerns, ladders and scaffolding, heat stress, air contaminants other than asbestos, fall hazards, hazardous materials on abatement projects.

(k) Conducting visual inspections. Inspections during abatement, visual inspections using the ASTM E1368 document; conducting inspections for completeness of removal; discussion of "how clean is clean?"

(l) Legal responsibilities and liabilities of project monitors. Specification enforcement capabilities; regulatory enforcement; licensing; powers delegated to project monitors through contract documents.

(m) Recordkeeping and report writing. Developing project logs/daily logs (what should be included, who sees them); final report preparation; recordkeeping under Federal regulations.

(n) Workshops (6 hours spread over 3 days). Contracts, specifications, and drawings: This workshop could consist of each participant being issued a set of contracts, specifications, and drawings and then being asked to answer questions and make recommendations to a project architect, engineer or to the building owner based on given conditions and these documents.

Air monitoring strategies/asbestos abatement equipment: This workshop could consist of simulated abatement sites for which sampling strategies would have to be developed (i.e., occupied buildings, industrial situations). Through demonstrations and exhibition, the project monitor may also be able to gain a better understanding of the function of various pieces of equipment used on abatement projects (air filtration units, water filtration units, negative pressure monitoring devices, sampling pump calibration devices, etc.).

Conducting visual inspections: This workshop could consist, ideally, of an interactive video in which a participant is "taken through" a work area and asked to make notes of what is seen. A series of questions will be asked which are designed to stimulate a person's recall of the area. This workshop could consist of a series of two or three videos with different site conditions and different degrees of cleanliness.

C. Examinations

1. Each State shall administer a closed book examination or designate other entities such as State-approved providers of training courses to administer the closed-book examination to persons seeking accreditation who have completed an initial training course. Demonstration testing may also be included as part of the examination. A person seeking initial accreditation in a specific discipline must pass the examination for that discipline in order to receive accreditation. For example, a person seeking accreditation as an abatement project designer must pass the State's examination for abatement project designer.

States may develop their own examinations, have providers of training courses develop examinations, or use standardized examinations developed for purposes of accreditation under TSCA Title II. In addition, States may supplement standardized examinations with questions about State regulations. States may obtain commercially developed standardized examinations, develop standardized examinations independently, or do so in cooperation with other States, or with commercial or non-profit providers on a regional or national basis. EPA recommends the use of standardized, scientifically-validated testing instruments, which may be beneficial in terms of both promoting competency and in fostering accreditation reciprocity between States.

Each examination shall adequately cover the topics included in the training course for that discipline. Each person who completes a
training course, passes the required examination, and fulfills whatever other requirements the State imposes must receive an accreditation certificate in a specific discipline. Whether a State directly issues accreditation certificates, or authorizes training providers to issue accreditation certificates, each certificate issued to an accredited person must contain the following minimum information:

a. A unique certificate number
b. Name of accredited person
c. Discipline of the training course completed.
d. Dates of the training course.
e. Date of the examination.
f. An expiration date of 1 year after the date upon which the person successfully completed the course and examination.
g. The name, address, and telephone number of the training provider that issued the certificate.
h. A statement that the person receiving the certificate has completed the requisite training for asbestos accreditation under TSCA Title II.

States or training providers who reaccredit persons based upon completion of required refresher training must also provide accreditation certificates with all of the above information, except the examination date may be omitted if a State does not require a refresher examination for reaccreditation.

Where a State licenses accredited persons but has authorized training providers to issue accreditation certificates, the State may issue licenses in the form of photo-identification cards. Where this applies, EPA recommends that the State licenses should include all of the same information required for the accreditation certificates. A State may also choose to issue photo-identification cards in addition to the required accreditation certificates.

Accredited persons must have their initial and current accreditation certificates at the location where they are conducting work.

2. The following are the requirements for examination in each discipline:

a. Worker:
   i. 50 multiple-choice questions
   ii. Passing score: 70 percent correct
b. Contractor/Supervisor:
   i. 100 multiple-choice questions
   ii. Passing score: 70 percent correct
c. Inspector:
   i. 50 multiple-choice questions
   ii. Passing score: 70 percent correct
d. Management Planner:
   i. 50 multiple-choice questions
   ii. Passing score: 70 percent correct
e. Project Designer:
   i. 100 multiple-choice questions
   ii. Passing score: 70 percent correct

D. Continuing Education

For all disciplines, a State’s accreditation program shall include annual refresher training as a requirement for reaccreditation as indicated below.

1. Workers: One full day of refresher training.
2. Contractor/Supervisors: One full day of refresher training.
3. Inspectors: One half-day of refresher training.
4. Management Planners: One half-day of inspector refresher training and one half-day of refresher training for management planners.
5. Project Designers: One full day of refresher training.

The refresher courses shall be specific to each discipline. Refresher courses shall be conducted as separate and distinct courses and not combined with any other training during the period of the refresher course. For each discipline, the refresher course shall review and discuss changes in Federal, State, and local regulations, developments in state-of-the-art procedures, and a review of key aspects of the initial training course as determined by the State. After completing the annual refresher course, persons shall have their accreditation extended for an additional year from the date of the refresher course. A State may consider requiring persons to pass reaccreditation examinations at specific intervals (for example, every 3 years).

EPA recommends that States formally establish a 12-month grace period to enable formerly accredited persons with expired certificates to complete refresher training and have their accreditation status reinstated without having to re-take the initial training course.

E. Qualifications

In addition to requiring training and an examination, a State may require candidates for accreditation to meet other qualification and/or experience standards that the State considers appropriate for some or all disciplines. States may choose to consider requiring qualifications similar to the examples outlined below for inspectors, management planners and project designers. States may modify these examples as appropriate. In addition, States may want to include some requirements based on experience in performing a task directly as a part of a job or in an apprenticeship role. They may also wish to consider additional criteria for the approval of training course instructors beyond those prescribed by EPA.

1. Inspectors: Qualifications - possess a high school diploma. States may want to require an Associate's Degree in specific fields (e.g., environmental or physical sciences).
2. Management Planners: Qualifications - Registered architect, engineer, or certified industrial hygienist or related scientific field.

3. Project Designers: Qualifications - registered architect, engineer, or certified industrial hygienist.

4. Asbestos Training Course Instructor: Qualifications - academic credentials and/or field experience in asbestos abatement.

EPA recommends that States prescribe minimum qualification standards for training instructors employed by training providers.

F. Recordkeeping Requirements for Training Providers

All approved providers of accredited asbestos training courses must comply with the following minimum recordkeeping requirements:

1. Training course materials. A training provider must retain copies of all instructional materials used in the delivery of the classroom training such as student manuals, instructor notebooks and handouts.

2. Instructor qualifications. A training provider must retain copies of all instructors’ resumes, and the documents approving each instructor issued by either EPA or a State. Instructors must be approved by either EPA or a State before teaching courses for accreditation purposes. A training provider must notify EPA or the State, as appropriate, in advance whenever it changes course instructors. Records must accurately identify the instructors that taught each particular course for each date that a course is offered.

3. Examinations. A training provider must document that each person who receives an accreditation certificate for an initial training course has achieved a passing score on the examination. These records must clearly indicate the date upon which the exam was administered, the training course and discipline for which the exam was given, the name of the person who proctored the exam, a copy of the exam, and the name and test score of each person taking the exam. The topic and date of the training course must correspond to those listed on that person’s accreditation certificate. States may choose to apply these same requirements to examinations for refresher training courses.

4. Accreditation certificates. The training providers or States, whichever issues the accreditation certificate, shall maintain records that document the names of all persons who have been awarded certificates, their certificate numbers, the disciplines for which accreditation was conferred, training and expiration dates, and the training location. The training provider or State shall maintain the records in a manner that allows verification by telephone of the required information.

5. Verification of certificate information. EPA recommends that training providers of refresher training courses confirm that their students possess valid accreditation before granting course admission. EPA further recommends that training providers offering the initial management planner training course verify that students have met the prerequisite of possessing valid inspector accreditation at the time of course admission.

6. Records retention and access. (a) The training provider shall maintain all required records for a minimum of 3 years. The training provider, however, may find it advantageous to retain these records for a longer period of time.

(b) The training provider must allow reasonable access to all of the records required by the MAP, and to any other records which may be required by States for the approval of asbestos training providers or the accreditation of asbestos training courses, to both EPA and to State Agencies, on request. EPA encourages training providers to make this information equally accessible to the general public.

(c) If a training provider ceases to conduct training, the training provider shall notify the approving government body (EPA or the State) and give it the opportunity to take possession of that providers asbestos training records.

G. Deaccreditation

1. States must establish criteria and procedures for deaccrediting persons accredited as workers, contractor/supervisors, inspectors, management planners, and project designers. States must follow their own administrative procedures in pursuing deaccreditation actions. At a minimum, the criteria shall include:

(a) If performing work requiring accreditation at a job site without being in physical possession of initial and current accreditation certificates;

(b) Permitting the duplication or use of one’s own accreditation certificate by another;

(c) Performing work for which accreditation has not been received; or

(d) Obtaining accreditation from a training provider that does not have approval to offer training for the particular discipline from either EPA or from a State that has a contractor accreditation plan at least as stringent as the EPA MAP.

EPA may directly pursue deaccreditation actions without reliance on State deaccreditation or enforcement authority or actions. In addition to the above-listed situations, the Administrator may suspend or revoke the accreditation of persons who have been subject to a final order imposing a civil penalty or convicted under section 16 of TSCA, 15 U.S.C. 2625 or 2647, for violations of 40 CFR part 763, or section 113 of the Clean Air Act.

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II. EPA Approval Process for State Accreditation Programs

A. States may seek approval for a single discipline or all disciplines as specified in the MAP. For example, a State that currently only requires worker accreditation may receive EPA approval for that discipline alone. EPA encourages States that currently do not have accreditation requirements for all disciplines required under section 206(b) of TSCA, 15 U.S.C. 2646(b), to seek EPA approval for those disciplines the State does accredit. As States establish accreditation requirements for the remaining disciplines, the requested information outlined below should be submitted to EPA as soon as possible. Any State that had an accreditation program approved by EPA under an earlier version of the MAP may follow the same procedures to obtain EPA approval of their accreditation program under this MAP.

B. Partial approval of a State Program for the accreditation of one or more disciplines does not mean that the State is in full compliance with TSCA where the deadline for that State to have adopted a State Plan no less stringent than the MAP has already passed. State Programs which are at least as stringent as the MAP for one or more of the accredited disciplines may, however, accredit persons in those disciplines only.

C. States seeking EPA approval or re-approval of accreditation programs shall submit the following information to the Regional Asbestos Coordinator at their EPA Regional office:

1. A copy of the legislation establishing or upgrading the State’s accreditation program (if applicable).
2. A copy of the State’s accreditation regulations or revised regulations.
3. A letter to the Regional Asbestos Coordinator that clearly indicates how the State meets the program requirements of this MAP. Addresses for each of the Regional Asbestos Coordinators are shown below:

   EPA, Region II, (6T-PT), Asbestos Coordinator, 1200 Sixth Ave., Seattle, WA 98101, (206) 597-3190.
   EPA, Region III, (3AT-33), Asbestos Coordinator, 2890 Woodbridge Ave., Edison, NJ 08837-3679, (908) 321-6671.
   EPA, Region IV, (3AT-33), Asbestos Coordinator, 1445 Ross Ave. Dallas, TX 75202-2744, (214) 655-7244.
   EPA, Region V, (SP-14J), Asbestos Coordinator, 77 W. Jackson Blvd., Chicago, IL 60604-3590, (312) 886-6003.
   EPA, Region VI, (6T-PT), Asbestos Coordinator, 726 Minnesota Ave., Kansas City, KS 66101, (913) 551-7020.
   EPA, Region VII, (ARTX/ASBS), Asbestos Coordinator, 126 Minnesota Ave., Kansas City, KS 66101, (913) 551-7020.
   EPA, Region VIII, (AT-TS), Asbestos Coordinator, 1 Denver Place, Suite 500 999 - 18th St., Denver, CO 80202-2405, (303) 293-1442.
   EPA, Region IX, (A-4-4), Asbestos Coordinator, 75 Hawthorne St., San Francisco, CA 94107, (415) 597-3190.
   EPA, Region X, (AT-083), Asbestos Coordinator, 1200 Sixth Ave., Seattle, WA 98101, (206) 597-3190.

   EPA maintains a listing of all those States that have applied for and received EPA approval for having accreditation requirements that are at least as stringent as the MAP for one or more disciplines. Any training courses...
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approved by an EPA-approved State Program are considered to be EPA-approved for purposes of accreditation.

III. Approval of Training Courses

Individuals or groups wishing to sponsor training courses for disciplines required to be accredited under section 206(b)(1)(A) of TSCA, 15 U.S.C. 2646(b)(1)(A), may apply for approval from States that have accreditation program requirements that are at least as stringent as this MAP. For a course to receive approval, it must meet the requirements for the course as outlined in this MAP, and any other requirements imposed by the State from which approval is being sought. Courses that have been approved by a State with an accreditation program at least as stringent as this MAP are approved under section 206(a) of TSCA, 15 U.S.C. 2646(a), for that particular State, and also for any other State that does not have an accreditation program as stringent as this MAP.

A. Initial Training Course Approval

A training provider must submit the following minimum information to a State as part of its application for the approval of each training course:

1. The course provider’s name, address, and telephone number.
2. A list of any other States that currently approve the training course.
3. The course curriculum.
4. A letter from the provider of the training course that clearly indicates how the course meets the MAP requirements for:
   a. Length of training in days.
   b. Amount and type of hands-on training.
   c. Examination (length, format, and passing score).
   d. Topics covered in the course.
   e. A copy of all course materials (student manuals, instructor notebooks, handouts, etc.).
   f. A detailed statement about the development of the examination used in the course.
   g. Names and qualifications of all course instructors. Instructors must have academic and/or field experience in asbestos abatement.
   h. A description of and an example of the numbered certificates issued to students who attend the course and pass the examination.

B. Refresher Training Course Approval

The following minimum information is required for approval of refresher training courses by States:

1. The length of training in half-days or days.
2. The topics covered in the course.
3. A copy of all course materials (student manuals, instructor notebooks, handouts, etc.).
4. The names and qualifications of all course instructors. Instructors must have academic and/or field experience in asbestos abatement.
5. A description of and an example of the numbered certificates issued to students who complete the refresher course and pass the examination, if required.

C. Withdrawal of Training Course Approval

States must establish criteria and procedures for suspending or withdrawing approval from accredited training programs. States should follow their own administrative procedures in pursuing actions for suspension or withdrawal of approval of training programs. At a minimum, the criteria shall include:

1. Misrepresentation of the extent of a training course’s approval by a State or EPA;
2. Failure to submit required information or notifications in a timely manner;
3. Failure to maintain requisite records;
4. Falsification of accreditation records, instructor qualifications, or other accreditation information; or
5. Failure to adhere to the training standards and requirements of the EPA MAP or State Accreditation Program, as appropriate.

In addition to the criteria listed above, EPA may also suspend or withdraw a training course’s approval where an approved training course instructor, or other person with supervisory authority over the delivery of training, has been found in violation of other asbestos regulations administered by EPA. An administrative or judicial finding of violation, or execution of a consent agreement and order under 40 CFR 22.18, constitutes evidence of a failure to comply with relevant statutes or regulations. States may wish to adopt this criterion modified to include their own asbestos statutes or regulations. EPA may also suspend or withdraw approval of training programs where a training provider has submitted false information as a part of the self-certification required under Unit V.B. of the revised MAP.

Training course providers shall permit representatives of EPA or the State which approved their training courses to attend, evaluate, and monitor any training course without charge. EPA or State compliance inspection staff are not required to give advance notice of their inspections. EPA may suspend or withdraw State or EPA approval of a training course based upon the criteria specified in this Unit III.C.

IV. EPA Procedures for Suspension or Revocation of Accreditation or Training Course Approval

A. If the Administrator decides to suspend or revoke the accreditation of any person or
suspend or withdraw the approval of a training course, the Administrator will notify the affected entity of the following:

1. The grounds upon which the suspension, revocation, or withdrawal is effective, whether permanent or otherwise.
2. The time period during which the suspension, revocation, or withdrawal is effective.
3. The conditions, if any, under which the affected entity may receive accreditation or approval in the future.
4. Any additional conditions which the Administrator may impose.
5. The opportunity to request a hearing prior to final Agency action to suspend or revoke accreditation or suspend or withdraw approval.

B. If a hearing is requested by the accredited person or training course provider pursuant to the preceding paragraph, the Administrator will:

1. Notify the affected entity of those assertions of law and fact upon which the action to suspend, revoke, or withdraw is based.
2. Provide the affected entity an opportunity to offer written statements of facts, explanations, comments, and arguments relevant to the proposed action.
3. Provide the affected entity such other procedural opportunities as the Administrator may deem appropriate to ensure a fair and impartial hearing.
4. Appoint an EPA attorney as Presiding Officer to conduct the hearing. No person shall serve as Presiding Officer if he or she has had any prior connection with the specific case.
5. The Presiding Officer appointed pursuant to the preceding paragraph shall:
   1. Conduct a fair, orderly, and impartial hearing, without unnecessary delay.
   2. Consider all relevant evidence, explanation, comment, and argument submitted pursuant to the preceding paragraph.
   3. Promptly notify the affected entity of his or her decision and order. Such an order is a final Agency action.

D. If the Administrator determines that the public health, interest, or welfare warrants immediate action to suspend the accreditation of any person or the approval of any training course provider, the Administrator will:

1. Notify the affected entity of the grounds upon which the emergency suspension is based;
2. Notify the affected entity of the time period during which the emergency suspension is effective.
3. Notify the affected entity of the Administrator’s intent to suspend or revoke accreditation or suspend or withdraw training course approval, as appropriate, in accordance with Unit IV.A. above. If such suspension, revocation, or withdrawal notice has not previously been issued, it will be issued at the same time the emergency suspension notice is issued.
4. Any notice, decision, or order issued by the Administrator under this section, and any documents filed by an accredited person or approved training course provider in a hearing under this section, shall be available to the public except as otherwise provided by section 14 of TSCA or 40 CFR part 2. Any such hearing at which oral testimony is presented shall be open to the public, except that the Presiding Officer may exclude the public to the extent necessary to allow presentation of information which may be entitled to confidential treatment under section 14 of TSCA or 40 CFR part 2.

V. Implementation Schedule

The various requirements of this MAP become effective in accordance with the following schedules:

A. Requirements applicable to State Programs

1. Each State shall adopt an accreditation plan that is at least as stringent as this MAP within 180 days after the commencement of the first regular session of the legislature of the State that is convened on or after April 4, 1994.
2. If a State has adopted an accreditation plan at least as stringent as this MAP as of April 4, 1994, the State may continue to:
   a. Conduct TSCA training pursuant to this MAP.
   b. Approve training course providers to conduct training and to issue accreditation that satisfies the requirements for TSCA accreditation under this MAP.
   c. Issue accreditation that satisfies the requirements for TSCA accreditation under this MAP.
3. A State that had complied with an earlier version of the MAP, but has not adopted an accreditation plan at least as stringent as this MAP by April 4, 1994, may:
   a. Conduct TSCA training pursuant to this MAP.
   b. Approve training course providers to conduct training and issue TSCA accreditation that satisfies the requirements for TSCA accreditation under this MAP.
   c. Issue accreditation pursuant to an earlier version of the MAP that provisionally satisfies the requirement for TSCA accreditation until October 4, 1994.

Such a State may not approve new TSCA training course providers to conduct training or to issue TSCA accreditation that satisfies
the requirements of this MAP, and are not required to retake initial training. They must then reapply for approval of these training courses pursuant to the procedures outlined in Unit III.

C. Requirements applicable to Accredited Persons.

Persons accredited by a State with an accreditation program no less stringent than an earlier version of the MAP or by an EPA-approved training provider as of April 3, 1994, are accredited in accordance with the requirements of this MAP, and are not required to reapply for approval of these training courses pursuant to the procedures outlined in Unit III.

D. Requirements applicable to Non-Accredited Persons.

In order to perform work requiring accreditation under TSCA Title II, persons who are not accredited by a State with an accreditation program no less stringent than an earlier version of the MAP or by an EPA-approved training provider as of April 3, 1994, must comply with the requirements of this MAP as of April 3, 1994. Such training providers shall have the effect of extending approval to any States from which approval had been obtained. The timely receipt of a complete self-certification by EPA and all approving States will have the effect of extending approval under this MAP to the training courses offered by the submitting provider. If a self-certification is not received by the approving governmental bodies on or before the due date, the affected training course is not approved under this MAP. Such training providers must then reapply for approval of these training courses pursuant to the procedures outlined in Unit III.
version of the MAP, and thereby perform work during the first 6 months after this MAP takes effect. However, by October 4, 1994, these persons must have successfully completed an upgraded training program that fully complies with the requirements of this MAP in order to continue to perform work requiring accreditation under section 206 of TSCA, 15 U.S.C. 2646.


APPENDIX D TO SUBPART E OF PART 763—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 Management Division, USEPA, Region I, JFK Federal Building, Boston, MA 02203, (617) 223-2266.
used for transport of containerized asbestos waste have an enclosed carrying compartment or utilize a canvas covering sufficient to contain the transported waste, prevent dangerous secondary emissions, and prevent fiber release. Transport of large quantities of asbestos waste is commonly conducted in a 20-cubic-yard “roll off” box, which should also be covered when it is not being transported to reduce waste volume 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 61, 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 metal 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, rinse out the truck, and immediately cover the asbestos 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.
- Prepare a separate trench to receive asbestos waste in the landfill. Recognize that water is not leaking from the truck. Receive the asbestos waste 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, rinse out the truck, and immediately cover the asbestos material prior to compacting the waste in the landfill.

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 erosion of the final cover, 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, 36 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 requirement 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 along 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 landfill deed or other record along with a notice warning against excavation of the area.


**APPENDIX E TO SUBPART E OF PART 763—INTERIM METHOD OF THE DETERMINATION OF ASBESTOS IN BULK INSULATION SAMPLES**

**SECTION 1. POLARIZED LIGHT MICROSCOPY**

1.1 Principle and Applicability

Bulk samples of building materials taken for asbestos identification are first examined for homogeneity and preliminary fiber identification at low magnification. Positive identification of suspect fibers is made by analysis of subsamples with the polarized light microscope.

The principles of optical mineralogy are well established. A light microscope equipped with two polarizing filters is used to observe specific optical characteristics of a sample. The use of plane polarized light allows the determination of refractive indices along specific crystallographic axes. More...
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1.6.2 Sample Preparation

Sample preparation apparatus requirements will depend upon the type of insulation sample under consideration. Various physical and/or chemical means may be employed for an adequate sample assessment.

- Ventilated Hood or negative pressure glove box.
- Microscope Slides
- Coverslips
- Mortar and Pestle: agate or porcelain (optional)
- Wylie Mill (optional)
- Beakers and Assorted Glassware (optional)
- Centrifuge (optional)
- Filtration apparatus (optional)
- Low temperature asher (optional)

1.6.1 Sample Preparation

- Distilled Water (optional)
- Dilute CH₃COOH: ACS reagent grade (optional)
- Dilute HCl: ACS reagent grade (optional)
- Sodium metaphosphate (NaPO₃)₆ (optional)

1.6.2 Analytical Reagents

- Refractive Index Liquids: 1.400–1.570, 1.590–1.720 in increments of 0.002 or 0.004
- Refractive Index Liquids for Dispersion Staining: high-dispersion series, 1.550, 1.605, 1.630 (optional).
- UICC Asbestos Reference Sample Set: Available from: UICC MRC Pneumoconiosis Unit, Llandough Hospital, Penarth, Glamorgan CF6 1XW, UK, and commercial distributors.
- Tremolite-asbestos (source to be determined)
- Actinolite-asbestos (source to be determined)

1.7 Procedures

Note: Exposure to airborne asbestos fibers is a health hazard. Bulk samples submitted for analysis are usually friable and may release fibers during handling or matrix reduction steps. A sample and slide preparations should be carried out in a ventilated hood or glove box with continuous airflow (negative pressure). Handling of samples without these precautions may result in exposure of the analyst and contamination of samples by airborne fibers.

1.7.1 Sampling

Samples for analysis of asbestos content shall be taken in the manner prescribed in Reference 5 and information on design of sampling and analysis programs may be found in Reference 6. If there are any questions about the representative nature of the sample, another sample should be requested before proceeding with the analysis.

1.7.2 Analysis

1.7.2.1 Gross Examination

Bulk samples of building materials taken for the identification and quantitation of asbestos are first examined for homogeneity at low magnification with the aid of a stereomicroscope. The core sample may be examined in its container or carefully removed from the container onto a glassine transfer paper or clean glass plate. If possible, note is made of the top and bottom orientation. When discrete strata are identified, each is treated as a separate material so that fibers are first identified and quantified in that layer only, and then the results for each layer are combined to yield an estimate of asbestos content for the whole sample.

1.7.2.2 Sample Preparation

Bulk materials submitted for asbestos analysis involve a wide variety of matrix materials. Representative subsamples may not be readily obtainable by simple means in heterogeneous materials, and various steps may be required to alleviate the difficulties encountered. In most cases, however, the best preparation is made by using forceps to sample at several places from the bulk material. Forceps samples are immersed in a refractive index liquid on a microscope slide, teased apart, covered with a cover glass, and observed with the polarized light microscope.

Alternatively, attempts may be made to homogenize the sample or eliminate interferences before further characterization. The selection of appropriate procedures is dependent upon the samples encountered and personal preference. The following are presented as possible sample preparation steps.

A mortar and pestle can sometimes be used in the size reduction of soft or loosely bound materials though this may cause matting of some samples. Such samples may be reduced in a Wylie mill. Apparatus should be clean and extreme care exercised to avoid cross-contamination of samples. Periodic checks of the particle sizes should be made during the grinding operation so as to preserve any fiber bundles present in an identifiable form. These procedures are not recommended for samples that contain amphibole minerals or...
formed in a muffle furnace at temperatures greater than 550 °C or lower. Temperatures of 550 °C or higher will cause dehydroxylation of the asbestos minerals, resulting in changes of the refractive index and other key parameters. If a muffle furnace is to be used, the furnace thermostat should be checked and calibrated to ensure that samples will not be heated at temperatures greater than 550 °C.

Ashing and acid treatment of samples should not be used as standard procedures. In order to monitor possible changes in fiber characteristics, the material should be viewed microscopically before and after any sample preparation procedure. Use of these procedures on samples to be used for quantitation requires a correction for percent weight loss.

1.7.2.3 Fiber Identification

Positive identification of asbestos requires the determination of the following optical properties:
- Morphology
- Color and pleochroism
- Refractive indices
- Birefringence
- Extinction characteristics
- Sign of elongation

Table 1-1 lists the above properties for commercial asbestos fibers. Figure 1-1 presents a flow diagram of the examination procedure. Natural variations in the conditions under which deposits of asbestiform minerals are formed will occasionally produce exceptions to the published values and differences from the UICC standards. The sign of elongation is determined by use of the compensator plate and crossed polars. Refractive indices may be determined by the Becke line test. Alternatively, dispersion staining may be used. Inexperienced operators may find that the dispersion staining technique is more easily learned, and should consult Reference 9 for guidance. Central stop dispersion staining colors are presented in Table 1-2. Available high-dispersion (HD) liquids should be used.

<table>
<thead>
<tr>
<th>Mineral</th>
<th>Morphology, color</th>
<th>Refrac- tive indices</th>
<th>Birefring- ence</th>
<th>Extinction</th>
<th>Sign of elongation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chrysotile (asbestiform</td>
<td>Wavy fibers: Fiber bundles have</td>
<td>1.493–1.560</td>
<td>.008</td>
<td>to fiber length.</td>
<td>+ (length slow)</td>
</tr>
<tr>
<td>serpentine)</td>
<td>splayed ends and &quot;kinks&quot;. Aspect ratio typically &gt;10:1. Colorless, nonpleochroic.</td>
<td>1.517–1.562</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amosite (asbestiform</td>
<td>Straight, rigid fibers. Aspect ratio typically &gt;10:1. Colorless to brown, nonpleochroic or weakly so. Opaque inclusions may be present.</td>
<td>1.635–1.696</td>
<td>.020–.033</td>
<td>to fiber length.</td>
<td>+ (length slow)</td>
</tr>
<tr>
<td>garnet)</td>
<td></td>
<td>1.655–1.729</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.696–1.710</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mineral</td>
<td>Morphology, color(^a)</td>
<td>Refractive indices(^b)</td>
<td>Birefringence</td>
<td>Extinction</td>
<td>Sign of elongation</td>
</tr>
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</tr>
<tr>
<td>Crocidolite (asbestiform Riebeckite).</td>
<td>Straight, rigid fibers. Thick fibers and bundles common, blue to purple-blue in color. Pleochroic. Birefringence is generally masked by blue color.</td>
<td>1.654–1.701</td>
<td>1.668–1.717(^{2a}) (normally close to 1.700).</td>
<td>0.014–0.016</td>
<td>to fiber length.</td>
</tr>
<tr>
<td>Anthophyllite-asbestos.</td>
<td>Straight fibers and acicular cleavage fragments. Some composite fibers. Aspect ratio &lt;10:1. Colorless to light brown.</td>
<td>1.596–1.652</td>
<td>1.615–1.676(^{f}).</td>
<td>0.019–0.024</td>
<td>to fiber length.</td>
</tr>
<tr>
<td>Tremolite-actinolite-asbestos.</td>
<td>Normally present as acicular or prismatic cleavage fragments. Single crystals predominate, aspect ratio &lt;10:1. Colorless to pale green.</td>
<td>1.599–1.668</td>
<td>1.622–1.688(^{f}).</td>
<td>0.023–0.020</td>
<td>Oblique extinction, 10–20° for fragments. Composite fibers show</td>
</tr>
</tbody>
</table>

\(^a\) From reference 5; colors cited are seen by observation with plane polarized light.

\(^b\) From references 5 and 8.

\(^c\) Fibers subjected to heating may be brownish.

\(^d\) Fibers defined as having aspect ratio >3:1.

\(^e\) To fiber length.

\(^f\) To fiber length.
Polarized light microscopy analysis: For each type of material identified by examination of sample at low magnification. Mount spatially dispersed sample in 1.550 RI liquid. (If using dispersion staining, mount in 1.550 HD.) View at 100X with both plane polarized light and crossed polars. More than one fiber type may be present.

Fibers present

Fibers absent

Fibers are isotropic (disappear at all angles of stage rotation with crossed polars)

Possible fibers include:
- Fiberglass: 1.20 μm uniform diameter, RI typically < 1.53
- Mineral wool: 0.200 μm diameter, bulbous ends and shot, RI typically > 1.53

Fibers are anisotropic (exhibit extinction at 90° intervals of stage rotation)

1. Determine extinction characteristics.
2. Determine sign of elongation.

Positive

Mount in 1.600 RI liquid.

All a's > 1.550

Determine a.
Check morphology for chrysotile.
If fibers are twisted and exhibit internal details, chrysotile is indicated.

Negative

Mount in 1.700 RI liquid.
Determine a.
Check morphology for crocidolite.

all a's < 1.600

Determine a.
Check morphology and characteristics for amphibole, tremolite actinolite.

Examine two additional prepared slides at 100X and 450X

Figure 1.1. Flow chart for analysis of bulk samples by polarized light microscopy.
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**Table 1-2—Central Stop Dispersion Staining Colors**

<table>
<thead>
<tr>
<th>Mineral</th>
<th>RI Liquid</th>
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<th>η</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chrysolite</td>
<td>1.550 HD</td>
<td>Blue</td>
<td>Golden-yellow</td>
</tr>
<tr>
<td>Amosite</td>
<td>1.680</td>
<td>Blue-magenta to pale blue</td>
<td>Yellow to white</td>
</tr>
<tr>
<td>Crocidole</td>
<td>1.700</td>
<td>Red magenta</td>
<td>Golden-yellow</td>
</tr>
<tr>
<td>Anthophyllite</td>
<td>1.605 HD</td>
<td>Blue</td>
<td>Yellow to white</td>
</tr>
<tr>
<td>Tremolite</td>
<td>1.605 HD</td>
<td>Pale blue</td>
<td>Gold</td>
</tr>
<tr>
<td>Actinolite</td>
<td>1.605 HD</td>
<td>Gold-magenta to blue</td>
<td>Golden-yellow</td>
</tr>
<tr>
<td>1.630 HD</td>
<td>Gold</td>
<td>Magenta</td>
<td>Gold</td>
</tr>
</tbody>
</table>

*From reference 9.

**Quantitation of Asbestos Content**

Asbestos quantitation is performed by a point-counting procedure or an equivalent estimation method. An ocular reticle (cross-hair or point array) is used to visually superimpose a point or points on the microscope field of view. Record the number of points positioned directly above each kind of particle or fiber of interest. Score only points directly over asbestos fibers or nonasbestos matrix material. Do not score empty points for the closest particle. If an asbestos fiber and a matrix particle overlap so that a point is superimposed on their visual intersection, a point is scored for both categories. Point counting provides a determination of the area percent asbestos. Reliable conversion of area percent to percent of dry weight is not currently feasible unless the specific gravities and relative volumes of the materials are known.

For the purpose of this method, "asbestos fibers" are defined as having an aspect ratio greater than 3:1 and being positively identified as one of the minerals in Table 1-1.

A total of 400 points superimposed on either asbestos fibers or nonasbestos matrix material must be counted over at least eight different preparations of representative sub-samples. Take eight forcep samples and mount each separately with the appropriate refractive index liquid. The preparation should not be heavily loaded. The sample should be uniformly dispersed to avoid overlapping particles and allow 25-50 percent empty area within the fields of view. Count 50 nonempty points on each preparation, using either:

- A cross-hair reticle and mechanical stage;
or
- A reticle with 25 points (Chalkley Point Array) and counting at least 2 randomly selected fields.

For samples with mixtures of isotropic and anisotropic materials present, viewing the sample with slightly uncrossed polars or the addition of the compensator plate to the polarized light path will allow simultaneous discrimination of both particle types. Quantitation should be performed at 100X or at the lowest magnification of the polarized light microscope that can effectively distinguish the sample components. Confirmation of the quantitation result by a second analyst on some percentage of analyzed samples should be used as standard quality control procedure.

The percent asbestos is calculated as follows:

\[
\text{Percent asbestos} = \left( \frac{a}{n} \right) \times 100\% 
\]

where:

- \(a\) = number of asbestos counts,
- \(n\) = number of nonempty points counted (400).

If \(a = 0\), report "No asbestos detected." If \(0 < a \leq 3\), report "<1% asbestos".
The value reported should be rounded to the nearest percent.

**References**

SECTION 2. X-RAY POWDER DIFFRACTION

2.1 Principle and Applicability

The principle of X-ray powder diffraction (XRD) analysis is well established. Any solid, crystalline material will diffract an impinging beam of parallel, monochromatic X-rays whenever Bragg's Law,

\[ n \lambda = 2d \sin \theta \]

is satisfied for a particular set of planes in the crystal lattice, where \( \lambda \) = the X-ray wavelength, Å; \( d \) = the interplanar spacing of the set of reflecting lattice planes, Å; and \( \theta \) = the angle of incidence between the X-ray beam and the reflecting lattice planes. By appropriate orientation of a sample relative to the incident X-ray beam, a diffraction pattern can be generated that, in most cases, will be uniquely characteristic of both the chemical composition and structure of the crystalline phases present.

Unlike optical methods of analysis, however, XRD cannot determine crystal morphology. Therefore, in asbestos analysis, XRD does not distinguish between fibrous and nonfibrous forms of the serpentine and amphibole minerals (Table 2–1). However, when used in conjunction with optical methods such as polarized light microscopy (PLM), XRD techniques can provide a reliable analytical method for the identification and characterization of asbestiform minerals in bulk materials.

For qualitative analysis by XRD methods, samples are initially scanned over limited diagnostic peak regions for the serpentine (∼7.4 Å) and amphibole (8.2–8.5 Å) minerals (Table 2–2). Standard slow-scanning methods for bulk sample analysis may be used for materials shown by PLM to contain significant amounts of asbestos (>5–10 percent). Detection of minor or trace amounts of asbestos may require special sample preparation and step-scanning analysis. All samples that exhibit diffraction peaks in the diagnostic regions for asbestiform minerals are submitted to a full (5°–60° 2θ; 1° 2θ/min) qualitative XRD scan, and their diffraction patterns are compared with standard reference powder diffraction patterns to verify initial peak assignments and to identify possible matrix interferences when subsequent quantitative analysis will be performed.

### Table 2–1—the Asbestos Minerals and Their Nonasbestiform Analogs

<table>
<thead>
<tr>
<th>Asbestiform</th>
<th>Nonasbestiform</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SERPENTINE</strong></td>
<td></td>
</tr>
<tr>
<td>Chrysotile</td>
<td>Antigorite, lizardite</td>
</tr>
<tr>
<td>Amphibole</td>
<td>Anthophyllite</td>
</tr>
<tr>
<td>Anthophyllite asbestos</td>
<td>Cummingonite-grunerite</td>
</tr>
<tr>
<td>Crocidolite</td>
<td>Asbestos (''Amosite'')</td>
</tr>
<tr>
<td>Tremolite asbestos</td>
<td>Riebeckite</td>
</tr>
<tr>
<td>Actinolite asbestos</td>
<td>Tremolite</td>
</tr>
<tr>
<td>''thin-layer'' asbestos</td>
<td>Actinolite</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Minerals</th>
<th>Principal d-spacings (Å) and relative intensities</th>
<th>JCPS Powder diffraction file number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chrysotile</td>
<td>7.37, 3.65, 4.57</td>
<td>21–543</td>
</tr>
<tr>
<td>''Amosite''</td>
<td>8.33, 7.10, 3.06</td>
<td>25–645</td>
</tr>
<tr>
<td>Anthophyllite</td>
<td>2.72, 3.03, 2.33</td>
<td>25–157</td>
</tr>
<tr>
<td>Crocidolite</td>
<td>8.38, 7.10, 2.70</td>
<td>27–1415</td>
</tr>
<tr>
<td>Tremolite</td>
<td>3.14, 2.70</td>
<td>23–666 (synthetic mixture with richterite)</td>
</tr>
</tbody>
</table>

*This information is intended as a guide, only. Complete powder diffraction data, including mineral type and source, should be referred to, to ensure comparability of sample and reference materials where possible. Additional precision XRD data on amosite, crocidolite, tremolite, and chrysotile are available from the U.S. Bureau of Mines.*

**Fibrosity questionable.**

Accurate quantitative analysis of asbestos in bulk samples by XRD is critically dependent on particle size distribution, crystallite size, preferred orientation and matrix absorption effects, and comparability of standard reference and sample materials. The most intense diffraction peak that has been shown to be free from interference by prior qualitative XRD analysis is selected for quantitation of each asbestiform mineral. A ‘‘thin-layer’’ method of analysis is recommended in which, subsequent to comminution of the bulk material to <10 μm by suitable cryogenic milling techniques, an accurately known amount of the sample is deposited on a silver membrane filter. The
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mass of asbestiform material is determined by measuring the integrated area of the selected diffraction peak using a step-scanning mode, correcting for matrix absorption effects, and comparing with suitable calibration standards. Alternative "thick-layer" or bulk methods,\textsuperscript{7,8} may be used for semi-quantitative analysis.

This XRD method is applicable as a confirmatory method for identification and quantitation of asbestos in bulk material samples that have undergone prior analysis by PLM or other optical methods.

2.2 Range and Sensitivity

The range of the method has not been determined. The sensitivity of the method has not been determined. It will be variable and dependent upon many factors, including matrix effects (absorption and interferences), diagnostic reflections selected, and their relative intensities.

2.3 Limitations

2.3.1 Interferences

Since the fibrous and nonfibrous forms of the serpentine and amphibole minerals (Table 2-1) are indistinguishable by XRD unless special sample preparation techniques and instrumentation are used,\textsuperscript{9} the presence of nonasbestiform serpentines and amphiboles in a sample will pose severe interference problems in the identification and quantitative analysis of their asbestiform analogs.

The use of XRD for identification and quantitation of asbestiform minerals in bulk samples may also be limited by the presence of other interfering materials in the sample. For naturally occurring materials the commonly associated asbestos-related mineral interferences can usually be anticipated. However, for fabricated materials the nature of the interferences may vary greatly (Table 2-3) and present more serious problems in identification and quantitation.\textsuperscript{10} Potential interferences are summarized in Table 2-4 and include the following:

- **Chlorite** has major peaks at 7.19 Å and 3.58 Å that interfere with both the primary (7.36 Å) and secondary (3.66 Å) peaks for chrysotile. Resolution of the primary peak to give good quantitative results may be possible when a step-scanning mode of operation is employed.
- **Halloysite** has a peak at 3.63 Å that interferes with the secondary (3.66 Å) peak for chrysotile.
- **Kaolinite** has a major peak at 7.15 Å that may interfere with the primary peak of chrysotile at 7.36 Å when present at concentrations of >10 percent. However, the secondary chrysotile peak at 3.66 Å may be used for quantitation.
- **Gypsum** has a major peak at 7.5 Å that overlaps the 7.36 Å peak of chrysotile when present as a major sample constituent. This may be removed by careful washing with distilled water, or be heating to 300 °C to convert gypsum to plaster of paris.
- **Cellulose** has a broad peak that partially overlaps the secondary (3.66 Å) chrysotile peak.\textsuperscript{8}
- **Overlap of major diagnostic peaks of the amphibole asbestos minerals, amosite, anthophyllite, crocidolite, and tremolite, at approximately 8.3 Å and 3.1 Å causes mutual interference when these minerals occur in the presence of one another. In some instances, adequate resolution may be attained by using step-scanning methods and/or by decreasing the collimator slit width at the X-ray port.**

<table>
<thead>
<tr>
<th>TABLE 2–3—COMMON CONSTITUENTS IN INSULATION AND WALL MATERIALS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Insulation materials</strong></td>
</tr>
<tr>
<td>Chrysotile</td>
</tr>
<tr>
<td>&quot;Amosite&quot;</td>
</tr>
<tr>
<td>Crocidolite</td>
</tr>
<tr>
<td>*Rock wool</td>
</tr>
<tr>
<td>*Slag wool</td>
</tr>
<tr>
<td>*Fiber glass</td>
</tr>
<tr>
<td>Gypsum (CaSO$_4$·2H$_2$O)</td>
</tr>
<tr>
<td>Vermiculite (micas)</td>
</tr>
<tr>
<td>*Perlite</td>
</tr>
<tr>
<td>Clays (kaolin)</td>
</tr>
<tr>
<td>*Wood pulp</td>
</tr>
<tr>
<td>*Paper fibers (talc, clay, carbonate fillers)</td>
</tr>
<tr>
<td>Calcium silicates (synthetic)</td>
</tr>
<tr>
<td>Opaques (chromite, magnetite inclusions in serpentine)</td>
</tr>
<tr>
<td>Hematite (inclusions in &quot;amosite&quot;)</td>
</tr>
<tr>
<td>Magnesite</td>
</tr>
<tr>
<td>*Diatomaceous earth</td>
</tr>
<tr>
<td><strong>B. Spray finishes or paints</strong></td>
</tr>
<tr>
<td>Bassanite</td>
</tr>
<tr>
<td>Carbonate minerals (calcite, dolomite, vaterite)</td>
</tr>
<tr>
<td>Talc</td>
</tr>
<tr>
<td>Tremolite</td>
</tr>
<tr>
<td>Anthophyllite</td>
</tr>
<tr>
<td>Serpentine (including chrysotile)</td>
</tr>
<tr>
<td>Amosite</td>
</tr>
<tr>
<td>Crocidolite</td>
</tr>
<tr>
<td>*Mineral wool</td>
</tr>
<tr>
<td>*Rock wool</td>
</tr>
<tr>
<td>*Slag wool</td>
</tr>
<tr>
<td>*Fiber glass</td>
</tr>
<tr>
<td>Clays (kaolin)</td>
</tr>
<tr>
<td>Micas</td>
</tr>
<tr>
<td>Chlorite</td>
</tr>
<tr>
<td>Gypsum (CaSO$_4$·2H$_2$O)</td>
</tr>
<tr>
<td>Quartz</td>
</tr>
<tr>
<td>*Organic binders and thickeners</td>
</tr>
<tr>
<td>Hyrdromagnesite</td>
</tr>
<tr>
<td>Wollastonite</td>
</tr>
<tr>
<td>Opaques (chromite, magnetite inclusions in serpentine)</td>
</tr>
<tr>
<td>Hematite (inclusions in &quot;amosite&quot;)</td>
</tr>
</tbody>
</table>

Pt. 763, Subpt. E, App. E
amphiboles and (210) reflections of the major (110) reflections of the monoclinic fraction patterns are characterized by having tations, with the result being that their dif-ficult. This is especially true for the isomorphous substitution and degree of crys-tality. This is especially true for the variability results from alterations in the crystal lattice associated with differences in isomorphous substitution and degree of crys-tallinity. This is especially true for the amphiboles. These minerals exhibit a wide variety of very similar chemical compositions, with the result being that their dif-fraction patterns are characterized by having major (110) reflections of the monoclinic amphiboles and (210) reflections of the orthorhombic anthophyllite separated by less than 0.2 Å.

2.3.2 Matrix Effects

If a copper X-ray source is used, the presence of iron at high concentrations in a sample will result in significant X-ray fluorescence, leading to loss of peak intensity along with increased background intensity and an overall decrease in sensitivity. This situation may be corrected by choosing an X-ray source other than copper; however, this is often accompanied by loss of intensity and by decreased resolution of closely spaced reflections. Alternatively, use of a diffracted beam monochromator will reduce background fluorescent radiation, enabling weaker diffraction peaks to be detected.

X-ray absorption by the sample matrix will result in overall attenuation of the diffracted beam and may seriously interfere with quantitative analysis. Absorption effects may be minimized by using sufficiently "thin" samples for analysis. However, unless absorption effects are known to be the same for both samples and standards, appropriate corrections should be made by referencing diagnostic peak areas to an internal standard or filter substrate (Ag) peak.

2.3.3 Particle Size Dependence

Because the intensity of diffracted X-radiation is particle-size dependent, it is essential for accurate quantitative analysis that both sample and standard reference materials have similar particle size distributions. The optimum particle size range for quantitative analysis of asbestos by XRD has been reported to be 1 to 10 µm. Comparison of sample and standard reference material particle size distributions should be verified by optical microscopy (or another suitable method) prior to analysis.

2.3.4 Preferred Orientation Effects

Preferred orientation of asbestiform minerals during sample preparation often poses a serious problem in quantitative analysis by XRD. A number of techniques have been developed for reducing preferred orientation effects in "thick layer" samples. However, for "thin" samples on membrane filters, the preferred orientation effects seem to be both reproducible and favorable to enhancement of the principal diagnostic reflections of asbestos minerals, actually increasing the overall sensitivity of the method. Further investigation into preferred orientation effects in both thin layer and bulk samples is required.

2.3.5 Lack of Suitably Characterized Standard Materials

The problem of obtaining and characterizing suitable reference materials for asbestos analysis is clearly recognized. NIOSH has

<table>
<thead>
<tr>
<th>Asbestiform mineral</th>
<th>Primary diagnostic peaks (approximate d-spacings, in Å)</th>
<th>Interference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serpentine</td>
<td>7.4 Nonasbestiform serpenines (antigorite, lizardite)</td>
<td>Chlorite, Kaolinite, Gypsum</td>
</tr>
<tr>
<td>Chrysotile</td>
<td>3.7 Chlorite</td>
<td>Cellulose</td>
</tr>
<tr>
<td>Amphibole</td>
<td>3.1 Nonasbestiform amphiboles (cummingtonite-grunerite, anthophyllite, nebeccite, tremolite)</td>
<td>Mutual interferences</td>
</tr>
<tr>
<td>Amosite</td>
<td></td>
<td>Carbonates, Talc</td>
</tr>
<tr>
<td>Anthophyllite</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crocidolite</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tremolite</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

• Carbonates may also interfere with quantitative analysis of the amphibole asbestos minerals, amosite, anthophyllite, crocidolite, and tremolite. Calcium carbonate (CaCO3) has a peak at 3.035 Å that overlaps major amphibole peaks at approximately 3.1 Å when present in concentrations of >5 percent. Removal of carbonates with a di-lute acid wash is possible; however, if present, chrysotile may be partially dissolved by this treatment.

• A major talc peak at 3.12 Å interferes with the primary tremolite peak at this same position and with secondary peaks of crocidolite (3.10 Å), amosite (3.06 Å), and anthophyllite (3.05 Å). In the presence of talc, the major diagnostic peak at approximately 8.3 Å should be used for quantitation of these asbestiform minerals.

The problem of intraspecies and matrix interferences is further aggravated by the variability of the silicate mineral powder diffraction patterns themselves, which often makes definitive identification of the asbes-tos minerals by comparison with standard reference diffraction patterns difficult. This variability results from alterations in the crystal lattice associated with differences in isomorphous substitution and degree of crys-tallinity. This is especially true for the amphiboles. These minerals exhibit a wide variety of very similar chemical compositions, with the result being that their dif-fraction patterns are characterized by having major (110) reflections of the monoclinic amphiboles and (210) reflections of the orthorhombic anthophyllite separated by less than 0.2 Å.
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recently directed a major research effort toward the preparation and characterization of analytical reference materials, including asbestos standards; however, these are not available in large quantities for routine analysis. In addition, the problem of ensuring the comparability of standard reference and sample materials, particularly regarding crystallite size, particle size distribution, and degree of crystallinity, has yet to be adequately addressed. For example, Langer et al. have observed that in insulating matrices, chrysotile tends to break open into bundles more frequently than amphiboles. This results in a line-broadening effect with a resultant decrease in sensitivity. Unless this effect is the same for both standard and sample materials, the amount of chrysotile in the sample will be underestimated by XRD analysis. To minimize this problem, it is recommended that standardized matrix reduction procedures be used for both sample and standard materials.

2.4 Precision and Accuracy

Precision of the method has not been determined. Accuracy of the method has not been determined.

2.5 Apparatus

2.5.1 Sample Preparation

Sample preparation apparatus requirements will depend upon the sample type under consideration and the kind of XRD analysis to be performed.

- Mortar and Pestle: Agate or porcelain.
- Razor Blades
- Sample Mill: SPEX, Inc., freezer mill or equivalent.
- Bulk Sample Holders
- Silver Membrane Filters: 25-mm diameter, 0.45-µm pore size. Selas Corp. of America, Flotronics Div., 1957 Pioneer Road, Huntington Valley, PA 19006.
- Microscope Slides
- Vacuum Filtration Apparatus: Gelman No. 1107 or equivalent, and side-arm vacuum flask.
- Microbalance
- Ultrasonic Bath or Probe: Model W140, Ultrasonics, Inc., operated at a power density of approximately 0.1 W/mL, or equivalent.
- Assorted Pipettes
- Pipette Bulb
- Non serrated Forceps
- Polyethylene Wash Bottle
- Pyrex Beakers: 50-mL volume.
- Desiccator
- Filter Storage Cassettes
- Magnetic Stirring Plate and Bars
- Porcelain Crucibles
- Muffle Furnace or Low Temperature Asher

2.5.2 Sample Analysis

Sample analysis requirements include an X-ray diffraction unit, equipped with:

- Constant Potential Generator; Voltage and mA Stabilizers
- Automated Diffractometer with Step-Scanning Mode
- Copper Target X-Ray Tube: High intensity, fine focus, preferably.
- X-Ray Pulse Height Selector
- X-Ray Detector (with high voltage power supply): Scintillation or proportional counter.
- Focusing Graphite Crystal Monochromator; or Nickel Filter (if copper source is used, and iron fluorescence is not a serious problem).
- Data Output Accessories:
  - Strip Chart Recorder
  - Decade Scaler/Timer
  - Digital Printer
- Sample Spinner (optional).

2.6 Reagents

2.6.1 Standard Reference Materials

The reference materials listed below are intended to serve as a guide. Every attempt should be made to acquire pure reference materials that are comparable to sample materials being analyzed.

- Chrysotile: UICC Canadian, or NIEHS Plastibest. (UICC reference materials available from: UICC, MRC Pneumoconiosis Unit, Llandough Hospital, Penarth, Glamorgan, CF61XW, UK).
- Crocidolite: UICC
- Amosite: UICC
- Anthophyllite: UICC
- Tremolite Asbestos: Wards Natural Science Establishment, Rochester, N.Y.; Cyprus Research Standard, Cyprus Research, 2435 Military Ave., Los Angeles, CA 90064 (washed with dilute HCl to remove small amount of calcite impurity); India tremolite, Rajasthan State, India.
- Actinolite Asbestos

2.6.2 Adhesive

Tape, petroleum jelly, etc. (for attaching silver membrane filters to sample holders).

2.6.3 Surfactant

1 percent aerosol OT aqueous solution or equivalent.

2.6.4 Isopropanol

ACS Reagent Grade.
2.7 Procedure

2.7.1 Sampling

Samples for analysis of asbestos content shall be collected as specified in EPA Guidance Document #C0090, Asbestos-Containing Materials in School Buildings.10

2.7.2 Analysis

All samples must be analyzed initially for asbestos content by PLM. XRD should be used as an auxiliary method when a second, independent analysis is requested.

NOTE: Asbestos is a toxic substance. All handling of dry materials should be performed in an operating fume hood.

2.7.2.1 Sample Preparation

The method of sample preparation required for XRD analysis will depend on: (1) The condition of the sample received (sample size, homogeneity, particle size distribution, and overall composition as determined by PLM); and (2) the type of XRD analysis to be performed (qualitative, quantitative, thin layer or bulk).

Bulk materials are usually received as inhomogeneous mixtures of complex composition with very wide particle size distributions. Preparation of a homogeneous, representative sample from asbestos-containing materials is particularly difficult because the fibrous nature of the asbestos minerals inhibits mechanical mixing and stirring, and because milling procedures may cause adverse lattice alterations.

A discussion of specific matrix reduction procedures is given below. Complete methods of sample preparation are detailed in Sections 2.7.2.2 and 2.7.2.3.

NOTE: All samples should be examined microscopically before and after each matrix reduction step to monitor changes in sample particle size, composition, and crystallinity, and to ensure sample representativeness and homogeneity for analysis.

2.7.2.1.1 Milling— Mechanical milling of asbestos materials has been shown to decrease fiber crystallinity, with a resultant decrease in diffraction intensity of the specimen; the degree of lattice alteration is related to the duration and type of milling process.10,22 Therefore, all milling times should be kept to a minimum.

For qualitative analysis, particle size is not usually of critical importance and initial characterization of the material with a minimum of matrix reduction is often desirable to document the composition of the sample as received. Bulk samples of very large particle size (≥2-3 mm) should be comminuted to ≤100 µm. A mortar and pestle can sometimes be used in size reduction of soft or loosely bound materials though this may cause matting of some samples. Such samples may be reduced by cutting with a razor blade in a mortar, or by grinding in a suitable mill (e.g., a microhammer mill or equivalent). When using a mortar for grinding or cutting, the sample should be moistened with ethanol, or some other suitable wetting agent, to minimize exposures.

For accurate, reproducible quantitative analysis, the particle size of both sample and standard materials should be reduced to ≤10 µm (see Section 2.3.3). Dry ball milling at liquid nitrogen temperatures (e.g., Spex Freezer Mill, or equivalent) for a maximum time of 10 min. is recommended to obtain satisfactory particle size distributions while protecting the integrity of the crystal lattice.3 Bulk samples of very large particle size may require grinding in two stages for full matrix reduction to <10 µm.8,9

Final particle size distributions should always be verified by optical microscopy or another suitable method.

2.7.2.1.2 Low temperature ashing—For materials shown by PLM to contain large amounts of gypsum, cellulosic, or other organic materials, it may be desirable to ash the samples prior to analysis to reduce background radiation or matrix interference. Since chrysotile undergoes dehydroxylation at temperatures between 550 °C and 650 °C, with subsequent transformation to forsterite,23,24 ashing temperatures should be kept below 500 °C. Use of a low temperature asher is recommended. In all cases, calibration of the oven is essential to ensure that a maximum ashing temperature of 500 °C is not exceeded.

2.7.2.1.3 Acid leaching—Because of the interference caused by gypsum and some carbonates in the detection of asbestiform minerals by XRD (see Section 2.3.1), it may be necessary to remove these interferents by a simple acid leaching procedure prior to analysis (see Section 1.7.2.2).

2.7.2.2 Qualitative Analysis

2.7.2.2.1 Initial screening of bulk material—Qualitative analysis should be performed on a representative, homogeneous portion of the sample with a minimum of sample treatment.

1. Grind and mix the sample with a mortar and pestle (or equivalent method, see Section 2.7.2.1.1) to a final particle size sufficiently small (<100 µm) to allow adequate packing into the sample holder.

2. Pack the sample into a standard bulk sample holder. Care should be taken to ensure that a representative portion of the milled sample is selected for analysis. Particular care should be taken to avoid possible size segregation of the sample. (Note: Use of a back-packing method of bulk sample preparation may reduce preferred orientation effects.)

3. Mount the sample on the diffractometer and scan over the diagnostic peak regions for
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the serpentine (~67.4 Å) and amphibole (8.2–8.5 Å) minerals (see Table 2–2). The X-ray diffraction equipment should be optimized for intensity. A slow scanning speed of 1°/min is recommended for adequate resolution. Use of a sample spinner is recommended.

4. Submit all samples that exhibit diffraction peaks in the diagnostic regions for asbestos minerals to a full qualitative XRD scan (5–60° 2θ; 1°/min) to verify initial peak assignments and to identify potential matrix interferences when subsequent quantitative analysis is to be performed.

5. Compare the sample XRD pattern with standard reference powder diffraction patterns (i.e., JCPDS powder diffraction data) or those of other well-characterized reference materials. Principal lattice spacings of amphibole and serpentine asbestos minerals are given in Table 2–2; common constituents of bulk insulation and wall materials are listed in Table 2–3.

2.7.2.2.2 Detection of minor or trace constituents—Routine screening of bulk materials by XRD may fail to detect small concentrations (<5% percent) of asbestos. The limits of detection will, in general, be improved if matrix absorption effects are minimized, and if the sample particle size is reduced to the optimal 1 to 10 µm range, provided that the crystal lattice is not degraded in the milling process. Therefore, in those instances where confirmation of the presence of an asbestos mineral at very low levels is required, or where a negative result from initial screening of the bulk material by XRD (see Section 2.7.2.2.1) is in conflict with previous PLM results, it may be desirable to prepare the sample as described for quantitative analysis (see Section 2.7.2.3) and step-scan over appropriate 2θ ranges of selected diagnostic peaks (Table 2–2). Accurate transfer of the sample to the silver membrane filter is not necessary unless subsequent quantitative analysis is to be performed.

2.7.2.3 Quantitative Analysis

The proposed method for quantitation of asbestos in bulk samples is a modification of the NIOSH-recommended thin-layer method for chrysotile in air. A thick-layer or bulk method involving pelletizing the sample may be used for semiquantitative analysis; however, this method requires the addition of an internal standard, use of a specially fabricated sample press, and relatively large amounts of standard reference materials. Additional research is required to evaluate the comparability of thin- and thick-layer methods for quantitative asbestos analysis.

For quantitative analysis by thin-layer methods, the following procedure is recommended:

1. Mill and size all or a substantial representative portion of the sample as outlined in Section 2.7.2.1.

2. Dry at 100 °C for 2 hr; cool in a desiccator.

3. Weigh accurately to the nearest 0.01 mg.

4. Samples shown by PLM to contain large amounts of cellulosic or other organic materials, gypsum, or carbonates, should be submitted to appropriate matrix reduction procedures described in Sections 2.7.2.1.2 and 2.7.2.1.3. After ashing and/or acid treatment, repeat the drying and weighing procedures described above, and determine the percent weight loss.

5. Quantitatively transfer an accurately weighed amount (50–100 mg) of the sample to a 1-L volumetric flask with approximately 200 mL isopropanol to which 3 to 4 drops of surfactant have been added.

6. Ultrasonicate for 10 min at a power density of approximately 0.1 W/mL to disperse the sample material.

7. Dilute to volume with isopropanol.

8. Place flask on a magnetic stirring plate. Stir.

9. Place a silver membrane filter on the filtration apparatus, apply a vacuum, and attach the reservoir. Release the vacuum and add several milliliters of isopropanol to the reservoir. Vigorously hand shake the asbestos suspension and immediately withdraw an aliquot from the center of the suspension so that total sample weight, W<sub>s</sub>, on the filter will be approximately 1 mg. Do not adjust the volume in the pipet by expelling part of the suspension; if more than the desired aliquot is withdrawn, discard the aliquot and resume the procedure with a clean pipet. Transfer the aliquot to the reservoir. Filter rapidly under vacuum. Do not wash the reservoir walls. Leave the filter apparatus under vacuum until dry. Remove the reservoir, release the vacuum, and remove the filter with forceps. (Note: Water-soluble matrix interferences such as gypsum may be removed at this time by careful washing of the filtrate with distilled water. Extreme care should be taken not to disturb the sample.)

10. Attach the filter to a flat holder with a suitable adhesive and place on the diffractometer. Use of a sample spinner is recommended.

11. For each asbestos mineral to be quantitated select a reflection (or reflections) that has been shown to be free from interferences by prior PLM or qualitative XRD analysis and that can be used unambiguously as an index of the amount of material present in the sample (see Table 2–2).

12. Analyze the selected diagnostic reflection(s) by step scanning in increments of 0.02° 2θ for an appropriate fixed time and integrating the counts. (A fixed count scan may be used alternatively; however, the method chosen should be used consistently for all samples and standards.) An appropriate scanning interval should be selected for each peak, and background corrections made. For a fixed time scan, measure the...
background on each side of the peak for one-half the peak-scanning time. The net intensity, \( I_a \), is the difference between the peak integrated count and the total background count.

13. Determine the net count, \( I_{Ag} \), of the filter 2.36 Å silver peak following the procedure in step 12. Remove the filter from the holder, reverse it, and reattach it to the holder. Determine the net count for the unattenuated silver peak following the procedure in step 12. Remove the filter from the holder, reverse it, and reattach it to the holder. Determine the net count for the unattenuated silver peak, \( I_{Ag} \). Scan times may be less for measurement of silver peaks than for sample peaks; however, they should be constant throughout the analysis.

14. Normalize all raw, net intensities (to correct for instrument instabilities) by referencing them to an external standard (e.g., the 3.34 Å peak of an α-quartz reference crystal). After each unknown is scanned, determine the net count, \( I_a \), of the reference specimen following the procedure in step 12. Determine the normalized intensities by dividing the peak intensities by \( I_a \):

\[
\hat{I}_a = \frac{I_a}{I_r}, \quad \hat{I}_{Ag} = \frac{I_{Ag}}{I_r}, \quad \text{and} \quad \hat{I}_r = \frac{I_r}{I_r}
\]

### 2.8 Calibration

#### 2.8.1 Preparation of Calibration Standards

1. Mill and size standard asbestos materials according to the procedure outlined in Section 2.7.2.1.1. Equivalent, standardized matrix reduction and sizing techniques should be used for both standard and sample materials.

2. Dry at 100 °C for 2 hr; cool in a desiccator.

3. Prepare two suspensions of each standard in isopropanol by weighing approximately 10 and 50 mg of the dry material to the nearest 0.01 mg. Quantitatively transfer each to a 1-L volumetric flask with approximately 200 mL isopropanol to which a few drops of surfactant have been added.

4. Ultrasonicate for 10 min at a power density of approximately 0.1 W/mL, to disperse the asbestos material.

5. Dilute to volume with isopropanol.

6. Place the flask on a magnetic stirring plate. Stir.

7. Prepare, in triplicate, a series of at least five standard filters to cover the desired analytical range, using appropriate aliquots of the 10 and 50 mg/mL suspensions and the following procedure.

   a. Mount each filter on a flat holder. Per- 

   b. Dry at 100 °C for 2 hr; cool in a desiccator.

   c. Prepare two suspensions of each standard in isopropanol by weighing approximately 10 and 50 mg of the dry material to the nearest 0.01 mg. Quantitatively transfer each to a 1-L volumetric flask with approximately 200 mL isopropanol to which a few drops of surfactant have been added.

   d. Ultrasonicate for 10 min at a power density of approximately 0.1 W/mL, to disperse the asbestos material.

   e. Place the flask on a magnetic stirring plate. Stir.

   f. Prepare, in triplicate, a series of at least five standard filters to cover the desired analytical range, using appropriate aliquots of the 10 and 50 mg/mL suspensions and the following procedure.

   g. Mount a silver membrane filter on the filtration apparatus. Place a few milliliters of isopropanol in the reservoir. Vigorously hand shake the asbestos suspension and immediately withdraw an aliquot from the center of the suspension. Do not adjust the volume in the pipet by expelling part of the suspension; if more than the desired aliquot is withdrawn, discard the aliquot and resume the procedure with a clean pipet. Transfer the aliquot to the reservoir. Keep the tip of the pipet near the surface of the isopropanol. Filter rapidly under vacuum. Do not wash the sides of the reservoir. Leave the vacuum on for a time sufficient to dry the filter. Release the vacuum and remove the filter with forceps.

#### 2.8.2 Analysis of Calibration Standards

1. Mount each filter on a flat holder. Perform step scans on selected diagnostic reflections of the standards and reference specimens using the procedure outlined in Section 2.7.2.3, step 12, and the same conditions as those used for the samples.

2. Determine the normalized intensity for each peak measured, \( I_{oAg} \), as outlined in Section 2.7.2.3, step 14.

#### 2.9 Calculations

For each asbestos reference material, calculate the exact weight deposited on each standard filter from the concentrations of the standard suspensions and aliquot volumes. Record the weight, \( w \), of each standard. Prepare a calibration curve by regressing \( I_{oAg} \) on \( w \). Poor reproducibility (±15 percent RSD) at any given level indicates problems in the sample preparation technique, and a need for new standards. The data should fit a straight line equation.

Determine the slope, \( m \), of the calibration curve in counts/microgram. The intercept, \( b \), of the line with the \( I_{oAg} \) axis should be approximately zero. A large negative intercept indicates an error in determining the background. This may arise from incorrectly measuring the baseline or from interference by another phase at the angle of background. A large positive intercept indicates an error in determining the baseline or that an impurity is included in the measured peak.

Using the normalized intensity, \( I_{oAg} \), for the unattenuated silver peak of a sample, and the corresponding normalized intensity from the unattenuated silver peak, \( I_{Ag} \), of the sample filter, calculate the transmittance, \( T \), for each sample as follows:

\[
T = \frac{I_{oAg}}{I_{Ag}}
\]

Determine the correction factor, \( f(T) \), for each sample according to the formula:

\[
f(T) = \frac{-R}{\ln(T)}
\]

where

\[
f(T) = \frac{-R}{\ln(T)}
\]

\[
I_{Ag} = I_{oAg} + b + m \cdot (w - \bar{w})
\]

\[
I_{oAg} = \frac{I_{Ag}}{f(T)}
\]

\[
\bar{w} = \frac{\sum w_i}{n}
\]

\[
\sigma = \frac{\sum (w_i - \bar{w})^2}{n - 1}
\]
Environmental Protection Agency

\[
R = \frac{\sin \theta_A}{\sin \theta_T}
\]

\(\theta_A\) = angular position of the measured silver peak (from Bragg's Law), and

\(\theta_T\) = angular position of the diagnostic asbestos peak.

Calculate the weight, \(W_a\), in micrograms, of the asbestos material analyzed for in each sample, using the appropriate calibration data and absorption corrections:

\[
W_a = \frac{I_a f(t) - b}{m}
\]

Calculate the percent composition, \(P_a\), of each asbestos mineral analyzed for in the parent material, from the total sample weight, \(W_T\), on the filter:

\[
P_a = \frac{W_a(1.01L)}{W_T} \times 100
\]

where

- \(P_a\) = percent asbestos mineral in parent material;
- \(W_a\) = mass of asbestos mineral on filter, in \(\mu g\);
- \(W_T\) = total sample weight on filter, in \(\mu g\);
- \(L\) = percent weight loss of parent material on ashing and/or acid treatment (see Section 2.7.2.3).

2.10 References

18. Personal communication, A. M. Langer, Environmental Sciences Laboratory, Mount...
§ 763.120 What is the purpose of this subpart?

This subpart protects certain State and local government employees who are not protected by the Asbestos Standards of the Occupational Safety and Health Administration (OSHA). This subpart applies the OSHA Asbestos Standards in 29 CFR 1910.1001 and 29 CFR 1926.1101 to these employees.

§ 763.121 Does this subpart apply to me?

If you are a State or local government employer and you are not subject to a State asbestos standard that OSHA has approved under section 18 of the Occupational Safety and Health Act or a State asbestos plan that EPA has exempted from the requirements of this subpart under §763.123, you must follow the requirements of this subpart to protect your employees from occupational exposure to asbestos.

§ 763.122 What does this subpart require me to do?

If you are a State or local government employer whose employees perform:

(a) Construction activities identified in 29 CFR 1926.1101(a), you must:

(1) Comply with the OSHA standards in 29 CFR 1926.1101.

(2) Submit notifications required for alternative control methods to the Director, National Program Chemicals Division (7404), Office of Pollution Prevention and Toxics, Environmental Protection Agency, 1200 Pennsylvania Ave., NW., Washington, DC 20460.

(b) Custodial activities not associated with the construction activities identified in 29 CFR 1926.1101(a), you must comply with the OSHA standards in 29 CFR 1910.1001.

(c) Repair, cleaning, or replacement of asbestos-containing clutch plates and brake pads, shoes, and linings, or removal of asbestos-containing residue from brake drums or clutch housings, you must comply with the OSHA standards in 29 CFR 1910.1001.

§ 763.123 May a State implement its own asbestos worker protection plan?

This section describes the process under which a State may be exempted from the requirements of this subpart. (a) States seeking an exemption. If your State wishes to implement its own asbestos worker protection plan, rather than complying with the requirements of this subpart, your State must apply for and receive an exemption from EPA.

(1) What must my State do to apply for an exemption? To apply for an exemption from the requirements of this subpart, your State must send to the Director of EPA’s Office of Pollution Prevention and Toxics (OPPT) a copy of its asbestos worker protection regulations and a detailed explanation of how your State’s asbestos worker protection plan meets the requirements of TSCA section 18 (15 U.S.C. 2617).
(2) What action will EPA take on my State's application for an exemption? EPA will review your State's application and make a preliminary determination whether your State's asbestos worker protection plan meets the requirements of TSCA section 18.

(i) If EPA's preliminary determination is that your State's plan does meet the requirements of TSCA section 18, EPA will initiate a rulemaking, including an opportunity for public comment, to exempt your State from the requirements of this subpart. After considering any comments, EPA will issue a final rule granting or denying the exemption.

(ii) If EPA's preliminary determination is that the State plan does not meet the requirements of TSCA section 18, EPA will notify your State in writing and will give your State a reasonable opportunity to respond to that determination.

(iii) If EPA does not grant your State an exemption, then the State and local government employers in your State are subject to the requirements of this subpart.

(b) States that have been granted an exemption. If EPA has exempted your State from the requirements of this subpart, your State must update its asbestos worker protection regulations as necessary to implement changes to meet the requirements of this subpart, and must apply to EPA for an amendment to its exemption.

(1) What must my State do to apply for an amendment to its exemption? To apply for an amendment to its exemption, your State must send to the Director of OPPT a copy of its updated asbestos worker protection regulations and a detailed explanation of how your State's updated asbestos worker protection plan meets the requirements of TSCA section 18. Your State must submit its application for an amendment within 6 months of the effective date of any changes to the requirements of this subpart, or within a reasonable time agreed upon by your State and OPPT.

(2) What action will EPA take on my State's application for an amendment? EPA will review your State's application for an amendment and make a preliminary determination whether your State's updated asbestos worker protection plan meets the requirements of TSCA section 18.

(i) If EPA determines that the updated State plan does meet the requirements of TSCA section 18, EPA will issue your State an amended exemption.

(ii) If EPA determines that the updated State plan does not meet the requirements of TSCA section 18, EPA will notify your State in writing and will give your State a reasonable opportunity to respond to that determination.

(iii) If EPA does not grant your State an amended exemption, or if your State does not submit a timely request for amended exemption, then the State and local government employers in your State are subject to the requirements of this subpart.

Subpart H [Reserved]

Subpart I—Prohibition of the Manufacture, Importation, Processing, and Distribution in Commerce of Certain Asbestos-Containing Products; Labeling Requirements

Source: 54 FR 29507, July 12, 1989, unless otherwise noted.

§ 763.160 Scope.
This subpart prohibits the manufacture, importation, processing, and distribution in commerce of the asbestos-containing products identified and at the dates indicated in §§ 763.165, 763.167, and 763.169. This subpart also includes general exemptions and procedures for requesting exemptions from the provisions of this subpart.

§ 763.163 Definitions.
For purposes of this subpart:
Agency means the United States Environmental Protection Agency.
Asbestos means the asbestiform varieties of: chrysotile (serpentine); crocidolite (riebeckite); amosite (cummingtonite-grunerite); tremolite; anthophyllite; and actinolite.

Asbestos-containing product means any product to which asbestos is deliberately added in any concentration or which contains more than 10 percent asbestos by weight or area.

Chemical substance, has the same meaning as in section 3 of the Act.

Commerce has the same meaning as in section 3 of the Act.

Commercial paper means an asbestos-containing product which is made of paper intended for use as general insulation paper or muffler paper. Major applications of commercial papers are insulation against fire, heat transfer, and corrosion in circumstances that require a thin, but durable, barrier.

Corrugated paper means an asbestos-containing product made of corrugated paper, which is often cemented to a flat backing, may be laminated with foils or other materials, and has a corrugated surface. Major applications of asbestos corrugated paper include: thermal insulation for pipe coverings; block insulation; panel insulation in elevators; insulation in appliances; and insulation in low-pressure steam, hot water, and process lines.

Customs territory of the United States means the 50 States, Puerto Rico, and the District of Columbia.

Distribute in commerce has the same meaning as in section 3 of the Act, but the term does not include actions taken with respect to an asbestos-containing product (to sell, resale, deliver, or hold) in connection with the end use of the product by persons who are users (persons who use the product for its intended purpose after it is manufactured or processed). The term also does not include distribution by manufacturers, importers, and processors, and other persons solely for purposes of disposal of an asbestos-containing product.

Flooring felt means an asbestos-containing product which is made of paper felt intended for use as an underlayer for floor coverings, or to be bonded to the underside of vinyl sheet flooring.

Import means to bring into the customs territory of the United States for export without any use, processing, or disposal within the customs territory of the United States; or (2) entering the customs territory of the United States as a component of a product during normal personal or business activities involving use of the product.

Importer means anyone who imports a chemical substance, including a chemical substance as part of a mixture or article, into the customs territory of the United States. Importer includes the person primarily liable for the payment of any duties on the merchandise or an authorized agent acting on his or her behalf. The term includes as appropriate:

(1) The consignee.
(2) The importer of record.
(3) The actual owner if an actual owner’s declaration and superseding bond has been filed in accordance with 19 CFR 141.20.
(4) The transferee, if the right to withdraw merchandise in a bonded warehouse has been transferred in accordance with subpart C of 19 CFR part 144.

Manufacturer means to produce or manufacture in the United States.

Manufacturer means a person who produces or manufactures in the United States.

New uses of asbestos means commercial uses of asbestos not identified in §763.165 the manufacture, importation or processing of which would be initiated for the first time after August 25, 1989.

Person means any natural person, firm, company, corporation, joint-venture, partnership, sole proprietorship, association, or any other business entity; any State or political subdivision thereof, or any municipality; any interstate body and any department, agency, or instrumentality of the Federal Government.

Process has the same meaning as in section 3 of the Act.

Processor has the same meaning as in section 3 of the Act.

Rollboard means an asbestos-containing product made of paper that is produced in a continuous sheet, is flexible, and is rolled to achieve a desired thickness. Asbestos rollboard consists of two sheets of asbestos paper.
§ 763.171 Labeling requirements.

(a) After August 27, 1990, manufacturers, importers, and processors of all asbestos-containing products that are identified in § 763.165(a) shall label the products as specified in this subpart at the time of manufacture, import, or processing. This requirement includes labeling all manufacturers', importers', and processors' stock-on-hand as of August 27, 1990.

(b) After August 25, 1995, manufacturers, importers, and processors of all asbestos-containing products that are identified in § 763.165(b) shall label the products as specified in this subpart at the time of manufacture, import, or processing. This requirement includes labeling all manufacturers', importers', and processors' stock-on-hand as of August 26, 1996.
§ 763.173 Exemptions.

(a) Persons who are subject to the prohibitions imposed by §§ 763.165, 763.167, or 763.169 may file an application for an exemption. Persons whose exemption applications are approved by the Agency may manufacture, import, process, or distribute in commerce the banned product as specified in the Agency’s approval of the application. No applicant for an exemption may continue the banned activity that is the subject of an exemption application after the effective date of the ban unless the Agency has granted the exemption or the applicant receives an extension under paragraph (b)(4) or (5) of this section.

(b) Application filing dates. (1) Applications for products affected by the prohibitions under §§ 763.165(a) and 763.167(a) may be submitted at any time and will be either granted or denied by EPA as soon as is feasible.

(2) Applications for products affected by the ban under § 763.169(a) may be submitted at any time and will be either granted or denied by EPA as soon as is feasible.

(3) Applications for products affected by the ban under §§ 763.165(b) and 763.167(b) may not be submitted prior to February 27, 1995. Complete applications received after that date, but before August 25, 1995, will be either granted or denied by the Agency prior to the effective date of the ban for the product. Applications received after August 25, 1995, will be either granted or denied by EPA as soon as is feasible.
(4) Applications for products affected by the ban under §763.169(b) may not be submitted prior to February 26, 1996. Complete applications received after that date, but before August 26, 1996, will be either granted or denied by the Agency prior to the effective date of the ban for the product. Applications received after August 26, 1996, will be either granted or denied by EPA as soon as is feasible.

(5) The Agency will consider an application for an exemption from a ban under §763.169 for a product at the same time the applicant submits an application for an exemption from a ban under §763.165 or §763.167 for that product. EPA will grant an exemption at that time from a ban under §763.169 if the Agency determines it appropriate to do so.

(6) If the Agency denies an application less than 30 days before the effective date of a ban for a product, the applicant can continue the activity for 30 days after receipt of the denial from the Agency.

(7) If the Agency fails to meet the deadlines stated in paragraphs (b)(3) and (b)(4) of this section for granting or denying a complete application in instances in which the deadline is before the effective date of the ban to which the application applies, the applicant will be granted an extension of 1 year from the Agency’s deadline date. During this extension period the applicant may continue the activity that is the subject of the exemption application. The Agency will either grant or deny the application during the extension period. The extension period will terminate either on the date the Agency grants the application or 30 days after the applicant receives the Agency’s denial of the application. However, no extension will be granted if the Agency is scheduled to grant or deny an application at some date after the effective date of the ban, pursuant to the deadline stated in paragraphs (b)(3) and (b)(4) of this section.

(c) Where to file. All applications must be submitted to the following location: TSCA Docket Receipts Office (7407), Office of Pollution Prevention and Toxics, U.S. Environmental Protection Agency, Rm E-G99, 1200 Pennsylvania Ave., NW., Washington, DC 20460. ATTENTION: Asbestos Exemption. For information regarding the submission of exemptions containing information claimed as confidential business information (CBI), see §763.179.

(d) Content of application and criteria for decisionmaking.

(1) Content of application. Each application must contain the following:

(i) Name, address, and telephone number of the applicant.

(ii) Description of the manufacturing, import, processing, and/or distribution in commerce activity for which an exemption is requested, including a description of the asbestos-containing product to be manufactured, imported, processed, or distributed in commerce.

(iii) Identification of locations at which the exempted activity would take place.

(iv) Length of time requested for exemption (maximum length of an exemption is 4 years).

(v) Estimated amount of asbestos to be used in the activity that is the subject of the exemption application.

(vi) Data demonstrating the exposure level over the life cycle of the product that is the subject of the application.

(vii) Data concerning:

(A) The extent to which non-asbestos substitutes for the product that is the subject of the application fall significantly short in performance under necessary product standards or requirements, including laws or ordinances mandating product safety standards.

(B) The costs of non-asbestos substitutes relative to the costs of the asbestos-containing product and, in the case in which the product is a component of another product, the effect on the cost of the end use product of using the substitute component.

(C) The extent to which the product or use serves a high-valued use.

(viii) Evidence of demonstrable good faith attempts by the applicant to develop and use a non-asbestos substance or product which may be substituted for the asbestos-containing product or the asbestos in the product or use that is the subject to the application.

(ix) Evidence, in addition to that provided in the other information required with the application, showing that the continued manufacture, importation,
§ 763.175  Enforcement.

(a) Failure to comply with any provision of this subpart is a violation of section 15 of the Act (15 U.S.C. 2614).

(b) Failure or refusal to establish and maintain records, or to permit access
to or copying of records as required by section 11 of the Act (15 U.S.C. 2610) is a violation of section 15 of the Act (15 U.S.C. 2614).

(c) Failure or refusal to permit entry or inspection as required by section 11 of the Act (15 U.S.C. 2610) is a violation of section 15 of the Act (15 U.S.C. 2614).

(d) Violators may be subject to the civil and criminal penalties in section 16 of the Act (15 U.S.C. 2615) for each violation.

(e) The Agency may seek to enjoin the manufacture, import, processing, or distribution in commerce of asbestos-containing products in violation of this subpart, or act to seize any asbestos-containing products manufactured, imported, processed, or distributed in commerce in violation of this subpart, or take any other actions under the authority of section 7 or 17 of the Act (15 U.S.C. 2606 or 2616) that are appropriate.

§ 763.176 Inspections.

The Agency will conduct inspections under section 11 of the Act (15 U.S.C. 2610) to ensure compliance with this subpart.

§ 763.178 Recordkeeping.

(a) Inventory. (1) Each person who is subject to the prohibitions imposed by §§ 763.165 and 763.167 must perform an inventory of the stock-on-hand of each banned product as of the effective date of the ban for that product for the applicable activity.

(2) The inventory shall be in writing and shall include the type of product, the number of product units currently in the stock-on-hand of the person performing the inventory, and the location of the stock.

(3) Results of the inventory for a banned product must be maintained by the person for 3 years after the effective date of the § 763.165 or § 763.167 ban on the product.

(b) Records. (1) Each person whose activities are subject to the bans imposed by §§ 763.165, 763.167, and 763.169 for a product must, between the effective date of the § 763.165 or § 763.167 ban on the product and the § 763.169 ban on the product, keep records of all commercial transactions regarding the product, including the dates of purchases and sales and the quantities purchased or sold. These records must be maintained for 3 years after the effective date of the § 763.169 ban for the product.

(2) Each person who is subject to the requirements of § 763.171 must, for each product required to be labeled, maintain a copy of the label used in compliance with § 763.171. These records must be maintained for 3 years after the effective date of the ban on distribution in commerce for the product for which the § 763.171 requirements apply.

[54 FR 29507, July 12, 1989, as amended by 54 FR 46898, Nov. 8, 1989; 58 FR 34205, June 23, 1993]

§ 763.179 Confidential business information claims.

(a) Applicants for exemptions under § 763.173 may assert a Confidential Business Information (CBI) claim for information in an exemption application or supplement submitted to the Agency under this subpart only if the claim is asserted in accordance with this section, and release of the information would reveal trade secrets or confidential commercial or financial information, as provided in section 14(a) of the Act. Information covered by a CBI claim will be treated in accordance with the procedures set forth in 40 CFR part 2, subpart B. The Agency will place all information not claimed as CBI in the manner described in this section in a public file without further notice to the applicant.

(b) Applicants may assert CBI claims only at the time they submit a completed exemption application and only in the specified manner. If no such claim accompanies the information when it is received by the Agency, the information may be made available to the public without further notice to the applicant. Submitters that claim information as business confidential must do so by writing the word “Confidential” at the top of the page on which the information appears and by underlining, circling, or placing brackets ([ ]) around the information claimed CBI.

(c) Applicants who assert a CBI claim for submitted information must provide the Agency with two copies of their exemption application. The first copy must be complete and contain all
information being claimed as CBI. The second copy must contain only information not claimed as CBI. The Agency will place the second copy of the submission in a public file. Failure to furnish a second copy of the submission when information is claimed as CBI in the first copy will be considered a presumptive waiver of the claim of confidentiality. The Agency will notify the applicant by certified mail that a finding of a presumptive waiver of the claim of confidentiality has been made. The applicant has 30 days from the date of receipt of notification to submit the required second copy. Failure to submit the second copy will cause the Agency to place the first copy in a public file.

(d) Applicants must substantiate all claims of CBI at the time the applicant asserts the claim, i.e., when the exemption application or supplement is submitted, by responding to the questions in paragraph (e) of this section. Failure to provide substantiation of a claim at the time the applicant submits the application will result in a waiver of the CBI claim, and the information may be disclosed to the public without further notice to the applicant.

(e) Applicants who assert any CBI claims must substantiate all claims by providing detailed responses to the following:

1. Is this information subject to a patent or patent application in the United States or elsewhere? If so, why is confidentiality necessary?
2. For what period do you assert a claim of confidentiality? If the claim is to extend until a certain event or point in time, please indicate that event or time period. Explain why such information should remain confidential until such point.
3. Has the information that you are claiming as confidential been disclosed to persons outside of your company? Will it be disclosed to such persons in the future? If so, what restrictions, if any, apply to use or further disclosure of the information?
4. Briefly describe measures taken by your company to guard against undesired disclosure of the information you are claiming as confidential to others.
5. Does the information claimed as confidential appear in advertising or promotional materials for the product or the resulting end product, safety data sheets or other similar materials for the product or the resulting end product, professional or trade publications, or any other media available to the public or to your competitors? If you answered yes, indicate where the information appears.
6. If the Agency disclosed the information you are claiming as confidential to the public, how difficult would it be for the competitor to enter the market for your product? Consider in your answer such constraints as capital and marketing cost, specialized technical expertise, or unusual processes.
7. Has the Agency, another Federal agency, or a Federal court made any confidentiality determination regarding this information? If so, provide copies of such determinations.
8. How would your company's competitive position be harmed if the Agency disclosed this information? Why should such harm be considered substantial? Describe the causal relationship between the disclosure and harm.
9. In light of section 14(b) of TSCA, if you have claimed information from a health and safety study as confidential, do you assert that disclosure of this information would disclose a process used in the manufacturing or processing of a product or information unrelated to the effects of asbestos on human health and the environment? If your answer is yes, explain.
Asbestos Cover-Up

Court documents provide irrefutable proof the asbestos industry leveraged its power and influence to keep workers and the public in the dark about the hazards of asbestos. Dozens of companies are implicated in the decades-long cover-up.

‘Mr. Brown, do you mean to tell me you would let them work until they dropped dead?’ He said, ‘Yes. We save a lot of money that way.’

Excerpt of a 1984 deposition

Meeting between Brown, Johns Manville attorney Vandiver Brown and officials from the asbestos firm Unarco

As early as the late 19th century, scattered reports on the health risks of asbestos emerged in Canada, Europe and the U.S. By the 1920s, leading medical journals had published articles linking asbestos to asbestosis, a new and sometimes fatal lung condition where inhaled asbestos scars the lungs and makes breathing difficult.

The disease was a serious problem for asbestos workers, who often toiled in thick clouds of asbestos dust each day. Even in the 1920s, doctors believed asbestosis could be prevented by limiting exposure to asbestos. It would take several decades, however, before asbestos was properly regulated in the U.S. and workers learned their jobs could lead to cancer and other serious health complications years down the line.
Favoring Profits over Health of Workers

Scientists established a connection between asbestos and lung cancer in the 1930s. Around the same time, doctors were advancing their understanding of mesothelioma, an aggressive cancer of the lining of the lungs caused almost exclusively by asbestos.

While evidence about the harmful effects of asbestos continued to grow, so did the influence of the asbestos companies. Between 1940 and 1980, the business expanded into a multibillion dollar industry that employed more than 200,000 people.

The success of these companies hinged on keeping the health risks of asbestos a secret — but it was asbestos workers and consumers who paid the price. In order to keep the industry alive and prosperous, many companies took steps to ensure miners, factory workers and the public knew nothing about the true dangers of asbestos.

**Company Knowledge of Asbestos Risks**
Court evidence has revealed multiple companies that contributed to the asbestos cover-up. Some concealed medical research that may have promoted stricter asbestos regulations and safer work practices. Others worked their employees to an early grave, refusing to show sick workers their X-ray scans that showed signs of respiratory disease. Some of the most incriminating examples follow, but during the asbestos boom years, many companies played a part.

William Cooke published the first medical paper on asbestosis.

1929

Asbestos industry leaders asked Dr. Anthony Lanza, assistant medical director at Metropolitan Life Insurance, to investigate asbestos disease among asbestos factory workers. The industry concealed results that showed high rates of asbestos-related illness.

1931
P. Klemperer and C.B. Rabin explained diagnosis and pathology of pleural mesothelioma, a cancer affecting the lining of the lungs.

1932

Raybestos-Manhattan and Johns Manville manipulated a study on asbestos textile workers to downplay the seriousness of asbestosis.

1933

Turner & Newall convinced British government officials to limit asbestos regulations and safety inspections.

1935

Lanza objected to hanging asbestos warning signs at a Johns Manville plant in Illinois because of the potential “legal situation.”
London pathologist Steven Gloyne reported a case of lung cancer associated with asbestosis and suggested asbestos as a possible cause for mesothelioma.

Raybestos-Manhattan president Sumner Simpson wrote, “The less said about asbestos, the better off we are,” in a letter to a Johns Manville attorney.

1940

Johns Manville became a world leader in asbestos product sales.

1945

MetLife®

Metropolitan Life blocked a safety inspection at a Johns Manville asbestos factory in New Jersey.
Dr. Kenneth Smith, future medical director of Johns Manville, advised the company against telling its sick workers they have asbestosis.

1962

Irving Selikoff and colleagues uncovered a definitive link between asbestos exposure and cancer.

1964

Asbestos industry leaders claimed they had no knowledge of asbestos health risks prior to 1964, but confidential documents prove otherwise.
In a confidential memo, a Bendix Corporation executive wrote, "If you have enjoyed a good life while working with asbestos products, why not die from it."

The U.S. Environmental Protection Agency (EPA) classified asbestos as a hazardous air pollutant.

The first asbestos product lawsuit paved the way for thousands of future claims against asbestos companies.

Johns Manville

By most accounts, Johns Manville was the largest manufacturer of asbestos products and the leading asbestos supplier in the U.S. from the 1920s to the 1970s. Much of the company’s financial success over this period is attributed to Lewis H. Brown, an innovative businessman named president of the company in 1929.
Brown’s leadership helped elevate Johns Manville to No. 1 in worldwide asbestos product sales by the 1940s. It later came to light that he reached this milestone by placing company profits over the health of his workers, evidenced by countless internal memos, industry letters and courtroom depositions.

Chilling historical image of workers bagging raw asbestos by hand.

In a 1984 deposition describing a meeting between Brown, Johns Manville attorney Vandiver Brown and officials from the asbestos firm Unarco, Charles Roemer recalled Lewis Brown’s callous disregard for his employees’ health.

“I'll never forget,” Roemer said. “I turned to Mr. Brown, one of the Browns made this crack (that Unarco managers were a bunch of fools for notifying employees who had asbestosis), and I said, 'Mr. Brown, do you mean to tell me you would let them work until they dropped dead?' He said, 'Yes. We save a lot of money that way.'”

Decades earlier in 1949, Dr. Kenneth Smith, a local physician, sent a memo to Johns Manville headquarters concerning seven asbestos mill workers whose chest X-rays
showed early signs of asbestosis. Smith advised company executives against sharing the test results with the workers, writing, “As long as the man is not disabled, it is felt that he should not be told of his condition so that he can live and work in peace, and the company can benefit by his many years of experience.”

We now know that Brown took Smith’s advice and made it company policy, leaving sick workers completely uninformed as their health degraded. Brown later hired Smith as medical director of Johns Manville, confirming he shared the doctor’s cruel approach to occupational health.

Metropolitan Life Insurance Company

While Metropolitan Life Insurance Company was not an asbestos business, it worked closely with asbestos companies to conceal the health effects of the toxic mineral. In 1944, the company insured more than a dozen big names in the industry, including Johns Manville, Raybestos-Manhattan, National Gypsum, Fibreboard and Flintkote.
Metropolitan Life knew about the high asbestosis rates at Johns Manville's factory in Manville, New Jersey, as early as 1932, but succeeded in blocking an inspection for poor work conditions there in 1945. The company even convinced government officials that asbestos hazards were under control, despite having knowledge of confidential company-sponsored reports that found evidence of asbestosis in 20 percent of workers.

In 1933, a plant physician at a Johns Manville plant in Illinois asked Dr. Anthony Lanza, a full-time employee at Metropolitan Life from 1926 to 1948, about hanging warning posters to spread worker awareness of asbestos-related health risks. Lanza objected because of the potential "legal situation."

Lanza’s early 1930s study on asbestos workers in the textile industry revealed that half of all workers with five to 10 years of exposure showed signs of asbestosis in X-rays. Of those with more than 15 years of exposure, a remarkable 87 percent suffered from lung disease. The asbestos industry blocked the publication of these findings for four years, and likely altered the data before the report was released.

Raybestos-Manhattan, Inc.

_The Sumner Simpson Papers revealed private conversations that very arguably show a pattern of denial and disease and attempts at suppression of information ... It further reflects a conscious effort by the industry in the 1930s to downplay, or arguably suppress, the dissemination of information to employees and the public for the fear of promotion of lawsuits._

Judge James

South Carolina Circuit Judge

Raybestos-Manhattan has been a leading manufacturer of asbestos-containing textiles, brake linings and other friction products since the 1920s, and continues to do business
outside the asbestos industry today. Court documents have revealed the company played a crucial role in the asbestos cover-up, most notably by working with Johns Manville in the 1930s to conceal information about the dangers of asbestos.

A collection of documents known as the Sumner Simpson Papers, named after the president of Raybestos-Manhattan in the 1930s and 1940s, provide clear evidence that the company attempted to hide asbestos health risks from workers and the general public.

Raybestos-Manhattan and Johns Manville in 1932 convinced Lanza of Metropolitan Life to alter his study on asbestos textile workers to minimize the seriousness of asbestosis. Manville and Raybestos allegedly had Lanza remove a sentence from the report explaining, “It is possible for uncomplicated asbestosis to result fatally.”

In a 1935 letter, A.F. Rossiter of Asbestos Magazine implied Simpson had requested he block the publication of articles mentioning asbestos dust hazards. Soon after, Simpson sent a letter to Johns Manville attorney Vandiver Brown. “The less said about asbestos,” he wrote, “the better off we are.”

Bendix Corporation

Bendix Corporation, now known as Honeywell, began manufacturing asbestos friction materials for automobiles in 1939 out of Troy, New York. The company expanded its operations to Cleveland, Tennessee, in 1964 and was still producing asbestos-containing brake components in the U.S. as recently as 1997.

My answer to the problem is: If you have enjoyed a good life while working with asbestos products, why not die from it.

Ernie Martin

Director of purchases for Bendix Corporation
Ernie Martin, director of purchases for Bendix Corporation, in September 1966 shared an asbestos report with Noel Hendry, a sales manager at a Johns Manville asbestos mine in Quebec, Canada. The report predicted asbestos health risks may lead to undesirable government regulations.

In response, Hendry said, “I suppose we have to bear with people who have nothing better to do than create alarm, but we are not alarmed, and we live and sleep with the stuff.”

While current U.S. regulations limit workplace asbestos exposure to 0.2 fibers per cubic centimeter of air (f/cc), surveys at Johns Manville’s Canadian mine and various other mines and mills throughout Quebec in the 1950s revealed asbestos levels ranging from 23 to 720 f/cc. Clearly, there was cause for alarm.

As more evidence of the dangers of asbestos emerged, Johns Manville’s Asbestos Fiber Division sent a position paper titled "Asbestos and Human Health" to a Bendix manager. The paper stated the asbestos industry had invested millions in industrial hygiene and medical research, but it gave a misleading account of the health risks of asbestos. It featured section titles labeled “An Essential Product” and “No Risk Shown for General Public.”

Turner & Newall, Ltd.

In 1920, four U.K. asbestos businesses merged to form Turner & Newall, one of the first companies to industrialize asbestos. Like many of the major asbestos companies in the U.S., Turner & Newall made repeated efforts to hide asbestos health risks.
While the company held many health and safety conferences, officials did not open the conversations to those unfamiliar with asbestosis, namely workers and their trade unions. Employees at Turner & Newall plants began dying of asbestos exposure in the 1920s, including a young asbestos worker who suffered a massive accumulation of fibers in her lungs. In her autopsy report, a doctor said the collection of fibers was so thick his knife almost appeared to grate as he cut into her left lung.

When the British government announced plans to enact the first regulations on the asbestos industry, Turner & Newall ensured industrial hygiene measures would only apply to manufacturing plants and not the end-use of asbestos products. Laws requiring regular medical examinations for asbestos workers came next, but Turner & Newall convinced the government to exclude asbestos insulation workers from mandatory
testing. Besides miners, this group was perhaps the highest risk occupation for asbestos disease.

Once government doctors learned in 1932 that warehouse employees who packed and shipped asbestos products faced serious asbestosis risks, Turner & Newall and several other companies convinced government representatives that regulatory updates to protect these workers weren’t necessary.

**Military Knowledge of Asbestos Danger**

All branches of the U.S. military used asbestos extensively from the 1930s to the mid-1970s, with the most hazardous conditions occurring in U.S. Navy ships and shipyards. As a result, veterans serving a wide range of military occupations are now at high-risk of developing cancer and other asbestos-related health complications.

*We are not protecting the men as we should.*

C.S. Stephenson

U.S. Navy Commander of Preventive Medicine

The U.S. government certainly had knowledge of asbestos dangers prior to World War II, when the Navy built and deployed thousands of new ships loaded with asbestos
insulation. Asbestos health risks are mentioned in Navy correspondence and documents from government archives dating back to the late 1930s.

While there’s no denying the military could have done more to protect our veterans, no evidence shows the government contributed to the asbestos cover-up.

In litigation, attorneys representing asbestos companies have argued that strict military specifications required the use of asbestos, but documents from the 1940s and 1950s suggest the industry may have played a leading role in drafting these specifications. Although some Navy guidelines were written for asbestos insulation, most major specifications for pipe and block insulations listed performance requirements, but not specific materials.

Insulation manuals in the early 1970s first told military insulation workers to take precautions while handling asbestos. The Navy adopted new asbestos regulations from the Occupational Safety and Health Administration (OSHA) in 1974, and issued a ban on all new asbestos insulation materials the following year. It is likely, however, that harmful exposures occurred well after 1975, when the Navy began to phase asbestos materials out of its ships.

**The End of the Cover-Up**

In the 1960s, new developments in law and medicine exposed the questionable dealings of the asbestos industry and put an end to a cover-up that may have continued indefinitely. Dr. Irving Selikoff of Mount Sinai Hospital in New York, with the help of two colleagues, definitively linked occupational asbestos exposure to cancer and other life-threatening conditions in 1962 and 1963. Finally, the asbestos industry could no longer hide or ignore the truth.
Beginning of Legal Action over Asbestos Exposure

Several years later, the American Law Foundation amended tort law to make the sellers of dangerous materials liable to legal action unless they placed adequate warning labels on their products. Not surprisingly, few companies added labels until the law required it. The first asbestos product lawsuit emerged in 1971, opening the door for the thousands of lawsuits that followed.
Mesothelioma Linked to Asbestos

Scientists established a connection between asbestos and lung cancer in the 1930s. Around the same time, doctors were advancing their understanding of mesothelioma, an aggressive cancer of the lining of the lungs caused almost exclusively by asbestos.

Legacy of Asbestos Continues

Although litigation brought massive payouts to asbestos workers — as well as punitive damages that drove more than 100 asbestos companies to bankruptcy by 2014 — families around the world still feel the effects of the asbestos industry’s conspiracy.

Global Asbestos Use
Knowledge about the dangers of asbestos prompted more than 55 countries to ban or restrict asbestos use, but worldwide use of the toxic mineral continues. In 2013 alone, the world produced and consumed more than 2 million metric tons of asbestos, with the majority of it mined and used in Russia and China.

When Will Asbestos Exposure End?

Despite a clear medical link between asbestos exposure and various cancers, workers worldwide still handle heaps of raw asbestos by hand without protective equipment or guidelines for safe work practices. In coming years, researchers expect the number of asbestos-related cancer cases in the U.S. to peak, but developing nations that rely on cheap asbestos building materials will suffer easily-preventable health problems and deaths for decades to come. Unfortunately, asbestos cover-ups continue in many countries.
Asbestos in Schools

Ceiling tiles, vinyl floor covering and the duct work for the heating and cooling system all may contain asbestos.

Students and school employees face significant health risks from lingering asbestos in schools and colleges across the U.S. Because the current policy is to manage asbestos materials in-place, the potential for harmful exposures will likely persist for years to come.

One area of concern for parents and teachers is the prevalence of asbestos in U.S. school buildings. If a school was built before the 1980s, it’s likely that it contains some form of asbestos. About half of all schools in the U.S. were built from 1950 to 1969, when asbestos materials were highly prevalent in construction.

When maintenance work disturbs these materials, or they start to deteriorate over time, asbestos dust can enter the air and be inhaled. Exposure to the dust puts teachers and students at increased risk for mesothelioma, lung cancer and other serious lung conditions.

Asbestos Cover-Up

Find out who concealed asbestos risks from their employees.

According to the Environmental Protection Agency (EPA), asbestos-containing materials reside in many of the approximately 132,000 primary and secondary schools in the nation. These schools serve more than 55 million children, and are the worksites for more than 7 million teachers, administrators and support staff.
As long as asbestos building materials remain in good condition, the EPA insists they pose minimal health risks and recommends schools leave them in place. But if negligent maintenance work or improper abatement procedures occur, otherwise harmless asbestos products can cause serious exposures.

In October 2014, parents and teachers in Huntington Beach, California were outraged to discover contractors had removed asbestos materials unsafely from multiple district schools earlier that year. The Ocean View School District failed to warn parents and teachers about the project and did not use proper safeguards to prevent exposure — serious violations of EPA regulations that protect students and teachers from asbestos.

Air tests at Lake View Elementary confirmed two classrooms had airborne asbestos levels exceeding federal safety standards. After considerable pressure from parents and teachers, the district closed Lake View and two other elementary schools indefinitely while the asbestos risks were being resolved.

The families of students who attended these schools filed a claim against the district, alleging its elected leaders and various other officials and contractors failed to protect children from the hazardous conditions at these schools.

**Health Risks for Teachers**

While the occupations at highest risk for asbestos exposure have historically been miners, construction workers and veterans of the U.S. Armed Forces, teachers are more likely to be exposed than many other occupations that don’t directly involve asbestos.

The elementary and secondary schools industry ranked second for mesothelioma deaths in 1999, according to National Center for Health Statistics (NCHS) data on
reported causes of death. Construction topped the list with 77 deaths, and teachers followed with 38 deaths.

More teachers died of mesothelioma that year than workers in other industries known for frequent asbestos exposure risks, including industrial chemicals, railroads and electric light and power.

More recent data from the U.K. reveals a sharp increase in mesothelioma deaths among school teachers from 1980 to 2012. While an average of three teachers died per year in the 1980s, the death rate rose to 19 per year by 2012.

Because doctors can link the vast majority of mesotheliomas to past exposures to asbestos, these statistics offer some insight into the prevalence of asbestos in schools and the dangers it poses to public health.

**Students at Higher Risk than Teachers**

In 2013, research from the U.K. government’s Committee on Carcinogenicity (COC) showed that children are more vulnerable to asbestos exposure than adults. The COC concluded a five-year-old child’s lifetime risk of developing mesothelioma is approximately five times greater than that of a 30-year-old adult.

An EPA risk assessment study from the early 1980s estimated that 1,000 premature deaths related to asbestos exposure would occur over the next 30 years, with people exposed as schoolchildren accounting for 90 percent of those deaths. These findings provided impetus for the development of mandated asbestos control programs in schools.
How Can Teachers Prevent Exposure?

Knowing how to spot asbestos-containing materials can help teachers maintain a safe environment for students and school employees. But unless a product is clearly labeled, there’s no way to tell if it contains asbestos simply by looking at it. By law, schools must consult a qualified expert to collect samples and have them tested in the lab to confirm the presence of asbestos.

**Common Locations for Asbestos-Containing Materials**

- Damaged wallboard, drywall or plaster
- Worn soundproofing material
- Deteriorated steam pipes or boiler insulation
- Crumbling floor tiles, roofing or ceiling panels
- Old heating and air-conditioning equipment
- Chipped paint

If you find a deteriorated area in the school, you should request a copy of the school’s asbestos management plan or talk to a custodian to find out if it poses an asbestos hazard. According to an EPA regulation called the Asbestos Hazard Emergency Response Act (AHERA), a designated person at the school must develop and update a detailed plan describing the location and type of any asbestos materials in the school. A copy of the plan must stay on-site.

The plan will list the results of all asbestos inspections and preventive or response actions the school has taken or plans to take to limit exposures. Anyone can request a copy of the asbestos management plan from the school’s administrative office. If the asbestos management plan confirms there are asbestos materials in the deteriorated area, notify your school administration or AHERA designated person immediately.

**A Timeline of Asbestos Regulations & Policies**
Starting in the early 1980s, the EPA began investigating the prevalence of asbestos in schools and assessing the risk it posed to students and teachers. As the consequences of exposure became increasingly clear, the EPA enacted a series of rules and regulations to prevent harmful exposures and minimize health risks when abatement was necessary.

EPA Estimated Asbestos Risks in Schools

An EPA risk study revealed more than 8,500 schools contain friable asbestos, a form that can easily crumble and shed airborne fibers. The EPA determined more than 3 million students and 250,000 teachers and school workers were at risk for harmful exposures.

The EPA issued the Asbestos-in-Schools rule, requiring schools to inspect for asbestos materials, document their locations and make this information readily available to teachers, parents and school workers. Schools also had to provide custodial workers an EPA guide on reducing asbestos exposure.

Asbestos-in-Schools Rule Enacted

The Asbestos School Hazard Abatement Act (ASHAA)
ASHAA provided grants and interest-free loans to public and private schools that lacked the necessary funding for emergency asbestos removal actions. Congress appropriated $382 million for ASHAA from 1984 to 1993, but supplied no additional funds after 1993.

Congress passed AHERA, requiring schools to develop an official plan outlining the location of asbestos materials and how they will be managed. AHERA gave the EPA authority to issue fines and civil suits against school systems and administrators that fail to follow federal asbestos laws during any activities related to asbestos.

The Asbestos Hazard Emergency Response Act (AHERA)
The Asbestos School Hazard Abatement Reauthorization Act (ASHARA)

ASHARA helped schools ensure they have the necessary expertise, technical assistance and financial resources to identify asbestos and remove it when necessary. The act required anyone involved with asbestos activities in commercial buildings, schools and other public buildings to be trained and accredited for asbestos work.

**Asbestos Hazard Emergency Response Act Guidelines**

- Perform an original inspection for asbestos-containing materials and re-examined every three years.
- Develop and maintain an asbestos management plan and keep a copy at the school.
- Provide yearly notifications to parents, teachers and employee organizations regarding the school’s asbestos management plan and any asbestos abatement actions taken or planned in the school.
- Name a designated person to ensure the school’s asbestos actions are implemented properly.
- Perform periodic surveillance of known or suspected asbestos-containing building materials.
- Ensure that accredited professionals perform inspections and response actions and prepare management plans.
- Provide custodial staff with asbestos awareness training.

If a school fails to conduct an inspection or develop an asbestos management plan, the EPA can fine the school as much as $5,000. In addition, AHERA mandates training for maintenance and janitorial staff so they are qualified to recognize asbestos hazards.

**Asbestos in Colleges**

According to the National Center for Education Statistics, an office of the U.S. Department of Education, 4,495 degree-granting institutions in the U.S. operate more than 10,000 establishments (campuses, offices, research facilities or other locations). This amount includes all public and private, for profit and nonprofit colleges, universities and junior colleges in the country. These post-secondary schools serve approximately 20.4 million full- and part-time students and employ more than 3.9 million faculty and staff.

While AHERA regulations address asbestos issues in elementary and secondary schools, the EPA, the [Occupational Safety and Health Administration (OSHA)](https://www.osha.gov/) and various state and municipal laws regulate asbestos removal procedures for the nation’s colleges and universities.
OSHA requires all colleges to:

- Survey their buildings and test for asbestos.

- Maintain records of any samples taken during maintenance, construction or demolition activities.

- Provide notifications regarding the locations of asbestos in their buildings.

- Post appropriate warning signs when asbestos-containing materials are identified or suspected.

- Provide asbestos training to maintenance and custodial employees.

Failure to follow OSHA and EPA guidelines during asbestos work or maintenance that may disturb asbestos materials can result in significant fines levied on any non-complying institution.
THE REALITY OF NATURE

Why are we doing this?

- Asbestos is:
  - Potentially hazardous to health
  - Seems like it is everywhere
  - Unpredictable
  - Laws and Regulations

We have a responsibility to provide a safe and healthy environment to our students, staff, faculty and administration.

HISTORY OF ASBESTOS

- First used as wicks for oil lamps.
- Egyptian Pharaohs were wrapped in asbestos cloth to protect the bodies from deterioration.
ASBESTOS IN THE MIDDLE AGES

• Around 755 AD, King Charlemagne of France ordered a tablecloth made of asbestos to prevent it from burning during accidental fires that frequently occurred during feasts and celebrations.
• In 1095, the French, German and Italian knights who fought in the First Crusade used a catapult, called a trebuchet, to fling bags of pitch and tar wrapped in asbestos bags over city walls during their sieges.
• Marco Polo visited an asbestos mine in China to disprove the myth that asbestos came from the hair of a wooly lizard.
• By the early 1900s, asbestos production had grown worldwide to more than 30,000 tons annually.
• U.S. asbestos consumption by 1942 had increased to about 60 percent of world production and peaked in 1973 to 804,000 tons annually.

DECLINE OF ASBESTOS USE WORLDWIDE

• By the late 1970s, a dramatic decline began in the use of asbestos throughout the industrialized nations. The public was beginning to understand the connection between asbestos exposure and debilitating lung diseases.
• By 2003, new environmental regulations and consumer demand helped push for full or partial bans on the use of asbestos in 17 countries.
• In 2005 asbestos was banned throughout the European Union. No ban in the United States.
• To date 40 countries have banned the use of asbestos in any products. No U.S. ban.
• The last U.S. asbestos mine closed in 2002, ending more than a century of the country’s asbestos production.

WHO REGULATES ASBESTOS?

• Environmental Protection Agency (EPA)
  • National Emissions Standards for Hazardous Air Pollutants (NESHAPS)
  • Asbestos Hazard Emergency Response Act (AHERA)
  • Toxic Substance Control Act (TSCA)
• Occupational Health and Safety Administration (OSHA)
  • 29 CFR 1910.1101 – Construction Standard
WHAT IS ASBESTOS?

- Asbestos is a naturally occurring mineral fiber.
- There are 6 types divided into 2 main groups.
- All asbestos groups are complex silicates.
- Asbestos is essentially inert.

THE SERPENTINE GROUP

Chrysotile

Most commonly used form of asbestos, makes up ~95% found in building products.

THE AMPHIBOLE GROUP

- This group includes:
  - Amosite
  - Crocidolite
  - Anthophyllite
  - Actinolite
  - Tremolite

Used in many building products and because of the long straight shape is considered the most dangerous form of asbestos.
WHY WAS ASBESTOS USED?

- Asbestos fibers are virtually indestructible.
- They are resistant to chemicals and heat, and they are very stable in the environment.
- They do not evaporate into the air or dissolve in water and they are not broken down over time.
- Asbestos is probably the best insulator known to man. Because asbestos has so many useful properties, it has been used in over 3,000 different products.

HOW MUCH ASBESTOS

- For OSHA and most other regulations a material must contain greater than 1% asbestos to be considered as Asbestos Containing Material (ACM).
- In addition materials can be Presumed Asbestos Containing Materials (PACM)
- If a material is PACM it is subject to all regulations that apply to ACM

WHERE IS ASBESTOS FOUND?

- Sprayed-on fire proofing
- Pipe insulation
- Wall and ceiling insulation
- Ceiling tiles
- Floor tiles
- Putties, caulks, and cements
- Plaster material
- Mastic material
- Roof coatings
- Roofing shingles
- Siding shingles on old buildings
- Wall and ceiling textures
- Joint compounds
- Brake linings and clutch pads
- Fire curtains
- Lab bench tops
- Fire blankets
- Fire doors
- Gaskets
THE USUAL SUSPECTS

• Sprayed-on insulation in locations such as various mechanical rooms, steel reinforcing beams, and some ceilings in older buildings.
• Most 9”x9” floor tiles in buildings built prior to 1981.
• Insulation around pipes and boilers.
• Interiors of fire doors.

WHEN IS ASBESTOS DANGEROUS?

• ACM is not generally considered to be harmful unless it is releasing dust or fibers into the air where the fibers can be inhaled.
• Many of the fibers will become trapped in the mucous membranes of the nose and throat where they can then be removed, but some may pass deep into the lungs.
• Once they are trapped in the lungs, the fibers can cause health issues.

WHEN IS ASBESTOS DANGEROUS?

• Asbestos is hazardous when it is friable and is disturbed in such a nature that it releases fibers in the air.
• The term “friable” means that the asbestos is easily crumbled by hand, releasing fibers into the air.
• Asbestos floor tile is non-friable.
• Asbestos ceiling tile is friable.
WHEN IS ASBESTOS DANGEROUS?

• Damage and deterioration will increase the likelihood of disturbance of friable ACM, and could result in a fiber release.
• Water damage, continued vibration, aging and physical impact such as drilling, grinding, buffing, cutting, sawing, or striking can break the materials down making fiber release more likely.

HEALTH EFFECTS OF ASBESTOS EXPOSURE

Because it is so hard to destroy asbestos fibers, the body cannot break them down or remove them once they are lodged in lung or body tissues. They remain in place where they can cause disease.

The three primary diseases associated with asbestos exposure:
• Asbestosis
• Lung Cancer
• Mesothelioma

ASBESTOSIS

Asbestosis is a serious, chronic, noncancerous respiratory disease. Inhaled asbestos fibers aggravate lung tissues, which cause them to scar.

Symptoms of asbestosis include shortness of breath and a dry crackling sound in the lungs while inhaling. In its advanced stages, the disease may cause cardiac failure because it is so difficult to breath.

There is no effective treatment for asbestosis; the disease is usually disabling and can cause death.

The risk of asbestosis is minimal for those who do not with asbestos; the disease is rarely caused by neighborhood or family exposure.

Typical latency period is approximately 15-30 years.
LUNG CANCER

Lung cancer causes the largest number of deaths related to asbestos exposure. The incidence of lung cancer in people who are directly involved in the mining, milling, manufacturing and use of asbestos and its products is much higher than in the general public. The most common symptoms of lung cancer are coughing and a change in breathing. Other symptoms include shortness of breath, persistent chest pains, hoarseness, and anemia.

MESOTHELIOMA

Mesothelioma is a rare form of cancer that most often occurs in the thin membrane lining of the lungs, chest, abdomen, and (rarely) the heart. About 200 cases are diagnosed each year in the United States. Virtually all cases of mesothelioma are linked with asbestos exposure. Approximately 2% of all miners and textile workers who work with asbestos contract mesothelioma.

Mesothelioma has an approximate latency period of 30-40 years.

HOW TO AVOID EXPOSURE

- In order to avoid being exposed to asbestos, you must be aware of the locations it is likely to be found.
- If you do not know whether something is asbestos or not and it fits the suspect material category, assume that it is until it is verified otherwise.
- Remember that you cannot tell if floor or ceiling tiles contain asbestos just by looking at them.

NEVER: Drill, hammer, cut, saw, break, damage, move, or disturb…….

...any asbestos containing materials or suspected materials. This could render the material Friable.
HOUSEKEEPING & ASBESTOS

Custodians should never sand or dry buff asbestos containing floor tiles, and only wet stripping or scrubbing methods should be used during top scrub or stripping operations.

If abrasion pads are required they should be low abrasion pads, and should be used at speeds below 300 rpm and again only wet processes used.

ASBESTOS SPILLS

It is important to report any damaged asbestos containing materials to your supervisor immediately.

If, for example, you discover some sprayed-on asbestos insulation has been knocked off a ceiling or wall, this would be considered a “spill.” As such it would need to be cleaned up immediately by asbestos abatement workers.

DO NOT ATTEMPT TO CLEAN UP SPILLS YOURSELF!!!!!

AVOIDING EXPOSURE

By knowing where asbestos is likely to be located and then taking measures not to disturb it, you will protect yourself and others from exposure to this hazardous substance.
Asbestos: The survey guide

This is a free-to-download, web-friendly version of HSG264 (Second edition, published 2012). This version has been adapted for online use from HSE's current printed version.

You can buy the book at www.hsebooks.co.uk.

ISBN 978 0 7176 6502 0
Price £17.50

This heavily illustrated publication replaces and expands on MDHS100, Surveying, sampling and assessment of asbestos-containing materials. It is aimed at people carrying out asbestos surveys and people with specific responsibilities for managing asbestos in non-domestic premises under the Control of Asbestos Regulations 2012. The book covers competence and quality assurance and surveys, including: survey planning, carrying out surveys, the survey report and the dutyholder's use of the survey information. It includes extensive appendices and references.
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This guidance is issued by the Health and Safety Executive. Following the guidance is not compulsory and you are free to take other action. But if you do follow the guidance you will normally be doing enough to comply with the law. Health and safety inspectors seek to secure compliance with the law and may refer to this guidance as illustrating good practice.

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Green summary boxes: This publication has specific guidance for clients/dutyholders in green boxes:

Box 1: The purpose of an asbestos survey.
- To help manage asbestos in your premises.
- To provide accurate information on the location, amount and condition of asbestos-containing materials (ACMs).
- To assess the level of damage or deterioration in the ACMs and whether remedial action is required.
- To use the survey information to prepare a record of the location of any asbestos, commonly called an asbestos register,* and an asbestos plan of the building(s).
- To help identify all the ACMs to be removed before refurbishment work or demolition.

*Note: the information in the register should be used to inform the risk assessment (eg consider who could disturb asbestos on your premises), and to establish the management plan to prevent such a disturbance.

Box 3: What the client/dutyholder should do to check the competency of the surveyor.

Box 4: Areas to be inspected as part of a management survey.

Box 6: Information the client/dutyholder should expect from the surveyor.

Box 9: Information required for a management survey.

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Box 11: What the client/dutyholder should do to check the accuracy of the survey report.

Blue summary boxes: This publication has specific guidance for surveyors in blue boxes

Box 2: Survey key points.

Box 5: Information the surveyor needs from the client.

Box 7: Information to be collected by the surveyor.

Box 8: Example of a systematic survey inspection.
Box 2: Survey key points

- Be aware that the survey is essential for the client/dutyholder to successfully manage asbestos.
- All asbestos should be located as far as reasonably practicable within the survey type.
- Ensure that the appropriate survey is undertaken for the client's needs.
- Avoid caveats.
- Ensure the survey is reported in a format that can be used to prepare an asbestos register and building plan.
- Inform the client that the survey is not the end point in managing asbestos.
1 Introduction

1 This guidance has been prepared by the Health and Safety Executive (with the help of others, see Acknowledgements) to help people carrying out asbestos surveys and those with specific responsibilities for managing the risks from asbestos in non-domestic premises under regulation 4 of the Control of Asbestos Regulations 2012 (CAR 2012). It is also designed to provide guidance in situations where surveys may be carried out for other purposes, eg for ‘managing’ asbestos in domestic premises under wider health and safety legislation and for meeting the requirements of the Construction (Design and Management) Regulations 2007 (CDM). It complements and supports other guidance on managing asbestos.

2 Large amounts of asbestos-containing materials (ACMs) were used for a wide range of construction purposes in new and refurbished buildings until 1999 when all use of asbestos was banned. This extensive use means that there are still many buildings in Great Britain which contain asbestos. Where asbestos materials are in good condition and unlikely to be disturbed they do not present a risk. However, where the materials are in poor condition or are disturbed or damaged, asbestos fibres are released into the air, which, if breathed in, can cause serious lung diseases, including cancers.

3 Workers who disturb the fabric of buildings during maintenance, refurbishment, repair, installation and related activities may be exposed to asbestos every time they unknowingly work on ACMs or carry out work without taking the correct precautions. The purpose of managing asbestos in buildings is to prevent or, where this is not reasonably practicable, minimise exposure for these groups of workers and other people in the premises. To prevent this exposure, information is needed on whether asbestos is, or is likely to be, present in the buildings, so that an assessment can be made about the risk it presents and appropriate measures put in place to manage those risks.

4 This guidance is aimed at:

- **Surveyors** who carry out asbestos surveys. It sets out how to survey premises for ACMs. In particular, it specifies the methodology to use in carrying out surveys and how to report and present the results. It also gives advice on how to recognise and sample suspected ACMs. In doing so, the guidance builds on and updates MDHS100 *Surveying, sampling and assessment of asbestos-containing materials*, which it replaces. It also contains a specific section which outlines the survey strategy to use when surveying large numbers of similar properties (eg domestic housing).

- **Those who commission surveys (eg clients/dutyholders).** It sets out how to decide what type of survey is appropriate, how to select a competent surveyor, what the client should expect from a surveyor and what the client should provide to the surveyor. It also highlights issues (eg restricted access, excluded areas and other caveats) which not only reduce the effectiveness of the survey, but also have serious implications for managing asbestos. It also explains what checks should be made on the survey report to ensure its validity and accuracy (ie “contract management”).

5 The guidance will also be useful to building professionals, such as architects, designers, building surveyors and particularly demolition and asbestos removal contractors. For example, architects and building surveyors need to be aware of the requirement to carry out asbestos buildings surveys (and indeed can advise on the need for an asbestos survey before refurbishment and demolition projects). They should also be aware of the various types of surveys and be able to review
completed surveys. Contractors need to be able to interpret asbestos surveys so that refurbishment or demolition can be planned and carried out safely.

6 The guidance does not cover airborne sampling or surveying contaminated land. These are specialised subjects outside the scope of this document.

Legal requirements

The duty to manage asbestos in non-domestic premises*

7 Asbestos, a category 1 human carcinogen, is subject to two sets of regulations – REACH (the Registration, Evaluation, Authorisation and Restriction of Chemicals Regulations 2007) and, CAR 2012. REACH prohibits the importation, supply and use of asbestos. CAR 2012 covers work with asbestos, and licensing of asbestos-removal activities. Regulation 4 of CAR 2012 contains an explicit duty on the owners and occupiers of non-domestic premises, who have maintenance and repair responsibilities, to assess and manage the risks from the presence of asbestos (the duty is summarised in Figure 1). The risks will vary with circumstances and can arise from normal occupation of a building or from inadvertent disturbance during the repair, refurbishment and demolition of premises. The risk assessment will be used to produce a management plan which details and records what actions to take to manage and reduce the risks from asbestos.

8 The requirements are placed on ‘dutyholders’, who should:

- take reasonable steps to determine the location of materials likely to contain asbestos;
- presume materials to contain asbestos, unless there are good reasons not to do so;
- make and maintain a written record of the location of the ACMs and presumed ACMs;
- assess and monitor the condition of ACMs and presumed ACMs;
- assess the risk of exposure from ACMs and presumed ACMs and prepare a written plan of the actions and measures necessary to manage the risk (ie the ‘management plan’); and
- take steps to see that these actions are carried out.
Figure 1 Summary of the main steps in managing asbestos

*The term ‘premises’ has a specific definition under health and safety legislation and includes vehicles, vessels, aircraft, installations on land and offshore, tents and moveable structures. While in most cases the survey will only be needed on existing buildings (including basements, cellars, tunnels, undercrofts etc) and the surrounding site, there may be some situations where there are hidden underground structures or pipes which may only come to light when refurbishment or demolition work is to take place. These should be included in the survey as appropriate.*
9 To manage the risk from ACMs, the dutyholder will need to:

- keep and maintain an up-to-date record of the location, condition, maintenance and removal of all ACMs on the premises;
- repair, seal or remove ACMs if there is a risk of exposure due to their condition or location;
- maintain ACMs in a good state of repair and regularly monitor their condition;
- inform anyone who is liable to disturb the ACMs about their location and condition;
- have arrangements and procedures in place so that work which may disturb the ACMs complies with CAR 2012; and
- review the plan at regular intervals and make changes if circumstances change.

Management of asbestos in domestic premises

10 The ‘duty to manage asbestos’ requirements of regulation 4 of CAR 2012 do not normally apply to domestic premises. However, the requirements do apply to common parts of premises, including housing developments and blocks of flats, but do not place any direct duties on landlords for individual houses or flats. Examples of common parts would include foyers, corridors, lifts and lift shafts, staircases, boilerhouses, vertical risers, gardens, yards and outhouses. The requirements do not apply to rooms within a private residence which are shared by more than one household, such as bathrooms, kitchens etc in shared houses and communal dining rooms and lounges in sheltered accommodation.

11 The Health and Safety at Work etc Act 1974 section 2, requires all employers to conduct their work so their employees will not be exposed to health and safety risks, and to provide information to other people about their workplace which might affect their health and safety. Section 3 places duties on employers and the self-employed towards people not in their employment and section 4 contains general duties for anyone who has control, to any extent, over a workplace. In addition, the Management of Health and Safety at Work Regulations 1999 require employers to assess the health and safety risks to third parties, such as tenants who may be affected by their activities, and to make appropriate arrangements to protect them.

12 These requirements mean that organisations such as local authorities, housing associations, social housing management companies and others who own, or are responsible for, domestic properties, have legal duties to ensure the health and safety of their staff (and others) in domestic premises used as a place of work. As employers, the organisations also have duties under the general requirements of CAR 2012 to identify asbestos, carry out a risk assessment of work liable to expose employees to asbestos and prepare a suitable written plan of work.

Construction work

13 CDM requires arrangements to be in place to deal with asbestos during construction work, including refurbishment and demolition. Where construction or building work is to be carried out, the CDM client must provide designers and contractors who are bidding for the work (or who they intend to engage) with project-specific information about the presence of asbestos, so that the risks associated with design and construction work, including demolition, can be addressed. It is not acceptable to make general reference to hazards that may exist. Therefore, site-specific asbestos surveys should be carried out in advance of construction work to make sure that the information is available to those who need it.
**Appointed person**

14. To help comply with the legal requirements and to ensure that ACMs in premises are properly managed, dutyholders should identify a person (and in some cases a deputy) within their organisation who will be responsible for that management. An appointed person will be essential where the dutyholder has a large or complex building portfolio. The appointed person will need the resources, skills, training and authority to ensure that the ACMs are managed effectively. Part of their responsibilities will include managing the survey, including contractual and reporting arrangements, quality and subsequent use of the data.

15. The survey data and information will be used to complete an asbestos register and building diagram(s) showing the ACM locations. It will also feed into the risk assessment, which will be used to develop the management plan. The dutyholder needs to establish clear lines of responsibility for asbestos management and implementation of the plan.

**Health and safety issues**

16. Surveying and sampling ACMs can give rise to exposure to asbestos. These work activities are covered by the more general requirements of CAR 2012. The regulations require employers to carry out a risk assessment (regulation 6) and prepare a plan of work (regulation 7), setting out the control measures and personal protective equipment (PPE) to be used. The regulations also require that adequate information, instruction and training (including refresher training) (regulation 10) are given to the sampling personnel. Training should meet the requirements for non-licensable asbestos work as set out in the Approved Code of Practice, Work with materials containing asbestos. Sampling ACMs is, however, exempt from the regulations covering licensing (regulation 8), notification of work with asbestos (regulation 9) and health surveillance (regulation 22) by virtue of regulation 3(2), as the exposure is sporadic and low intensity and is unlikely to exceed the control limit. Other hazards may also be present, such as working at heights and electrical cables. A risk assessment will need to be carried out before starting work on site (see paragraphs 83–87). It should include any safety aspects and record any safety protocol to be observed on site as well as fire alarm and evacuation procedures.

Asbestos surveying and sampling is likely to be ‘work’ with asbestos and therefore will require a risk assessment and a plan of work (method statement) under CAR 2012. Some activities may also involve physical work with asbestos (eg moving asbestos insulating board (AIB) ceiling tiles) and will require similar consideration.

Some direct work on asbestos to support the survey may have to be carried out by a licensed asbestos contractor (see Appendix 1, paragraphs 6 and 7).
2 Competence and quality assurance procedures

17 Surveys can be carried out by in-house personnel or a third party. In each case, the surveyor must be competent to carry out the work required. To be competent, the ‘surveyor’ must:

- have sufficient training, qualifications, knowledge, experience and ability to carry out their duties in relation to the survey and to recognise their limitations;
- have sufficient knowledge of the specific tasks to be undertaken and the risks which the work will entail;
- be able to demonstrate independence, impartiality and integrity;
- have an adequate quality management system; and
- carry out the survey in accordance with recommended guidance (ie this publication).

HSE strongly recommends the use of accredited or certificated surveyors for asbestos surveys.

The dutyholder should not appoint or instruct an independent surveyor to carry out a survey unless the surveyor is competent.

18 Surveyors should have training and experience in all aspects of survey work including survey planning, resources, technical specification, quality control and ACM assessment criteria.

19 The asbestos surveyor needs knowledge of asbestos products (eg their nature, uses, hazards, sampling techniques etc) and also knowledge of building construction, construction methods, fire protection and the various uses of buildings. Surveyors should be aware of the different forms of building construction (eg system build, traditional, industrial etc) and how construction techniques affect asbestos use. Surveyors should also have knowledge of the use of ACMs in fire protection systems and the effect of building services on the distribution and location of ACMs. For example:

- fire protection in steel-framed buildings around columns and beams;
- fire protection around electrical and heating systems;
- fire protection separating multi-occupancy buildings;
- fire protection in lift shafts and risers;
- building services in voids, plenums, ducts, cavities, undercrofts and risers.

20 Surveyors should be aware of the range of building components and structures which contain asbestos (eg barge boards, chimney cowls, ducts, eaves, fascias, fire dampers, flue terminals and risers, gables, plenums, soffits, stud partitions, sandwich partitions etc).

21 Knowledge of building construction techniques and design is particularly relevant for refurbishment and demolition surveys, to understand where (and why) ACMs may have been used in a structure. Surveyors should also be aware that there are many unrecorded ad hoc uses of ACMs in buildings. Some uses arose simply from the convenient presence of ACMs as building and engineering materials. AIB panels and offcuts, for example, were used extensively, randomly and imaginatively as shuttering for concrete, packers around columns, spacers
around window and door frames, and cavity closers. Other ACMs may have caused contamination in buildings from the way they were applied, poor work practices or later disturbance, producing for example:

- overspray and spread of dust from sprayed coatings;
- residues from thermal insulation on brickwork and in ducts;
- debris from AIB fire breaks in ceiling voids and also in cavity walls.

These ACMs are often hidden and unrecorded in building plans.

22. Survey thoroughness is important. Simple and obvious ACMs are sometimes missed, as well as those which are hidden or obscured. The survey should be performed in a structured, methodical and systematic manner. The use of checklists and a structured approach to the survey process will minimise the risk of ACMs being missed (see Box 8). Adequate time must be allowed for the survey inspection to be done effectively.

23. Organisations can demonstrate that they are technically competent to undertake surveys for ACMs through accreditation to ISO/IEC 17020.9 The United Kingdom Accreditation Service (UKAS) is the sole national accreditation body in the United Kingdom (UKAS, 21–47 High Street, Feltham, Middlesex TW13 4UN Tel: 020 8917 8400 www.ukas.com). Accreditation gives an assurance that an independent and authoritative body has assessed the technical competence of an organisation, including its underpinning management system. The scheme should ensure that the organisation can provide a valid service for the services specified on its schedule of accreditation.

24. Individual surveyors can also demonstrate that they are technically competent to undertake specified surveys through holding ‘personnel’ certification from a Certification Body accredited by UKAS for this activity under ISO/IEC 17024.10 Personnel certification provides assurance that an individual has achieved a defined level of competence to carry out specific activities. Currently there is no accredited scheme in operation. A number of people may have been certificated under previous schemes, ‘NIACS’ (National Individual Asbestos Certification Scheme) and ‘ABICS’ (Asbestos Building Inspectors Certification Scheme). Certificated surveyors should also work within a general Quality Assurance framework provided by ISO/IEC 17020 (or ISO 900111 as a minimum).

Accreditation and personnel certification are both valid schemes for demonstrating competence in performing asbestos surveys. The schemes are designed for different market segments and have different emphasis. Both will ensure that surveys are carried out by competent people. Accreditation is suitable for organisations of all sizes where the scale and volume of surveying work dictates not only individual competence but also the need for more formal and well-defined quality management systems.

Personnel certification is designed for individuals who may operate as sole traders or in organisations with only a few surveyors. The scheme focuses on individual competence.
25 Individuals without personnel certification may be able to demonstrate that they have sufficient competency to undertake specified surveys through a combination of qualifications and experience. In this situation, experience (ie extent and range) is particularly important. The most widely held training qualification in the UK is the BOHS Proficiency Module P402: ‘Buildings surveys and bulk sampling for asbestos’ (other proficiency courses may be available from other training organisations). The P402 is a basic minimum qualification for individuals carrying out asbestos surveys and on its own it does not demonstrate competency. Therefore, in addition, individuals must also have at least six months’ full-time, relevant, practical field experience on asbestos surveys under the supervision of experienced and suitably qualified personnel. The experience should cover the property sectors including industrial, commercial and domestic, and should cover management surveys and refurbishment and demolition surveys, as appropriate. Trainees will be able to demonstrate a certain level of competence through audit or assessment on an appropriate number of surveys (eg at least five) before they can be allowed to operate as the lead surveyor.

26 Further training and experience will be necessary to ensure competence in refurbishment and demolition surveys particularly for large premises. Training should cover, for example, the potential additional locations to be inspected, access techniques into cavities, walls and partitions, sandwich partitions etc. The Proficiency Module P402 can be supplemented with two refresher modules, P402R, relating to management surveys, and refurbishment and demolition surveys respectively. These modules can be a useful way of providing ongoing annual refresher training, as well as the opportunity to exchange information and experience with others (as required in ISO/IEC 17020).

27 The BOHS S301 course (‘Asbestos and other fibres’) is also a relevant starting qualification, but again on its own does not demonstrate an individual’s competence. However, individuals can then obtain a Certificate of Competence in Asbestos (CoCA) from BOHS after obtaining the S301, by completing six months’ practical experience in asbestos, successfully submitting a written report (eg on asbestos surveys) and passing an oral exam. The qualification must still be supplemented by adequate supervised field experience.

28 Personnel may also hold another qualification in surveying: the Royal Society for Public Health (RSPH) Level 3 Certificate in asbestos inspection procedures. This qualification was developed as part of a personnel certification scheme and is still available on the RSPH website (www.rsph.org.uk). The qualification alone does not demonstrate competency. Candidates will also need at least six months’ supervised and audited practical experience, as outlined for the P402 qualification (see paragraph 25).

29 All surveying organisations should have a quality management system (ie quality assurance and quality control schemes) in place to ensure the highest standards. These schemes should be written and should include a minimum of these three component parts:

- A proportion of surveys being reinspected by another competent surveyor/auditor, usually while the survey is in progress. All aspects of the site work (safety assessments, inspection procedures, sampling, documentation, material risk assessments etc) should be checked. It is recommended that
about 5% of surveys are reinspected (BS 6002: 2006).  
- All the management procedures and systems of a surveying organisation should be quality assured by carrying out audits of completed surveys. This would normally be a desk-top audit.
- There should also be a quality control scheme for survey reports. All reports should be checked before being issued to clients. Simple but thorough checks should be made that the client's requirements have been met, as well as checks on the consistency, technical accuracy and completeness of the report.

30  More details of a quality management system are given in Appendix 6.

31  Laboratories who carry out bulk analysis for asbestos must demonstrate that they conform to the requirements of ISO/IEC 17025 and, if they provide this service for a third party, must be accredited by a recognised accreditation body, ie UKAS. The laboratory should be able to demonstrate its competence to carry out bulk asbestos analysis through:

- staff training records;
- certificates from external training providers;
- participation in quality assurance schemes;
- internal proficiency testing programmes;
- satisfactory performance in national proficiency testing programmes;
- replicate analysis checks of a proportion of the routine samples.

32  The Asbestos in Materials Scheme (AIMS) is the UK national proficiency testing programme for bulk asbestos analysis. Individual analysts should also demonstrate competency through training records and satisfactory performance in an internal quality assurance scheme.

33  It is the responsibility of anyone using a laboratory for the analysis of samples for asbestos to make sure the lab holds the necessary accreditation (details can be obtained from the UKAS website: www.ukas.com).

34  Samples or representative sub-samples should be kept for at least six months after analysis to allow checks to be made. Samples associated with a legal dispute or claim may need to be kept for longer.
Box 3: What the client/dutyholder should do to check the competency of the surveyor

The dutyholder should be satisfied that the surveyor is competent to carry out the work required.

This means that the dutyholder should make reasonable enquiries as to whether the organisation or individual is technically competent to carry out the survey adequately and safely, and can allocate adequate resources to it. The competency enquiry should be carried out as a two-stage process:

- **Stage 1:** An assessment of the individual’s or company’s survey expertise and also, their knowledge of health and safety, to determine whether these are sufficient to enable them to carry out the survey competently, safely and without risk to health.

- **Stage 2:** An assessment of the individual’s or company’s experience and track record to establish if it is capable of doing the work and that it recognises its limitations.

**Stage 1:** Establish the accreditation or certification status of the surveyor and any relevant asbestos survey qualifications (see paragraphs 23–28). Obtain a written declaration which states that the surveyor can operate with independence, impartiality and integrity and that personnel carrying out the work are adequately trained for all aspects of the work taking place. In addition, obtain copies of the current insurance certificates for employer’s liability, public liability and professional indemnity cover and check them to see that they cover the proposed work.

**Stage 2:** Obtain information on the surveyor’s past experience on the type of survey planned and their capability to do the work. References or evidence of recent similar work should be requested.

If a company or surveyor cannot demonstrate competence through current accreditation or personnel certification, the dutyholder will need to conduct a more detailed assessment of their competence to do the work. This will include requesting: details of their qualifications, copies of their written procedures (including quality control policies) and references to other evidence of recent similar work.
3 Asbestos surveys

Purpose

35 The purpose of the survey is to help manage asbestos in the dutyholder's premises. The survey has to provide sufficient information for: an asbestos register and plan to be prepared, a suitable risk assessment to be carried out and a written plan to manage the risks to be produced. The process is shown schematically in Figure 2.

Figure 2 Schematic diagram showing the link between the asbestos survey and the management plan
36 In most cases, the survey will have three main aims:

- it must as far as reasonably practicable locate and record the location, extent and product type of any presumed or known ACMs;
- it must inspect and record information on the accessibility, condition* and surface treatment of any presumed or known ACMs;
- it should determine and record the asbestos type, either by collecting representative samples of suspect materials for laboratory identification, or by making a presumption based on the product type and its appearance etc.

Presumption or identification of ACMs

37 The duty to manage requirement in CAR 2012 regulation 4 allows materials to be ‘presumed’ to contain asbestos. Therefore in the asbestos survey, materials can be presumed to contain asbestos. There are two levels of ‘presumption’:

1 Strong presumption: in this case the material looks as if it is an ACM, or that it might contain asbestos. This conclusion can be reached through visual inspection alone by an experienced, well-trained surveyor, familiar with the range of asbestos products. Examples of ‘strong presumption’ would be:

- where laboratory analysis has confirmed the presence of asbestos in a similar construction material;
- materials in which asbestos is known to have been commonly used in the manufactured product at the time of installation (eg corrugated cement roof and wall sheeting, cement gutters and drainpipes, cement water tanks, ceiling tiles, insulating boards);
- materials which have the appearance of asbestos but no sample has been taken, eg thermal insulation on a pipe where fibres are clearly visible.

2 A ‘default’ situation where a material is presumed to contain asbestos because there is insufficient evidence (eg no analysis) to confirm that it is asbestos free, or where a dutyholder/surveyor decides that it is easier under the planned management arrangements to presume certain materials contain asbestos. Many non-asbestos materials will also be presumed to contain asbestos using this system. There is a further default situation where materials must be presumed to contain asbestos. The default applies to areas which cannot be accessed or inspected. In this situation any area not accessed or inspected must be presumed to contain asbestos, unless there is strong evidence that it does not.

* The exception is refurbishment and demolition surveys where information on the condition of the asbestos is usually not required (see paragraph 52), as the ACM will be removed soon after the survey. However, in circumstances where the removal will not take place for some time after the survey (eg more than three months), the ACMs will have to be managed during this period. In this situation, the condition of the ACMs should also be determined and remedial action taken as appropriate (see paragraphs 124 and 130).
38 Materials cannot be presumed to be asbestos free (ie contain no asbestos) unless there is strong evidence to conclude that they are highly unlikely to contain asbestos. There are obvious materials which are not asbestos, eg wood, glass, metal, stone etc. There are also many examples of asbestos being present inside materials, eg a sandwich layer inside doors, inside columns or under column casings, on the ‘hidden’ side of items, eg wood panelling, ceiling tiles, under veneers. Reasons to conclude that a material does not contain asbestos would be:

- non-asbestos substitute materials were specified in the original architect's/quantity surveyor's plans or in subsequent refurbishments;
- the product was very unlikely to contain asbestos or have asbestos added (eg wallpaper, plasterboard etc);
- post-1985 construction (for amphibole ACMs such as asbestos insulating board, see Appendix 1);
- post-1990 construction for decorative textured coatings (formulations containing asbestos were prohibited in 1988 and some suppliers voluntarily ceased using asbestos in 1984);
- post-1999 construction (some chrysotile products were prohibited in 1993 and nearly all were prohibited in 1999).

39 It is not always straightforward to conclude that ACMs are absent. The regulations require that reasonable steps are taken. While original specifications may not have included ACMs in certain building locations, workers may have used them for their convenience. For example, work on building systems (eg CLASP systems\(^1\)\(^4\)) has shown that ACMs, eg asbestos insulating board (AIB) off-cuts were used as filler/packing and support items in places where their presence was not recorded. There are also many examples of poor removal practice leaving asbestos-containing debris and residues. Therefore areas where asbestos has been removed previously will need to be reinspected as part of the survey.

Areas where asbestos has been removed previously will need to be reinspected.

**Types of survey**

40 This document describes two different types of survey: management surveys and refurbishment and demolition surveys.

41 The type of survey will vary during the lifespan of the premises and several may be needed over time. A management survey will be required during the normal occupation and use of the building to ensure continued management of the ACMs in situ. A refurbishment or demolition survey will be necessary when the building (or part of it) is to be upgraded, refurbished or demolished. It is probable that at larger premises a mixture of survey types will be appropriate, eg a boiler house due for demolition will require a refurbishment/demolition survey, while offices at the same site would have a management survey. In later years refurbishment surveys may be required in rooms or floors which are being upgraded. In sectors where there are large numbers of properties (eg domestic houses) or internal units (eg hotels), only particular rooms may be specified for upgrading, eg kitchens, bathrooms and bedrooms. Refurbishment surveys would only be necessary in these locations.

42 It is important that the client and the surveyor know exactly what type of survey is to be carried out and where, and what the specification will be. So there should be a clear statement and record of the type of survey that is to be carried out, including the reasons for selecting that type of survey, and where it is to be carried out.
Management survey

43 A management survey is the standard survey. Its purpose is to locate, as far as reasonably practicable, the presence and extent of any suspect ACMs in the building which could be damaged or disturbed during normal occupancy, including foreseeable maintenance and installation, and to assess their condition.

44 Management surveys will often involve minor intrusive work and some disturbance. The extent of intrusion will vary between premises and depend on what is reasonably practicable for individual properties, ie it will depend on factors such as the type of building, the nature of construction, accessibility etc. A management survey should include an assessment of the condition of the various ACMs and their ability to release fibres into the air if they are disturbed in some way. This ‘material assessment’ (see paragraphs 124–127) will give a good initial guide to the priority for managing ACMs as it will identify the materials which will most readily release airborne fibres if they are disturbed.

45 The survey will usually involve sampling and analysis to confirm the presence or absence of ACMs. However, a management survey can also involve presuming the presence or absence of asbestos. A management survey can be completed using a combination of sampling ACMs and presuming ACMs or, indeed, just presuming. Any materials presumed to contain asbestos must also have their condition assessed (ie a material assessment).

Management surveys can involve a combination of sampling to confirm asbestos is present or presuming asbestos to be present.

46 By presuming the presence of asbestos, the need for sampling and analysis can be deferred until a later time (eg before any work is carried out). However, this approach has implications for the management arrangements. The dutyholder bears potential additional costs of management for some non-ACMs. Any work carried out on ‘presumed’ materials would need to involve appropriate contractors and work methods in compliance with CAR 2012 irrespective of whether the material was actually an ACM or not. Alternatively, before any work starts, sampling and analysis can be undertaken to confirm or refute the presence of asbestos. The results will determine the work methods and contractors to be used. The ‘presumption’ approach has several disadvantages: it is less rigorous, it can lead to constant obstructions and delays before work can start, and it is more difficult to control. ‘Default’ presumptions may also lead to unnecessary removal of non-ACMs and their disposal as asbestos waste. Default presumptions may be suitable in some instances, eg ‘small’ or simple premises, as part of a client’s management arrangements.

47 Surveyors should always endeavour to positively identify ACMs. A sufficient number of samples should be taken to confirm the location and extent of ACMs. It is legitimate to reduce sample numbers where materials can be strongly presumed to be ACMs. However, the default presumption option should be avoided where possible, as it can make managing asbestos more difficult for the dutyholder. Default presumption should only be used in circumstances where it is requested by the client and/or where access genuinely cannot be obtained.

48 When sampling is carried out as part of a management survey, samples from each type of suspect ACM should be collected and analysed. If the material sampled is found to contain asbestos, other similar materials used in the same way in the building can be strongly presumed to contain asbestos. Less homogeneous materials (eg different surfaces/coating, evidence of repair etc) will require a greater number of samples. The sample number should be sufficient to establish whether asbestos is present or not in the particular material. Sampling may take place...
simultaneously with the survey, or as in the case of some larger surveys, can be carried out later as a separate exercise.

49 All areas should be accessed and inspected as far as is reasonably practicable. Areas should include underfloor coverings, above false ceilings, and inside risers, service ducts, lift shafts etc (see Box 4). Surveying may also involve some minor intrusive work, such as accessing behind fascia and panels and other surfaces or superficial materials. The extent of intrusion will depend on the degree of disturbance that is or will be necessary for foreseeable maintenance and related activities, including the installation of new equipment/cabling. Surveyors should come prepared to access such areas (ie with the correct equipment etc). Management surveys are only likely to involve the use of simple tools such as screwdrivers and chisels. Any areas not accessed must be presumed to contain asbestos. The areas not accessed and presumed to contain asbestos must be clearly stated in the survey report and will have to be managed on this basis (see paragraph 46), ie maintenance or other disturbance work should not be carried out in these areas until further checks are made.

Box 4: Areas to be inspected as part of a management survey

All ACMs should be identified as far as is reasonably practicable. The areas inspected should include: underfloor coverings, above false ceilings (ceiling voids), lofts, inside risers, service ducts and lift shafts, basements, cellars, underground rooms, undercrofts (this list is not exhaustive).

50 Management surveys should cover routine and simple maintenance work. However, it has to be recognised that where ‘more extensive’ maintenance or repair work is involved, there may not be sufficient information in the management survey and a localised refurbishment survey will be needed. A refurbishment survey will be required for all work which disturbs the fabric of the building in areas where the management survey has not been intrusive. The decision on the need for a refurbishment survey should be made by the dutyholder (probably with help from others).

Refurbishment surveys will be required for all work which disturbs the fabric of the building in areas where the management survey has not been intrusive.

The dutyholder will need to make the decision but probably with help from others.

Refurbishment and demolition surveys

51 A refurbishment and demolition survey is needed before any refurbishment or demolition work is carried out. This type of survey is used to locate and describe, as far as reasonably practicable, all ACMs in the area where the refurbishment work will take place or in the whole building if demolition is planned. The survey will be fully intrusive and involve destructive inspection, as necessary, to gain access to all areas, including those that may be difficult to reach. A refurbishment and demolition survey may also be required in other circumstances, eg when more intrusive maintenance and repair work will be carried out or for plant removal or dismantling.

52 There is a specific requirement in CAR 2012 (regulation 7) for all ACMs to be removed as far as reasonably practicable before major refurbishment or final demolition. Removing ACMs is also appropriate in other smaller refurbishment situations which involve structural or layout changes to buildings (eg removal of partitions, walls, units etc). Under CDM, the survey information should be used to help in the tendering process for removal of ACMs from the building before
work starts. The survey report should be supplied by the client to designers and contractors who may be bidding for the work, so that the asbestos risks can be addressed. In this type of survey, where the asbestos is identified so that it can be removed (rather than to ‘manage’ it), the survey does not normally assess the condition of the asbestos, other than to indicate areas of damage or where additional asbestos debris may be present. However, where the asbestos removal may not take place for some time, the ACMs’ condition will need to be assessed and the materials managed (see paragraph 124).

53 Refurbishment and demolition surveys are intended to locate all the asbestos in the building (or the relevant part), as far as reasonably practicable. It is a disruptive and fully intrusive survey which may need to penetrate all parts of the building structure. Aggressive inspection techniques will be needed to lift carpets and tiles, break through walls, ceilings, cladding and partitions, and open up floors. In these situations, controls should be put in place to prevent the spread of debris, which may include asbestos. Refurbishment and demolition surveys should only be conducted in unoccupied areas to minimise risks to the public or employees on the premises. Ideally, the building should not be in service and all furnishings removed. For minor refurbishment, this would only apply to the room involved or even part of the room where the work is small and the room large. In these situations, there should be effective isolation of the survey area (eg full floor to ceiling partition), and furnishings should be removed as far as possible or protected using sheeting. The ‘surveyed’ area must be shown to be fit for reoccupation before people move back in. This will require a thorough visual inspection and, if appropriate (eg where there has been significant destruction), reassurance air sampling with disturbance. Under no circumstances should staff remain in rooms or areas of buildings when intrusive sampling is performed.

54 There may be some circumstances where the building is still ‘occupied’ (ie in use) at the time a ‘demolition’ survey is carried out. For example in the educational sector, refurbishment/demolition surveys may be conducted in schools or colleges during one closure period (eg holidays) and the work not undertaken until the next holiday period. Also, a demolition survey maybe conducted to establish the economic future or viability of a building(s). The survey results would determine the outcome. In such situations, the ‘survey’ will need extremely careful managing with personnel and equipment/furnishings being decanted and protected (as necessary), while the survey progresses through the building. Again, there should be effective isolation of the survey areas and the ‘surveyed’ area must be shown to be fit for reoccupation before personnel reoccupy (see paragraph 53).

Survey restrictions and caveats

55 The value and usefulness of the survey can be seriously undermined where either the client or the surveyor imposes restrictions on the survey scope or on the techniques/method used by the surveyor. Information on the location of all ACMs, as far as reasonably practicable, is crucial to the risk assessment and development of the management plan. Any restrictions placed on the survey scope will reduce the extent to which ACMs are located and identified, incur delays and consequently make managing asbestos more complex, expensive and potentially less effective.

56 In management surveys, surveyors should be properly prepared for accessing all reasonably practicable areas in all parts of the building (see Box 4). Potentially difficult to enter areas (including locked rooms etc) should be identified in the planning stage with the dutyholder and arrangements made for access, eg mobile elevating work platforms (MEWPs) for work at height, rooms unlocked, doors/corridors unblocked etc. In situations where there is no entry on the day of the survey, a revisit should be made when access will be possible. Where there are
health and safety risks associated with some activities (eg height, confined spaces), these should be adequately assessed and arrangements made to control them (see paragraphs 83–91). Any area not accessed (and where no other information exists) must be presumed to contain asbestos and be managed on that basis.

57. In refurbishment surveys, the area and scope of the work will need to be agreed between the dutyholder and the surveyor. In these surveys and in demolition surveys there should be no restrictions on access unless the site is unsafe (eg fire-damaged premises) or access is physically impractical. The level of intrusion will be significantly greater than with management surveys. It will include accessing structural areas, between floors and walls and underground services. Some areas may be difficult to gain entry to and/or may need specialist assistance or equipment. Access arrangements need to be fully discussed in the planning stage and form part of the contract, particularly where assistance has to be engaged. Where access has not been possible during refurbishment and demolition surveys, these areas must be clearly located on plans and in the text of the report to allow the refurbishment and demolition processes to be progressive in those areas. Any ACMs must be identified and removed at this time. It is now recognised that even with ‘complete’ access demolition surveys, all ACMs may not be identified and this only becomes apparent during demolition itself. Surveyors need to be competent to do all the relevant work and tasks in this class of surveys (see Section 2: Competence and quality assurance procedures). They will need some knowledge of construction, be able to carry out the work safely and without risk to health, have the correct equipment to do the work and have the appropriate insurance.

58. If any restrictions have to be imposed on the scope or extent of the survey, these items must be agreed by both parties and clearly documented. They should be agreed before work starts (eg at the preliminary site meeting and walk-through inspection or during discussion (see paragraphs 77–78)) and are likely to form part of the contract. If during the survey the surveyor is unable to access any location or area for any reason, the dutyholder must be informed as soon as possible and arrangements made for later access. If access is not possible, then the survey report should clearly identify these areas not accessed. Limitations should be kept to an absolute minimum by ensuring that staff are adequately trained, insured and have the appropriate equipment and tools.

Survey restrictions and caveats can seriously undermine the management of asbestos in buildings. They should be included only where absolutely necessary and should be fully justified. Most can be avoided by proper planning and discussion. They must be agreed between the dutyholder and the surveyor and documented in the survey report.

Survey strategy

Non-domestic premises

59. In the non-domestic sector, there is an expectation that every building will be surveyed on an individual basis to identify the presence and condition of asbestos. In premises where there are large numbers of similar or near-identical rooms (eg offices or hotels), a survey strategy can be adopted which reflects the scale and nature of the buildings. All rooms should be visually inspected, as there clearly can be differences in rooms due to location (eg presence of risers, services) or function/facilities. Subsequently, ‘similar’ rooms can be placed into groups (ie rooms with similar locations or facilities, such as next to lifts, containing risers, gable end or middle building rooms, plant rooms etc). In these groups there is likely to be greater uniformity in the presence of ACMs, eg fire protection next to lift shafts). Within these groups, there will be less need for sampling in all rooms. Sampling can be conducted in a representative number of rooms and, where
ACMs are identified, the same items in other rooms in this group can be strongly presumed to contain asbestos.

**Domestic premises**

60 In the domestic sector, local authorities and housing associations have responsibility for very large numbers of properties which need a range of maintenance and repair work as well as general improvement and upgrading or occasionally demolition. Works can include electrical rewiring, structural repairs and alterations, replacement windows, central heating, insulation, renewal of bathroom and kitchen fittings or complete renovations. The work may be necessary on individual or small numbers of premises (eg emergency work due to fire/water/storm damage) or on large numbers where there are major improvement or upgrading schemes.

61 Domestic properties present particular challenges for surveying asbestos. The main issues are the scale (ie large number of properties and consequently what is reasonable and practicable), the real extent of similarity in building materials and the personal nature of the property. Asbestos was extensively used in domestic properties between 1930 and 1980. However, the presence of ACMs can now be quite variable and unpredictable even within the same archetypal group. The content varies for several reasons including:

- inconsistent/variable initial use;
- random use of waste pieces and offcuts by builders;
- previous unrecorded removal of asbestos;
- modifications of properties by tenants (present and past) and housing associations (removing and adding ACMs).

62 Domestic dwellings often fall into particular archetypal groups in terms of style, design and age, eg flats within blocks would generally be similar at construction. These factors can be used to develop the survey strategy. The following paragraphs outline the general strategy to use for surveying domestic properties. There are three components: establish the asbestos status of properties, carry out management surveys and carry out, as necessary, refurbishment surveys.

**Establish asbestos status of properties**

63 Carry out a desk-top study to establish the probable asbestos status of groups of properties. In this exercise, properties can be placed into archetypal groups based on various parameters including construction date (eg estates phases), house design and location. These groups of properties can be separated into the following categories: asbestos free, ‘contain’ ACMs and ‘possibly contain’ ACMs. The main criteria involved here for concluding groups are asbestos free would be any property constructed in 2000 or later. It may also be possible to conclude that groups are asbestos free based on other information, such as original construction information, building material specification, previous asbestos surveys or removals or other records. The evidence for this would need to be strong and records complete. These sources of information would also be used to conclude the definite presence of asbestos in particular property groups. Other properties constructed pre-2000 should be classed as possibly containing ACMs (unless there is evidence to show otherwise (eg previous surveys etc)).

**Management surveys**

64 Management surveys should be carried out on properties which contain or possibly contain ACMs. ‘Asbestos-free’ dwellings should be recorded as such in the management plan and do not need surveying. However, workers in such premises (particularly pre-2000) should always be vigilant. A proportion of properties in each category (ie that contain or possibly contain ACMs) and each archetypal group should be surveyed. Exact sampling ratios cannot be specified,
as the proportion will depend on the variability of housing stock. A proportion should be surveyed until the results demonstrate as far as reasonably practicable that there is consistency in the range of ACMs in the property type. Not every property will contain all the ACM items but the range of ACMs in the property types will be known. Every non-surveyed property has the potential to contain all the ACMs in the range and the ACMs should be managed on that basis. Where there is considerable variability, the ratio surveyed will be high.

65 Information from the management surveys can be enhanced with data from more intrusive surveys when the circumstances allow, eg when properties are vacant. Information from refurbishment and demolition surveys should be used to update the asbestos register for that particular type of property.

66 Management surveys, supported by refurbishment and demolition surveys, should be used as the primary means of managing routine maintenance work in domestic premises. However, dutyholders must recognise that these surveys are limited in their scope and extent of intrusion and therefore do not provide sufficient information on the presence of ACMs for larger scale refurbishment and other improvement projects.

Refurbishment surveys

67 Refurbishment and demolition surveys will be required where refurbishment work or other work involving disturbing the fabric of the building is carried out. The survey strategy for refurbishment works is similar to that for management surveys. Refurbishment and demolition surveys should also be carried out on a proportion of properties in the work programme. The ratio again will depend on asbestos variability within the housing stock and may be high where there is substantial variation. A proportion should be surveyed until the results demonstrate as far as reasonably practicable that there is consistency in the range of ACMs in the property type and there is an accurate picture of asbestos presence. The refurbishment and demolition survey will only be necessary in the specific area/location where the works will take place, eg cupboard, part of a room, kitchen/bathroom. However, further refurbishment and demolition surveys will be necessary in other locations when new improvement schemes are proposed. These localised refurbishment and demolition surveys should have the specific purpose of identifying ACMs for removal, control or avoidance during the refurbishment works.

68 For house improvement schemes and other project work, refurbishment and demolition surveys should be incorporated into the planning phase of such work as far as possible. This will avoid delays and disruption etc. Where the work is urgent (eg essential or emergency maintenance, repair and installation), the refurbishment surveys may have to be carried out just before the work itself. Surveys should be performed with due diligence.

69 The above strategy requires management arrangements which reflect the circumstances and uncertainty of ACMs in domestic premises. There will always be the potential for ACMs not to have been identified before maintenance and refurbishment work is carried out. In these situations the management arrangements must include the following:

- adequate asbestos training of tradespeople (eg to cover awareness, including identification) and work procedures;
- arrangements must be in place to ensure that asbestos registers or records are checked before work commencing and there are procedures for dealing with any suspect/suspicious/unknown material, ie stop work, check material etc;
- adequate supervision to ensure procedures are implemented and followed.
4 Survey planning

70. The key to an effective survey is the planning. The degree of planning and preparation will depend on the extent and complexity of the building portfolio. Single, simple one-storey factory buildings will be different from a school or a large hospital complex. Surveys on sites with many and variable types of buildings will need considerable planning and prioritising. The principles to be used in planning/structuring and conducting the survey will be similar in all cases. The survey is not about just turning up and taking samples. There needs to be a sufficient initial exchange of information between the dutyholder or client and the surveyor and a clear understanding by both parties of what is required. The information will be used to form the contract between the dutyholder and the surveyor including where the survey is performed in-house.

**Box 5: Information the surveyor needs from the client**

- Details of buildings or parts of buildings to be surveyed and survey type(s).
- Details of building(s) use, processes, hazards, priority areas.
- Plans, documents, reports and surveys on design, structure and construction.
- Safety and security information: fire alarm testing, special clothing areas (e.g., food production).
- Access arrangements and permits.
- Contacts for operational or health and safety issues.

**Box 6: Information the client/dutyholder should expect from the surveyor**

- Surveyor(s) identity, qualifications, accreditation or certification status, quality control procedures.
- References from previous work.
- Insurance (professional indemnity cover).
- Costs.
- Proposed scope of work.
- Plan of work, including plans for sampling or asbestos disturbance.
- Timetable.
- Details of caveats.
- Report, including areas not accessed/not surveyed.

71. The key points are summarised in Boxes 5 and 6. The dutyholder should know what to expect from the surveyor and vice versa.

**Dutyholder’s planning**

72. The dutyholder needs to consider the purpose of the survey and what information it needs to provide. The dutyholder will be the client and should consider:

- Why the survey is needed.
- What type(s) of survey is needed?
- What information must the survey provide?
- What format do I want the report in (asbestos register, drawings, electronic, printed etc)?
- What information will the surveyor require?
Surveyor's planning procedure

73 The surveyor should establish the type of survey(s) required. It may be that more than one survey type will be required, eg a management survey for most of the premises, but a refurbishment survey in one building or part of a building. Establishing the survey type should be done in consultation with the client. The survey planning should be structured and include the various steps outlined below. These steps are listed separately but in practice there will be overlap or they will run concurrently/simultaneously. There may be some situations where all the steps are not necessary or possible (eg small or simple premises, fire-damaged premises and pre-purchase surveys etc). Where the survey involves sampling or asbestos disturbance, a site-specific assessment and plan of work is required under CAR 2012.

Step 1: Collect all the relevant information to plan the survey.

Step 2: Consider the information (desk-top study).

Step 3: Prepare a survey plan (including how data will be recorded).

Step 4: Conduct a risk assessment for the survey.

Step 1: Collect all the relevant information to plan the survey

74 It is essential that the surveyor collects all the necessary relevant information to ensure that the survey is completed efficiently, effectively and safely, and that it meets the client’s requirements. The information should be gathered as early as possible to enable thorough planning. The ideal situation would be to arrange a preliminary site meeting and have a walk-through inspection. This is essential for large and complex premises. However, pre-survey site visits may not always be possible (eg small surveys where the cost of a second visit outweighs advantages or where there are multiple premises (eg chain stores) and it is not practical to visit them all). In such situations the information will need to be gathered through other means (eg by correspondence such as phone/e-mail/post, or by a preliminary meeting and walk-through immediately before the survey).

75 The information required is listed in Box 7. It is often easier to obtain this information through direct discussion with the client. The meeting is also an opportunity to explain further the nature of the survey and material assessments and agree the nature and format of the results and report.

76 Accurate plans of the building(s) and the floor layout should be obtained at this stage where possible. Building plans should be used for complex premises. The plans should contain the main features of each room, corridors, stairs etc. The plans should be marked with unique floor and room numbers to help identify individual locations. The plans should be checked for accuracy and completeness. If plans are not available, an accurate drawing of the premises will need to be made by the surveyor before the survey starts. In some premises (eg small/ uncomplicated), a simple drawing showing the salient features may be sufficient. In other situations, more detailed drawings will have to be made. These plans will be used to refer to and record the position of any suspect material and the location of any samples taken for identification. The plans should also be used to locate and record any sensitive or restricted areas and hazards.
### Box 7: Information to be collected by the surveyor

- Description and use of property (i.e., industrial, office, retail, domestic, education, health care, etc.).
- Number of buildings: age, type, and construction details.
- Number of rooms.
- Any unusual features, underground sections.
- Details about whether the buildings have been extended, adapted, or refurbished, and if they have, when the work was done.
- Any plant or equipment installed.
- Whether a listed building, conservation area, etc.
- Extent or scope of survey required (possibly mark details on a site plan or architects’ drawings).
- Whether the surrounding ground and associated buildings or structures are to be included in the scope of the survey.
- Current plans or drawings of the site.
- Previous plans, including architects’ original drawings and specifications and subsequent plans for major changes and refurbishment.
- Whether the premises are vacant or occupied.
- Any restrictions on access.
- Special requirements or instructions.
- Responsibility and arrangements for access.
- Whether survey damage is to be made good (refurbishment/demolition surveys).
- Site-specific hazards (mechanical, electrical, chemical, etc.).
- Responsibility for isolation of services, power, gas, chemicals, etc.
- Working machinery or plant (including lifts) to be made safe (these are covered in greater detail in Step 4).
- If photos are to be taken.
- How many bulk samples will be necessary.
- The location of all services, heating and ventilation ducts, plant rooms, riser shafts, and lift shafts.
- Details of any previous asbestos surveys (Type 1/2/3 Surveys), current asbestos registers, and all records of asbestos removal or repairs.
- Information on possible repairs to ACMs, e.g., pipe/thermal insulation.
- History of the site: any buildings previously demolished; presence of underground ducts or shafts, etc.

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**Preliminary site meeting and walk-through inspection**

A walk-through inspection will be extremely valuable for planning the survey and identifying potential issues and problems. The inspection will enable the surveyor to become familiar with the layout of the premises, including the location of equipment and furniture, which may impede access or sampling. In addition, it will allow the surveyor to gain an appreciation of the size of the project and to estimate the extent of sampling required. The inspection also allows any specific hazards to be recognised and discussed to minimise the risks. It will also enable other potential issues to be identified or raised (and resolved). Possible issues include entry or access restrictions (e.g., to ceiling voids, high areas, and crawl spaces), sampling matters (e.g., sampling only when the area is unoccupied, materials or decorations which cannot be disturbed), labelling of sample locations, future placement of asbestos warning labels (see Figure 3), measures used to reduce dust release and clean-up, etc. and the potential need for a licensed asbestos contractor (e.g., to gain access through AIB ceiling tiles). Where access is required to high areas, arrangements should be made for the use of scaffolding, a tower crane, or MEWP. The walk-through inspection should also be used to check the accuracy of the building plans.
If a pre-survey site meeting and walk-through are not possible, the information listed in Box 7 should be collected through discussion and correspondence with the client. Any information not collected will need to be obtained at the site prior to the survey starting. In addition, plans and drawings will need to be checked at this time.

### Step 2: Consider the information (desk-top study)

79. The surveyor needs to collate and consider all the collected information (eg on the premises, building structures, processes, plant and machinery types) so the survey can be properly planned. This is a ‘desk-top’ exercise to review the information, plan the survey strategy and consider if there are any gaps in the information. The surveyor should also consider the resources and equipment etc, which will be necessary to complete the work. The surveyor should consider the information on the following:

- competency to undertake the work;
- available resources;
- intended programme of works;
- expected equipment to be used for access:
  - into the structure;
  - to high levels;
  - into contaminated areas or confined spaces;
  - through known ACMs;
- the need for additional trades (joiner, electrician, builder) to gain access during the survey or to reinstate areas on completion;
- bulk sampling strategy and expected number of samples to be taken with reference to the site plan.
80 Many premises will be relatively simple and straightforward, eg one or two buildings and no additional land or ground, no machinery, lifts and outbuildings and no previous refurbishment or demolition. The ‘desk-top’ review is the time to focus on the nature of the premises and the type of survey. Refurbishment and demolition surveys in particular will need much consideration.

**Step 3: Prepare a survey plan (including how data will be recorded)**

81 After all the relevant information has been collected and the preliminary site inspection and desk-top study have been completed, a written plan for the main survey can be produced. The plan essentially sets out the content of the survey and can form the basis of the contract with the client. The plan will normally specify the following:

**Scope**
- The scope of the buildings’ survey.
- Any external areas to be included.
- Any areas to be excluded.
- The type of survey (management or refurbishment and demolition).
- Any possible or known ACMs, not to be included in the survey.

**Survey procedure**
- The survey procedure (eg how it will be conducted) and sampling strategy including:
  - agreed numbers of samples and sampling methods;
  - agreed numbers of photographs;
  - procedures for making good;
  - agreed survey times of work;
  - agreed signage;
  - key access;
  - agreed start and completion dates;
- The material assessment method and the parameters to be assessed (eg product type, location, extent, condition and accessibility of ACMs).
- The information to be recorded and the method and format to be used.
- The quality assurance checks and procedures to be undertaken.
- Any known area where access will not be possible.

**Personnel and safety issues**
- Names of surveyors (for security purposes).
- Safety precautions from the surveyor’s risk assessment, including steps to minimise asbestos disturbance and prevent asbestos spread.
- Site safety procedures for emergencies including decontamination etc.

**Report**
- Report format with headings (see paragraph 132).
- What data will be reported.
- How the data will be presented (each room/area should be individually recorded).
- The way the survey data will be stored, accessed and updated (eg a paper copy in the site manager’s office or a computer database accessible on a network or the internet).
- The way photographic or video records and marked-up plans will be stored and reported.
82 The survey report should contain a summary of the results in a format that can be used as the basis for an updatable register of ACMs (ie the asbestos register) and a diagram (ie building drawings) indicating the locations of ACMs (see paragraphs 131–144). This register will need to be readily accessible to all involved in initiating maintenance or other work on the fabric of the building. It should be available in hard copy format and, where appropriate, stored electronically.

### Step 4: Conduct a risk assessment for the survey

83 Surveying will present health and safety issues to the surveyors and others. Therefore before a site survey, it is important that an assessment of the risks to the health and safety of surveyors, sampling personnel and building occupants is carried out. The client should provide information relating to any hazards specific to the site at the Step 1 stage. The types of non-asbestos hazards which may be associated with surveys include:

- working at heights, in ceiling voids or on a fragile roof;
- working on operable machinery or plant;
- working in confined spaces;
- chemical hazards;
- electrical hazards;
- biological hazards;
- noise hazards; and
- lone working.

84 There may also be other specific hazards in certain types of premises, eg hospitals and nuclear plant have radiological hazards.

85 The risk assessment should be prepared by a competent person (normally the surveyor) and it should be written down. It should establish all the hazards at the particular premises and go on to identify the correct precautions and procedures in a plan of work for the survey. In many cases, surveyors will only see the site for the first time at the survey, so they will have little chance to evaluate the site-specific hazards that are involved and will rely on the risk assessment made based on information collected at Stage 1. The risk assessment should also specifically address the asbestos issues, including:

- the need to prevent disturbance of ACMs as far as possible;
- the need to prevent the spread of ACMs;
- identification of safe work procedures (eg controls to be used while taking samples, arrangements for entering contaminated areas);
- PPE to be used;
- decontamination and disposal arrangements.

86 Information on safe systems of work for asbestos sampling is set out in paragraphs 110–111.

87 Refurbishment/demolition surveys are more likely to present some serious health and safety hazards due to the intrusive and destructive nature of the work, eg hidden electrical cables or pipes or unstable buildings. The hazards will need to be properly addressed with procedures in place to deal with emergencies.
Safe work procedures
88 Ideally a survey should be conducted with a team(s) of two people. This has a number of advantages, for example in assisting with carrying equipment such as step ladders, labelling of sample bags and documentation. In cases of remote or dangerous locations (eg derelict buildings or items identified in paragraphs 83–84), a team of two should be specified as a safety requirement. Team working also allows field training of new surveyors to be carried out in a supervised practical environment and gives a better chance of finding ACMs. Further information on safe working procedures can be found in paragraphs 110–111.

Personal protective equipment
89 Disposable coveralls, overshoes and gloves should be worn when there is a likelihood of asbestos contaminating the surveyor's clothing and during bulk sampling. The coveralls should be the type normally used for asbestos work (ie Type 5 coverall) and should have a hood and elasticated cuffs and ankles. They can usually be worn over normal clothing, but should be carefully removed after use by turning inside out, and be disposed of as asbestos waste. Coveralls should not be reused after they have been taken off. The coveralls are usually rolled inside out to minimise spread so that the outside makes contact with the inside: if reused they will contaminate normal clothing. Take care to prevent the spread of asbestos. For some dirty or contaminated sites, Wellington boots will be required, and these should be wiped or washed clean if they become contaminated. They should also be cleaned after sampling is completed. For some sites, more stringent decontamination procedures may be needed (see paragraph 91). There should be an appropriate statement in the generic plan of work as to what type of situation will trigger this, so that even at sites where a preliminary meeting etc was not feasible, appropriate precautions can be taken by the surveyor.

90 Appropriate RPE should be worn during sampling or when surveying areas where the asbestos is likely to be disturbed during the inspection (eg crawl tunnels and above false ceilings). The survey and sampling personnel must have been properly trained in the selection, use and maintenance of RPE and follow the guidance given in Asbestos: The analysts’ guide for sampling, analysis and clearance procedures. In many cases a disposable FFP3 respirator or a half mask fitted with a P3 filter will provide adequate protection. Face-fit tests should be carried out to confirm that the mask fits the wearer.

Decontamination and disposal arrangements
91 If the surveyor has to enter areas where there is significant contamination (eg thermal insulation in crawl tunnels, spray insulation in ceiling voids), there is a greater potential for contamination of clothing and footwear. The risk assessment must take these conditions into account, as additional safety precautions and decontamination procedures will be needed. It may involve a higher standard of personal protection (eg powered full-facepiece respirator fitted with a P3 filter) and more comprehensive decontamination procedures (eg use of a decontamination unit). Where entry into these locations is necessary, surveyors must be adequately trained in the use of high-performance RPE and in decontamination procedures (decontamination procedures are covered in Asbestos: The analysts’ guide for sampling, analysis and clearance procedures). Surveyors should not wear their own clothes under coveralls in these circumstances. In addition, there should be appropriate discussion between the surveyor and client to ensure the relevant decontamination procedures are employed. If significant contamination is unexpectedly encountered in the course of the survey, then ‘emergency’ procedures should be implemented, eg leave the area and discuss with the client.
5 Carrying out the survey (surveying)

Introduction

92 Surveys should be carried out methodically, systematically and diligently to make sure ACMs are not missed and all areas of the premises are inspected. Building plans should be used to prepare the survey strategy and for checking progress through the premises. Plans should be inspected to make sure building features and services (eg voids, cavities, risers, ducting, undercrofts etc) are included. There are various options for a systematic survey inspection. One example is shown in Box 8.

93 Each area should be surveyed with due care to avoid missing any ACMs. Surveyors should be inquisitive and use initiative. Materials should be tapped and prodded. Everything should be checked and inspected. Do not presume every item is the same just because it looks similar. This is particularly relevant when assuming items are non-asbestos. Sample and take photographs as you go along. Look out for unusual, potential sources such as overspray or packers. Allow enough time for the survey. It is good practice to survey ‘in pairs’ ie two people working together, with both inspecting one area at the same time. Recheck areas which are complex or have many items (eg plant rooms). ACMs will be missed where surveyors are tired, rushed or make assumptions. Do a final walk-through, checking notes against plans. Large premises will require more detailed survey procedures, particularly if several surveyors are involved, eg it may be appropriate to carry out a separate survey on the building services, machinery and any large floor and ceiling voids; and recaps and checks should be carried out frequently.

Box 8: Example of a systematic survey inspection

<table>
<thead>
<tr>
<th>External areas:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work downwards from high to low.</td>
</tr>
<tr>
<td>Work from the periphery inwards.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Internal areas:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work upwards from basement to roof.</td>
</tr>
<tr>
<td>Inspect each area individually.</td>
</tr>
<tr>
<td>Work around each area clockwise from the door of entry.</td>
</tr>
<tr>
<td>Inspect each component inside each compartment in the following order: ceiling, walls, floors, fixtures and fittings, equipment and services.</td>
</tr>
<tr>
<td>Look at each item individually.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>General:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check and inspect everything.</td>
</tr>
<tr>
<td>Sample and take photographs as you go along.</td>
</tr>
<tr>
<td>Recheck areas which are complex or have many items.</td>
</tr>
<tr>
<td>Do a final walk-through, checking notes against plans.</td>
</tr>
</tbody>
</table>

Types, location and appearance of asbestos-containing building products: Appendices

94 Appendices 2–3 provide detailed information on ACMs in buildings. Appendix 2 summarises the main types and uses of ACMs in the fabric of a building and in fixed installations such as heating, water and electrical systems. It lists the
main product types, their location and use, asbestos content, date last used and common trade or product names. The product types are listed approximately in order of their ability to release fibres assuming no surface treatments have been applied. The locations of many of these products in buildings are shown diagrammatically in Appendix 3 together with an extensive picture gallery of many asbestos products as an aid to identifying ACMs.

**Older industrial machinery and plant**

95 Older equipment is likely to contain asbestos due to its age or higher performance requirements. The equipment is also likely to need servicing and maintenance. The surveyor should inspect the accessible parts of machinery and plant which provide heat and electrical insulation, high-performance seals and frictional performance (eg driving belts, clutches, brakes and bearings). The surveyor should not sample or work on any machinery unless qualified to do so. Engineers or maintenance personnel may be able to help in these situations. If sampling is not carried out, the equipment should be presumed to contain asbestos unless there is evidence that it contains non-asbestos materials.

**Older consumer electrical products**

96 Older consumer-type industrial electrical products may also contain some ACMs (eg hairdryers, irons, washing machines, dishwashers, tumble dryers). However as the asbestos in this type of equipment is not readily accessible and presents only a very low risk, it is not practical to inspect or sample for it. However, products which are used for or require significant heat insulation should be inspected during the survey. These will include simmering mats, iron stands, fire curtains and blankets, catalytic gas heaters, all types of warm air, storage or radiant heaters, and cooker door seals.

**What to assess and record**

97 The management survey requires that the condition of the ACMs and their ability to release fibres are assessed (ie a material assessment). Therefore, for a management survey, the information listed in Box 9 should be obtained and recorded for each ACM or presumed or suspect ACM. Refurbishment and demolition surveys normally require less information as details of ACM condition are not required (see Box 10 but note time reference).

<table>
<thead>
<tr>
<th>Box 9: Information required for a management survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>■ Asbestos product type(s).</td>
</tr>
<tr>
<td>■ Location of the material(s).</td>
</tr>
<tr>
<td>■ Extent (or quantity) of the material(s).</td>
</tr>
<tr>
<td>■ Asbestos type(s).</td>
</tr>
<tr>
<td>■ Accessibility and/or vulnerability of the material(s).</td>
</tr>
<tr>
<td>■ Amount of damage or deterioration.</td>
</tr>
<tr>
<td>■ Surface treatment (if any).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Box 10: Information* required for a refurbishment or demolition survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>■ Asbestos product type(s).</td>
</tr>
<tr>
<td>■ Location of the material(s).</td>
</tr>
<tr>
<td>■ Extent (or quantity) of the material(s).</td>
</tr>
<tr>
<td>■ Asbestos type(s).</td>
</tr>
</tbody>
</table>

* Where the refurbishment or demolition work will not take place for a significant period after the survey (eg three months), then the information required for a management survey should be obtained (see paragraph 52).
Presumed ACMs
98 If a sample is not taken, there must also be a presumption made whether the material is asbestos or non-asbestos. Surveyors may visually assess the edges and damaged areas of suspect materials and record the following:

- whether visible fibres are present on close inspection (see Asbestos: The analysts’ guide for sampling, analysis and clearance procedures);
- the colour of the fibres, if visible; and
- whether fibres are visually consistent with asbestos (eg form bundles with splayed ends).

99 Some materials, like textured plasters, paints and vinyl floor tiles, may contain very fine dispersed chrysotile asbestos which may not be seen by eye or with a magnifying glass, and these materials (if old) will have to be presumed to contain asbestos unless they are sampled and carefully analysed by a competent laboratory. As imported materials may have contained chrysotile asbestos until 1999 and laboratories often miss the fine asbestos, some additional checks may be necessary with these types of materials. Other useful characteristics (eg surface texture, sound when knocked, warmth to touch, surface hardness/deformation with a probe) may also be used by experienced surveyors to help compare the material with other materials they have previously encountered and had samples identified. Unless the surveyor is convinced that there is adequate evidence to conclude that the material is asbestos-free (eg plaster, plasterboard, wood etc), a presumption or strong presumption should be made that it is an ACM.

Asbestos type
100 The material assessment requires information on the type of asbestos. In the absence of analytical data and where similar products have not been identified in the survey, the most likely asbestos type must be allocated based on the product types and age in Appendix 2. It may also be possible to obtain information on the type of asbestos from close inspection of the material, eg if fibres are visible in the product, these can give some additional clues to the type of asbestos (see Asbestos: The analysts’ guide for sampling, analysis and clearance procedures). In general, however, unless there is evidence to show otherwise, the asbestos type should be assumed to be crocidolite asbestos.

Bulk sampling strategy
101 Sampling will normally be carried out at the time of the survey. This is usually the most convenient and efficient arrangement. However, for very large premises or where access has not been possible, sampling may be carried out as a separate exercise, eg when the area is available. Each area and room in the premises should have a thorough visual examination to identify the materials and locations to be selected for sampling. The visual inspection should be conducted systematically (see paragraph 93 and Box 8). Materials should be inspected for apparent differences and variation in appearance. Samples of about 3–5 cm² surface area and through the entire depth of the ACM (including any backing paper) should normally be taken with the aim of collecting one or more samples which are representative of the whole material. Sampling should not be carried out where there is an electrical hazard or if it will damage the critical integrity of a roof, gutter, pipe etc. An equipment checklist for sampling is given in Appendix 5.

102 The sampling strategy will be based on several factors, including the size and numbers of premises/rooms and the extent, types and variation in materials present. The visual inspection and checking (eg tapping and prodding) of each material will allow the sample numbers and locations to be specified. In general, for homogeneous manufactured products containing asbestos, it can be assumed
that the asbestos is uniformly distributed throughout the material, and one or two samples will suffice, eg boards, sheets, cement products, textiles, ropes, friction products, plastics and vinyls, mastics, sealant, bitumen roofing felt and gaskets. Insulation materials are generally less homogeneous as they were applied on site and their composition depended on the availability of supply. Subsequent repairs and patching may add to this variability and increase the number of samples required. Repaired and replaced materials should always be sampled in addition to the original items.

103 In addition, substantial contamination and debris may have been produced at the time of installation, eg overspray, other insulation debris, AIB off-cuts. A favourite practice was to drop off-cuts into voids and sweep debris into lift shafts and other risers. Asbestos debris and other suspect visible contamination should be sampled.

104 For homogeneous material, often a single sample may be all that is required to confirm the suspicion that it is asbestos and to make a presumption that it applies to other material of the same type. However, for non-homogeneous materials and for some presumed non-asbestos materials, additional sampling may often be needed, to reduce the possibility of false negatives which may lead to incorrect conclusions. The following sample numbers are suggested for each room or defined area, but may be adapted depending on the site and the circumstances prevailing.

Spray coatings, encapsulated sprays and bulk materials
105 These are usually, but not always, homogeneous (under any encapsulate). Different mixtures may have been used and material may have been removed, repaired or patched at various times. Where the material appears uniform and consistent, two samples should usually be enough, if taken at either end of the sprayed surface. If the installation is particularly large (eg >100 m²), one sample should be taken approximately every 25–30 m². Samples should be taken from all patches of repairs or alterations.

Pipe/thermal insulation
106 Pipe insulation is often highly variable in composition, especially where there is a change in colour, size and texture or there is evidence of repairs or modifications, eg asbestos may have been stripped from long runs of pipes but have been left around pipe elbows, taps and valves. In general, one sample should be taken per 3 m run of pipe with particular attention paid to different layers and functional items (valves etc). For long runs of pipes (eg >20 m), one sample per 6 m will usually be enough. It can be difficult to demonstrate that individual pipes are asbestos free so all pipes should be sampled even when they appear similar (see Figure 4). Samples should be taken from all patches of repairs or alterations.

Figure 4 Pipe uncertainty: Top pipe is non-asbestos. All pipes should be sampled

Insulating board
107 Insulating board is usually homogeneous but repairs and replacement boards and tiles may have been fitted. Boards and tiles may also have been painted.
One sample per room or every 25 m² is usually adequate. Ceilings and walls should be thoroughly inspected to check for variation and differences. Many premises have had individual or groups of AIB tiles replaced as part of improvement programmes. If there is evidently more than one type of tile (e.g., based on colour, pattern, design, size etc) then representative samples of each should be taken. Larger installations completed at the same time may require only a few tile samples to be taken. Some replacement tiles may look the same. Inspection of the hidden side of the board or tile may, where access permits, reveal the trade name of the materials and/or differences in colour which indicate variations in the material. Insulating board or tiles may occasionally have been manufactured with asbestos paper on one or both sides.

**Asbestos cement materials**

108 These are homogeneous materials which are commonly encountered as corrugated and flat sheets or as various moulded products. Asbestos cement (AC) was also widely used in low-cost housing as wall and ceiling panels and in schools in fume cabinets and kick boards. It was also mistakenly used as fireproofing and therefore is found in places where AIB is expected, as well as on office partition walls. It does not always look like AC in these situations. In older buildings, most pre-formed exterior cement sheets can be strongly presumed to be asbestos and only limited sampling is needed to confirm the presumption. The risk from falls through asbestos cement roofs usually means that sampling is restricted. If sampling is required, one sample of each type of sheet or product (e.g., gutters, downpipes etc) should be taken. Repeated sampling is not usually necessary unless areas of replaced sheets are found. Asbestos cement sheets are visually very similar to their non-asbestos (fibre cement) replacement. Fibre-cement replacement sheets are identifiable by a code ‘NT’ placed near the edge of the sheet, where they overlap. Some ‘newer’ asbestos sheets have the code ‘AT’ in a similar position.

**Other materials including debris and contamination**

109 Where there are distinct types of materials, then one or two samples from each separate source will usually be adequate. Two samples are recommended if there are more than a few square metres of material.

**Bulk sampling procedures**

**Safe systems of work**

110 All work to be carried out must have an adequate risk assessment of the survey site (see paragraphs 83–87) and the work must be carried out according to the procedures defined in the risk assessment. The work should minimise the disruption to the client’s operations and must protect the health and safety of everyone who may be at risk. Sampling personnel must wear adequate PPE (see paragraphs 89–91). Airborne emissions should normally be controlled by pre-wetting the material to be sampled, with water and/or a suitable wetting agent. This may involve spraying the surface (e.g., boards and sheets) or injecting (e.g., lagging and sprays). Shadow vacuuming (holding the suction inlet close to the area where dust is being produced) with a Class H (BS EN 60335)¹⁶ vacuum cleaner should be used if wetting is likely to be incomplete (e.g., AC sheets, AIB boards, ropes and gaskets) or if it is not safe to do so (e.g., it may drip into electrical installations). Special sampling precautions are used for pipe insulation (see paragraphs 114–115).

111 The areas to be sampled inside buildings should as far as possible be unoccupied. Sampling should not be undertaken in normally occupied areas, but if in constant use, periods of minimal occupation should be chosen. The nature of the area, the likely release of dust and the proximity and nature of future work
will dictate the precautions required to prevent the spread of asbestos. Entry of other people to any sampling area should be restricted or suitable warnings posted (eg a notice with wording such as ‘Asbestos sampling in progress: Keep out’). Care should be taken to minimise disturbance to ACMs and any dust or debris that might be present. Surfaces onto which asbestos debris may fall should be protected with a sheet of impervious material such as polythene which can be easily cleaned by wet-wiping or using a suitable Class H vacuum cleaner. All samples must be individually sealed in their own container or a sealable polythene bag which is then sealed in a second container or polythene bag. The sample area should be left clean with no evidence of debris from the sampling operation and any sampling points sealed to prevent the release of fibres. Various methods are used to reseal the sampling point (eg tapes and fillers).

**Sample and site labelling**

112 Whenever a sample is collected, it should be labelled with a unique identifier that is also recorded in the survey documentation, records and site plans so that the sample origin can be traced at a later date. The sampling position at the site may also be labelled with the same identifier. Visual records such as marked-up plans and/or photographic records showing the location and extent of the sample are also effective ways of recording the sampling position and the location of the ACMs.

**Bulk sampling**

*Spray coatings and bulk materials*

113 If the coating is encapsulated, it can be pre-injected with liquid around the sampling area then carefully cut with a sharp knife or scalpel to lift a small flap to retrieve a sample. If the spray coating is not covered, both wetting (spraying surface and injection) and shadow vacuuming may be necessary to reduce airborne emissions. As spray coatings are generally homogeneous, a surface sample should suffice.

*Pipe insulation*

114 The area to be sampled should be fully wetted first: injection techniques are recommended. Samples are taken with a core sampler which should penetrate to the full depth of the pipe insulation. Proprietary types are available, but laboratory cork borers are also suitable. It should include a plunger to remove the sample from the borer. The sample point hole should be made safe after sampling (eg covered with tape or filled with a suitable inert filler), if the pipe is to remain in place and the surface was originally intact. This helps to keep the insulation in good condition and to prevent dispersal of asbestos. The borer should have a wet wipe pushed down to form a plug inside the borer and another wrapped around the outside. The borer is then used to take a full-depth sample of the insulation. The inner wet wipe is used to seal the surface of the insulation where the borer enters and disturbs the insulation. The outer wet wipe is used to clean the surface of the insulation where the borer enters and disturbs the insulation. The outer wet wipe is used to clean the outside of the borer as it is withdrawn, and the contaminated wet wipe can be placed in the sample bag. The sample is removed by using the plunger to push the sample out into the polythene bag, complete with the wet wipe. Further cleaning will be required to completely clean the sampling equipment between samples.

115 An alternative approach is to use core sampling tubes in which the sample is retained. Again the core tube can be withdrawn through a wet wipe and then capped at both ends and placed in a bag until it reaches the laboratory. Chicken wire was often included within pipe insulation. This may hamper sampling, and a thin core sample may need to be taken. Where there is pipe insulation which is obviously new and non-asbestos, the possibility of debris from an earlier asbestos strip beneath the new insulation should be investigated.
**Insulating board**

116 Materials such as ceiling tiles or wall panels should be inspected for areas of existing damage, where a sample can be collected more easily. Otherwise, a small sample should be taken from a discrete location at the corner or edge of the panel, with a sharp knife or chisel blade to lever off a sample. Make sure that any paper, on one or both sides, is included.

**Asbestos cement**

117 Asbestos cement can usually be identified by visual inspection. Where sampling is necessary (eg to distinguish between AC and AIB), look for a damaged portion where it will be easier to remove a small sample (AC is usually very hard). The sample size should be about 5 cm² as it will be necessary to search for traces of amphibole asbestos such as crocidolite and amosite. The sample should be obtained using pliers or a screwdriver blade to remove a small section from an edge or corner. **Samples should not be collected from roofs without special safety precautions to prevent falls through the fragile sheets.** If the analysis is still inconclusive (eg chrysotile and amosite are detected), then the definitive water absorption test should be conducted (the material will be classed as AC if it absorbs <30% water) (see *Work with materials containing asbestos*).

**Gaskets, rope, seals, paper, felts and textiles**

118 Samples can be taken using a sharp knife to cut a representative portion from the material.

**Floor and wall coverings**

119 Samples should be cut out with a sharp knife, usually taking one sample from tiles of each type or colour present. The area should be cleaned after sampling but the fibre release is likely to be very low, unless the asbestos is present as a lining or backing material.

**Textured coatings**

120 Samples should be obtained by carefully scraping the coating with a screwdriver or narrow scraper, directing the material into the sample container held below the sampling point.

**Air sampling**

121 Personal air sampling can be carried out to measure the exposures of survey and sampling personnel. Occasionally there may be a request for ‘background’ air sampling if the ACMs are a matter of sensitivity to the occupants. Such requests need careful appraisal, as the area may already be contaminated, even before the bulk sampling is carried out. **Air sampling may also be required where there has been intrusive sampling (eg in refurbishment or demolition surveys) and areas or buildings are to be reoccupied for a period before the work is carried out (see paragraphs 53–54).** The procedures for reassurance air sampling as described in *Asbestos: The analysts’ guide for sampling, analysis and clearance procedures* should be used.

**Sample analysis and reporting**

122 Analysis of the samples collected should be carried out and reported in accordance with the method given in *Asbestos: The analysts’ guide for sampling, analysis and clearance procedures* or an equivalent method. The laboratory report should for each sample give a clear statement of whether asbestos was found and the types of asbestos identified.

123 Laboratory results should be appended. Materials which have been sampled and found not to contain asbestos after analysis also need recording as **asbestos not detected**, as the asbestos content of these materials may be questioned in future and it will save a great deal of time and cost if this has been clearly recorded.
in the first instance. The survey report or abstracts from it should be presented in a form that can be used as the basis of a register or log of ACMs (see paragraph 139).

Material assessment

124 As outlined in paragraph 44, the management survey should include an assessment of the condition of the various ACMs and their ability to release fibres. This assessment allows the dutyholder to assess the potential for fibre release for each ACM and then go on to prioritise the need for action as part of the plan for managing asbestos. The material assessment should be carried out as part of the management survey. A standardised assessment tool suitable for a management survey is given in paragraphs 125–127. It is based on a simple additive algorithm. The tool can be used to numerically assess the potential for fibre release. The tool is not designed to calculate absolute differences in potency or fibre release/hazard potential between ACMs. It does however enable ACMs to be ranked in a simple numerical order. No condition assessment is normally necessary for refurbishment and demolition surveys but, where the period between survey and the event is significant, eg more than three months, then a material assessment should be conducted and interim management arrangements put in place.

Material assessment algorithm

125 In the material assessment process, the main factors influencing fibre release are given a score which can then be added together to obtain a material assessment rating. The four main parameters which determine the amount of fibre released from an ACM when subject to disturbance are:

- product type;
- extent of damage or deterioration;
- surface treatment; and
- asbestos type.

126 Each parameter is scored between 1 and 3. A score of 1 is equivalent to a low potential for fibre release, 2 = medium and 3 = high. Two parameters can also be given a nil score (equivalent to a very low potential for fibre release). The value assigned to each of the four parameters is added together to give a total score of between 2 and 12. Presumed or strongly presumed ACMs are scored as crocidolite (ie score = 3) unless there is strong evidence to show otherwise. Examples of scoring for each parameter are given in Appendix 4.

127 Materials with assessment scores of 10 or more are rated as having a high potential to release fibres, if disturbed. Scores of between 7 and 9 are regarded as having a medium potential, and between 5 and 6 a low potential. Scores of 4 or less have a very low potential to release fibres. Non-asbestos materials are not scored.

Risk assessment and management plans

128 The material assessment identifies the ‘high-hazard’ materials, ie those materials which will most readily release airborne fibres if disturbed. It does not automatically follow that those materials assigned the highest score in the material assessment will be the priority for remedial action. Priority must be determined by carrying out a risk assessment (ie a priority assessment) which will take into account factors such as:

- the location of the material;
- the extent of the material;
- the use to which the location is put;
the occupancy of the area;
- the activities carried on in the area; and
- the likelihood/frequency with which maintenance activities are likely to take place.

129 The priority assessment can only be carried out with the detailed knowledge of all these factors. The surveyor can help in this process, by obtaining information which will contribute to the priority assessment, particularly in small or simple premises where information on occupancy and use is straightforward. However, such help must be undertaken with caution. It is the dutyholder, under CAR 2012, who is required to make the risk assessment using their detailed knowledge of the activities carried out in the premises.

130 The combined material and priority assessment results should be used to establish the priority for those ACMs needing remedial action and the type of action that will be taken. There are various remedial options available: in many cases the ACMs can be protected or enclosed, sealed or encapsulated, or repaired. These options should be considered first. Where such actions are not practical, ACMs should be removed.
6 Survey report

131 The survey report is a record of the information collected at a particular time on the presence and condition of ACMs. Extreme care and attention should be paid to producing the report, particularly in transposing data, as the document will be the formal record of the survey. It will contain the information and data that will be used to prepare the risk assessment and management plan and to make decisions and judgements on the need for actions. Errors in the report could lead to incorrect conclusions and inappropriate decisions.

132 The report should be completed in a written format, supplied either as a hard copy or as an electronic document, or both. It should be comprehensible to and usable by the client. In particular, the information in the survey report should be easy for the client to extract and to use to prepare an asbestos register, eg by presenting the results in a manner or format that can be directly lifted or employed to form the asbestos register. The report should contain the results of sample analyses. The survey report should contain the following sections:

- executive summary;
- introduction covering the scope of work;
- general site and survey information;
- survey results (including material assessment results);
- conclusions and actions;
- bulk analysis results.

133 The design, layout, content and size of the report are very important. Large reports can be unwieldy and even intimidating. Clients are most interested in the summary, results, conclusions and actions. In hard-copy documents, it can be useful to separate the report into different parts, with the bulk analysis results and the individual survey results, particularly if displayed with accompanying photographs, contained in separate detachable appendices.

Executive summary

134 The executive summary should briefly describe the scope, type and extent of the survey and it should summarise the most important information, including:

- the locations with identified (or presumed) ACMs;
- areas not accessed (which should be specific to the survey and not generic);
- ACMs with high material assessment scores;
- clear notes on any actions (and priorities).

Introduction

135 The introduction should explain the scope of the work and the purpose, aims and objectives of the survey. It should also contain a description of the nature and age of the building(s) (or other structures) plus construction type.

General site information

136 General site and survey information should include:

- the name and address of the organisation;
- the names of the surveyors;
■ the name and address of the person who commissioned the survey;
■ the name and address of the premises surveyed;
■ the date of the report;
■ the date of the survey;
■ a description of the areas included in the survey;
■ a description of any areas excluded in the survey;
■ the survey method used (this publication and/or other documented procedures);
■ the type of survey undertaken (management or refurbishment/demolition) and, if more than one type is used, where they apply within the premises;
■ any variations or deviations from the method; and
■ agreed exclusions and inaccessible areas (with reasons) which should be specific to the survey and not generic.

Survey results

137 The survey results should be summarised in table format and as a set of marked-up plans (diagrams) showing the location of ACMs and presumed ACMs. The summary table should contain the following information:

■ location of the ACMs (eg building identifier, floor number or level, room identifier and position);
■ extent of the ACMs (area, length, thickness and volume, as appropriate);
■ product type (see Appendix 2);
■ level of identification of the ACM (presumed, strongly presumed or identified); and
■ asbestos type in the ACM (eg chrysotile, amosite, crocidolite).

138 For a management survey (and refurbishment and demolition surveys where the work is not imminent), the following additional information should be provided:

■ accessibility of the ACM;
■ amount of damage or deterioration;
■ surface treatment (if any);
■ the material assessment score or category (high, medium, low or very low);
■ any actions required from the material assessment.

139 Table 1 shows the presentation of survey results. This format can be easily incorporated directly into the asbestos register. Figure 5 shows an example of a marked-up building plan.

140 The information in the results table should be presented on an individual room basis. Any rooms or areas not accessed and presumed to contain asbestos should be included in the results table. If a priority assessment has been included, the priority scores should be listed and any actions required highlighted. (Note: the priority assessment should only be carried out in consultation with the client or dutyholder, who must provide accurate information on all the activities carried out on the premises.)

141 Where suspect material is proved not to be asbestos, by sampling or other means, this should be recorded in a separate table. This will help in any future debate over the nature of these materials.
<table>
<thead>
<tr>
<th>Address</th>
<th>Location</th>
<th>Product type</th>
<th>Extent</th>
<th>Accessibility</th>
<th>Condition</th>
<th>Surface treatment</th>
<th>Asbestos type</th>
<th>Sample no</th>
<th>Sampled/presumed/strongly presumed</th>
<th>Material assessment score and action</th>
<th>Priority score</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Store room 2, BC408 ceiling</td>
<td>AIB</td>
<td>Whole ceiling 120 m²</td>
<td>Medium</td>
<td>Good</td>
<td>Painted one face only</td>
<td>Amosite</td>
<td>1</td>
<td>Sampled 4 samples</td>
<td>5</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Store room 2, BC408 fire door</td>
<td>Asbestos board on door carcass (AIB)</td>
<td>21 m²</td>
<td>Medium</td>
<td>Good</td>
<td>Encapsulated by wood in door</td>
<td>Amosite</td>
<td>2</td>
<td>Sampled 1 sample</td>
<td>5</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meeting room 2, BC412, ceiling</td>
<td>Asbestos ceiling tiles (AIB)</td>
<td>5 m²</td>
<td>Medium</td>
<td>Good</td>
<td>Painted one face only</td>
<td>Amosite</td>
<td>3</td>
<td>Sampled 1 sample</td>
<td>5</td>
<td>13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canteen, BC410, lino on floor</td>
<td>Cushion floor (paper)</td>
<td>5 m²</td>
<td>Easy</td>
<td>Good-damage to edge</td>
<td>Covered by vinyl</td>
<td>Chrysotile</td>
<td>4</td>
<td>Sampled 1 sample</td>
<td>4</td>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corridor, BC411, electrical switch box</td>
<td>Woven cloth</td>
<td>Possibly 4 items</td>
<td>Medium</td>
<td>Medium</td>
<td>Unsealed</td>
<td>Chrysotile</td>
<td>5</td>
<td>Strongly presumed</td>
<td>8</td>
<td>14 remove during next campaign</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plant room 2, BC416, lift motor</td>
<td>Brake shoes</td>
<td>2 items</td>
<td>Difficult</td>
<td>Medium</td>
<td>Unsealed</td>
<td>Chrysotile</td>
<td>6</td>
<td>Strongly presumed</td>
<td>4</td>
<td>10 ‘H’ Vac dust</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plant room 2, BC416, pipe lagging</td>
<td>Pipe insulation</td>
<td>24 linear metres</td>
<td>Easy</td>
<td>Good</td>
<td>Sealed and labelled</td>
<td>Crocidolite Amosite Chrysotile</td>
<td>7</td>
<td>Sampled 6 samples</td>
<td>8</td>
<td>14 remove during next campaign</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plant room 2, BC416, wall panels</td>
<td>Asbestos panels (AIB)</td>
<td>43 m²</td>
<td>Easy</td>
<td>Good</td>
<td>1 face sealed and labelled</td>
<td>Chrysotile</td>
<td>8</td>
<td>Sampled 4 samples</td>
<td>5</td>
<td>14 monitor weekly</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Material scores above 10 have high potential to release fibres

Table 1 Summary of survey results and format for asbestos register
Conclusions and actions

142 The conclusions section should summarise the rooms where asbestos is present and the products/items which contain asbestos (ie it should be an ‘easy guide’ for the client/dutyholder). It should also contain a list of any actions identified in the material assessment (or the priority assessment if included) and indicate their urgency, eg immediate, middle/longer term.

Bulk analysis results

143 The survey report should also include the certificate of analysis showing the results of the samples taken. This data can be listed in an appendix with the following information:

- the name and address of the laboratory carrying out the bulk identification;
- a reference to the method used;
- the laboratory’s current UKAS accreditation for bulk asbestos analysis/sampling and accreditation number;
- a table or appendix summarising the results of the bulk analysis, including asbestos found or not found and types identified, by sample identifier;
- dates the bulk analysis was carried out and reported by the laboratory; and
- the names and signatures of the analyst and any countersigning person.
Photographs can be very informative to the client and should be included in the report. Photographs can show the material sampled, its condition and location and its surrounding environment. Photographs provide a context for the sample and can assist the client in managing asbestos for example by providing a benchmark for the comparison of condition over time. Photographs can also be used to identify the actual sampling points. However, it is important not to dominate the report with photographs. It is not necessary to have a single page per photograph. It is also worth noting that much of the detail of photographs can be obscured in photocopied reports.
7 Dutyholder’s use of survey information

145 The survey report needs to meet the requirements of the client and comply with the tender/contractual obligations. The report should be fit for purpose and the client should check that this is the case. Therefore, the client should examine the report and carry out a number of checks to make sure that the survey has been adequate and that the report is suitable and accurate. These checks are set out in Box 11.

Box 11: What the client/dutyholder should do to check the accuracy of the survey report

- Check the report against the original tender.
- Check for unagreed caveats or disclaimers.
- Check that the survey is as requested: Management or refurbishment/ demolition (or a combination).
- Check diagrams and plans are clear and accurate.
- Check all rooms and areas have been accessed.
- Check sufficient samples have been taken (usually 1–2 per area/room) and that sample numbers are not disproportionate (eg dominated by one ACM type).
- Check sample numbers reflect variations in the same ACMs, eg different ceiling tiles in the same room.
- Check for any obvious discrepancies and inconsistencies.

146 The information in the survey report should be used to form the asbestos register which is a key component of the management plan. The survey report itself will generally not be the asbestos register. The asbestos register will be a simpler document and will not contain most of the information in the survey report, eg the bulk analysis results or survey site information. However, the results in the survey report should be presented in a manner or format that can be directly lifted or employed to form the asbestos register. Table 1 shows a sample asbestos register.

147 The asbestos register is a living document which must always contain current information on the presence and condition of asbestos. The register will need regular updating. The dutyholder should make:

- deletions to the register when asbestos is removed;
- additions to the register when new areas are sampled;
- changes to the register if the condition of ACMs has altered on rechecking.

148 The asbestos register can be a paper or electronic document/database. It must be up to date and accessible, irrespective of the form. Hard copies are useful for ease of interrogation and may suit dutyholders with smaller and simpler premises. Electronic versions are often more convenient for dutyholders with large numbers of properties. Electronic documents can be readily accessible and easily updated. Electronic documents can also be used to record all the remedial work carried out and to prompt the relevant person, eg the building manager, to carry out and record any further inspections required. Some databases can also link digital picture images of a sample and CAD plans. Printed versions of an electronic document will usually be needed for contractors and others. The distribution and circulation of such documents will need to be carefully managed to ensure only current versions are referenced.
149 The asbestos register must be available to those who plan or initiate
maintenance and related work, so it can be consulted before the work is
authorised. The asbestos register should be consulted for all work which may
disturb the fabric of the building or involve the building services. It includes simple
and short duration work such as single hole-drilling or attaching items to walls.
The register must be kept in convenient locations (eg in the estates or building
manager’s or appointed person’s office) and be easily accessible. Information on
the presence of asbestos should be passed to contractors as early as possible
(eg at the tender or engagement stage of work) so that appropriate precautions,
procedures and controls can be employed. Supplying the information or the
register to a contractor when they arrive on site to do the work is unlikely to provide
sufficient time for the correct control arrangements to be put into place. The
dutyholder should ensure that the contractor acknowledges the presence of ACMs
and will implement controls. The register should also be available to contractors
and employees on request.
Appendix 1: Refurbishment and demolition surveys

1 Refurbishment and demolition surveys are technically more challenging than management surveys, as their purpose is to identify all ACMs within a particular building area or within the whole premises, so they can be removed. Many buildings have been individually designed with their own layout and materials. There may have been numerous refurbishments and modifications over the years, with many changes and alterations to the building structure and appearance, eg ‘false’ floors, ceilings and walls, concealed and hidden areas and surface treatments. Building drawings may not have been updated. Management surveys will not have accessed structural locations (eg behind concrete or between floors and walls such as cavity walls). The level of competency and knowledge needed for refurbishment and demolition surveys (eg on construction building techniques) is much greater than for management surveys and the intrusive nature presents more health and safety hazards.

2 This appendix provides additional practical guidance to help complete refurbishment and demolition surveys. It provides details of specific areas which should be inspected in a refurbishment or demolition survey (but note that the list is not exhaustive). The guidance also tries to describe these areas and illustrate how to collect samples. These items are in addition to those normally found in a management survey.

3 In many instances, access will be required into the fabric of the building and various items such as brickwork, timber, boards and panels etc will have to be removed or broken into. In these circumstances, it may be helpful to seek professional help on such activities/work from a joiner, builder, maintenance worker, engineer or other appropriate person. In some situations, where concrete is to be sampled or brickwork removed, advice may have to be sought from a competent person, such as a structural engineer.

Textured coatings

4 The more explicit guidance in Work with materials containing asbestos on removal of ACMs from buildings before demolition applies directly to textured coatings. ACMs should only be removed before demolition if it is reasonably practicable. In many cases, it will not be reasonably practicable to remove textured coatings before demolition as the removal is resource-intensive/time-consuming and involves other risks, eg where textured coatings are attached directly to substrates such as concrete or lath. However, where textured coatings are attached onto materials which can be essentially removed intact or whole, eg plasterboard sheets, then removal may be reasonably practicable, eg by removing whole sheets intact. The survey should identify the nature of the substrate and whether textured coating removal will be required. Textured coating removal will be necessary where refurbishment is taking place.

Areas to be examined

‘No access’ areas from previous survey

5 All ‘no access’ areas on previous surveys (if available) must be accessed with suitable access equipment and procedures.
**Suspended ceilings**

6 Suspended ceilings not previously accessed (e.g., AIB tiles screwed to wooden battens) must be entered, by means of an enclosure and airlock system constructed by a licensed asbestos-removal contractor. This work is likely to exceed the short-term exemption under the Approved Code of Practice *Work with materials containing asbestos* and will therefore be notifiable to the relevant enforcing authority.

7 If the work is deemed to be short duration and non-licensed, i.e., it meets the short-term exemption (as well as the other criteria) under the Approved Code of Practice *Work with materials containing asbestos* (i.e., total time less than two hours with no one person working for more than one hour), then the work may be done by a competent non-licensed contractor using appropriate control measures (e.g., *Asbestos essentials*). However, a licensed contractor is strongly recommended.

8 Suspended ceiling voids are often very cluttered and full of ventilation ducting, pipework, and cables. If several entry points are required or more than one void is to be inspected, the work will probably be notifiable and require a licensed asbestos-removal contractor.

9 The ceiling void may contain asbestos debris and other ACMs such as sprayed coating, pipe insulation, older ceilings above the latest one, damaged fire breaks etc. All ACMs in the void will need to be located.

**Partition walls (plasterboard/AIB sandwich)**

10 Walls may not be uniform and may have undergone partial replacement. All sections of a partition wall will need to be examined, unless documentary evidence confirms that they were erected at a time when ACMs would not have been used or the original specification confirms that ACMs were not to be used. Visual inspection will not be enough on its own. If the evidence is that the walls were erected at a specific time and that no refurbishment or alteration has taken place, then an appropriate proportion of the sections should be examined.

11 The joints between partition panels may contain asbestos rope fire seals. The rope may only be apparent when the outer trim (e.g., aluminium) is removed.

**Cavity walls**

12 Although loose asbestos was not known to be used as a cavity insulation material, wall cavities should be inspected with an endoscope to check for the presence of any asbestos materials or debris such as AIB. Entry points should be agreed with a competent person, e.g., a builder, joiner or structural engineer.

13 Walls should also be examined thoroughly where insulated heating pipes pass through brick or breeze block walls. Check for insulation or residues within the wall cavity itself.

**Apertures (doors, windows etc)**

14 Cavity closers (usually AC) are sometimes found around air bricks, windows etc. All apertures should be considered and examined thoroughly.

15 Window frames commonly had AIB packers or spacers where the window frame was attached to the brick wall. Asbestos rope seals as fire breaks are also found.

16 Door frames (particularly around fire doors) should be inspected for AIB packers where the frame is fitted into the doorway. The architraves will need to be removed.
**Floors**

17 Carpets and tiles must be lifted. The floor tile adhesives also frequently contained asbestos.

18 Floor ducts or trenches must be accessed and inspected for shuttering, services, pipe insulation, fire stops, debris etc. The inspection includes the duct cover itself, which may have AC or AIB shuttering. The full length of each duct will need to be inspected, unless it is clear that asbestos pipe insulation is present throughout, when the entire run can be treated as containing asbestos.

19 Floor boards must be lifted to examine the void below. Sufficient boards must be lifted to ensure that the whole floor void is examined for loose asbestos, AIB debris, packers, fire protection, electric cables etc. It may be necessary to inspect the ends of the joists for AIB packing.

20 Slab (poured concrete) floors are known to contain AIB or AC which was used as an expansion joint or shuttering below the surface. These may only be found by drilling core samples through the slab. This will need specialist advice on the structural considerations and on the equipment needed to carry out this type of investigation.

21 AC sleeves were used where cables or pipes run through a slab floor, although these should be visible at the surface.

**Ducts**

22 Service risers, including fire stops between floors, if not investigated under a previous survey, must be inspected. Lift shafts must be inspected, including the pit at the bottom of the shaft. Ventilation shafts or ducts have been seen with asbestos acoustic attenuators and with debris from assorted ACMs. Ventilation trunking should also be examined.

**Cladding**

23 Columns or stanchions may have been originally provided with fire protection from AIB or sprayed coating. It may be concealed by over-cladding with a non-asbestos board (Supalux or Masterboard), wood or metal sheet. Inspect all columns.

24 External cladding of tiles or slates (which may or may not be asbestos) will usually conceal a moisture membrane based on a bituminous ACM and possibly AIB panels.

**Debris in boiler room areas**

25 This should have been investigated during a previous survey (eg old Type 2 survey) but it may be necessary to look closely at where pipes pass through walls, or in sumps and gulleys, behind and underneath tanks and other plant. In particular, the walls and floors should be inspected for insulation debris, which may have been painted over. All plant and electrical equipment must be investigated (while certified in a safe condition) (but see note on consumer electrical equipment in paragraph 96).

26 It may not be possible to locate some or all of the debris until the plant (tanks or boilers) has been removed. It will be necessary to remove the plant under controlled conditions with an appropriate plan of work. Cast iron sectional boilers with asbestos between the sections (or as a plinth under the boiler) will need to be disassembled under controlled conditions.
Debris underneath non-asbestos re insulation

27 If the desk-top study reveals that asbestos insulation has been stripped and replaced, a proportion of the new insulation must be removed to examine the extent of any asbestos debris on the pipes, bolt-heads and flanges. If any of the pipes are shown to have frequent occurrences of asbestos debris, then it is likely that the pipes will have to be removed as ACMs.

Roof voids

28 Where Rockwool or vermiculite loft insulation is present in a roof void, the areas underneath it should be inspected, particularly if there is evidence of other ACMs, such as AIB as fire breaks etc.

29 Loose asbestos is very occasionally found as loft insulation in houses around old asbestos factories or dockyards.

Previously demolished areas: From the desk-top study

30 The desk-top study should be used to investigate whether any previous structures (including underground structures) remain or may have released asbestos debris into the soil.

31 Whether the desk-top study information is available or not, the site must be inspected visually to identify obvious signs of demolition works and associated surface asbestos debris. It may be necessary to treat the external area as a contaminated site for investigation purposes, in which case, trenches and pits may need to be excavated to establish the extent of the debris.

32 The desk-top study will need to include reference to old plans from historical archives, for example.

Overspray debris from sprayed coatings

33 If a sprayed asbestos coating is present or known to have been present at some time in the past, the area must be inspected carefully for the presence of debris and to establish the extent and location of any overspray.

Use of AIB as packing and shuttering

34 Depending on the age of the building, surveyors need to be vigilant in buildings constructed in the 1960s and 1970s for the use of AIB as packing and shuttering. This was frequently used simply as a convenient piece of board and not because of the need for fire protection etc. Some of these applications should have been found under a previous survey (eg old Type 2 survey).

Damp-proof course (DPC)

35 Any DPC with asbestos should have been detected in a previous survey (eg old Type 2 survey). It will not normally be necessary to remove this during demolition.

36 It must be emphasised that this is a list of common and/or frequently found locations which must be examined. It must not be regarded as exhaustive or exclusive, and each type of structure must be thoroughly examined on its own merits.
# Appendix 2: ACMs in buildings listed in order of ease of fibre release

<table>
<thead>
<tr>
<th>Asbestos product</th>
<th>Location/use</th>
<th>Asbestos and type/date last used</th>
<th>Ease of fibre release and product names</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Loose insulation</strong></td>
<td>Bulk loose fill, bulk fibre-filled mattresses, quilts and blankets. Also ‘jiffy bag’ type products used for sound insulation.</td>
<td>Usually pure asbestos except for lining/bag. Mattresses and quilts usually contain crocidolite or chrysotile. Acoustic insulation may contain crocidolite or chrysotile.</td>
<td>Loose asbestos may readily become airborne if disturbed. If dry, these materials can give rise to high exposures. Covers may deteriorate or be easily damaged by repair work or accidental contact.</td>
</tr>
<tr>
<td><strong>Bulk loose fill insulation</strong></td>
<td>Bulk loose fill insulation is now rarely found but may be encountered unexpectedly, eg DIY loft insulation and fire-stop packing around cables between floors. Mattresses and quilts used for thermal insulation of industrial boilers were filled with loose asbestos. Paper bags/sacks were also loose-filled and used for sound insulation under floors and in walls.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sprayed coatings</strong></td>
<td>Dry applied, wet applied and trowelled finish.</td>
<td>Sprayed coatings usually contain 55%–85% asbestos with a Portland cement binder. Crocidolite was the major type until 1962. Mixture of types including crocidolite until mid-1971. Asbestos spray applications were used up to 1974.</td>
<td>The surface hardness, texture and ease of fibre release will vary significantly depending on a number of factors. Sprays have a high potential for fibre release if unsealed, particularly if knocked or the surface is abraded or delaminates from the underlying surface. Dust released may then accumulate on false ceilings, wiring and ventilation systems. ‘Limpet’ (also used for non-asbestos sprays).</td>
</tr>
<tr>
<td><strong>Thermal insulation</strong></td>
<td>Thermal insulation of pipes, boilers, pressure vessels, calorifiers etc.</td>
<td>All types of asbestos have been used. Crocidolite used in lagging until 1970. Amosite was phased out by the manufacturers during the 1970s. Content varies 6-85%. Various ad hoc mixtures were hand-applied on joints and bends and pipe runs. Preformed sections were widely used, eg ‘85% magnesia’ contained 15%</td>
<td>The ease of fibre release often depends on the type of lagging used and the surface treatment. Often it will be encapsulated with calico and painted (eg PVA, EVA, latex, bitumen or proprietary polymer emulsions or PVC, neoprene solutions), eg ‘Decadex’ finish is a proprietary polymer</td>
</tr>
<tr>
<td>Asbestos product</td>
<td>Location/use</td>
<td>Asbestos and type/date last used</td>
<td>Ease of fibre release and product names</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Thermal insulation (continued)</td>
<td></td>
<td>amosite, ‘Caposil’ calcium silicate slabs and blocks contained 8–30% amosite while ‘Caposite’ sections contained – 85% amosite. Blankets, felts, papers, tapes and ropes were usually ~100% chrysotile.</td>
<td>emulsion. A harder chemical-/weather resistant finish is known as ‘Bulldog’.</td>
</tr>
<tr>
<td>Asbestos boards</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>‘Millboard’</td>
<td>‘Millboard’ was used for general heat insulation and fire protection. Also used for insulation of electrical equipment and plant.</td>
<td>Crocidolite was used in some millboard manufacture between 1896 and 1965; usually chrysotile. Millboards may contain 37–97% asbestos, with a matrix of clay and starch.</td>
<td>Asbestos ‘Millboard’ has a high asbestos content and low density so is quite easy to break and the surface is subject to abrasion and wear.</td>
</tr>
<tr>
<td>Insulating board</td>
<td>Used for fire protection, thermal and acoustic insulation, resistance to moisture movement and general building board. Found in service ducts, fire breaks, infill panels, partitions and ceilings (including ceiling tiles), roof underlay, wall linings, soffits, external canopies and porch linings.</td>
<td>Crocidolite used for some boards up to 1965, amosite up to 1980, when manufacture ceased. Usually 15–25% amosite or a mixture of amosite and chrysotile in calcium silicate. Older boards and some marine boards contain up to 40% asbestos.</td>
<td>AIB can be readily broken, giving significant fibre release. Also significant surface release is possible by abrasion, but surface is usually painted or plastered. Sawing and drilling will also give significant releases. ‘Asbestolux’, ‘Turnasbestos’, ‘LDR’, ‘asbestos wallboard’, ‘insulation board’. Marine boards known as ‘Marinite’ or ‘Shipboard’.</td>
</tr>
<tr>
<td>Insulating board in cores and linings of composite products</td>
<td>Found in fire doors, cladding infill panels, domestic boiler casings, partition and ceiling panels, oven linings and suspended floor systems. Used as thermal insulation and sometimes as acoustic attenuators.</td>
<td>Crocidolite used for some boards up to 1965, amosite up to 1980, when manufacture ceased. 16–40% amosite or a mixture of amosite and chrysotile.</td>
<td>Can be broken by impact; significant surface release possible by abrasion, but usually painted or plastered. Sawing and drilling will also give significant releases. ‘Asbestolux’. ‘Caposil’.</td>
</tr>
<tr>
<td>Paper, felt and cardboard</td>
<td>Used for electrical/heat insulation of electrical equipment. Also used in some air conditioning systems as insulation and acoustic lining. Asbestos paper has also been used to reinforce bitumen and other products and as a facing/lining to flooring products.</td>
<td>Asbestos paper can contain ~100% chrysotile asbestos but may be incorporated as a lining, facing or reinforcement for other products, eg roofing felt and damp-proof courses, steel composite wall cladding and roofing (see asbestos paper).</td>
<td>Paper materials, if not encapsulated/combined within vinyl, bitumen, or bonded in some way, can easily be damaged and release fibres when subject to abrasion or wear (eg worn flooring surface with paper backing). Asbestos paper, asbestos felt, ‘Novilon’.</td>
</tr>
<tr>
<td>Asbestos product</td>
<td>Location/use</td>
<td>Asbestos and type/date last used</td>
<td>Ease of fibre release and product names</td>
</tr>
<tr>
<td>------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>----------------------------------</td>
<td>----------------------------------------</td>
</tr>
<tr>
<td>Paper, felt and cardboard (continued)</td>
<td>combustible boards, flame-resistant laminate. Corrugated cardboard has been used for duct and pipe insulation.</td>
<td>bitumen products below), vinyl flooring. Asbestos paper is also sometimes found under MMMF insulation on steam pipes.</td>
<td>flooring, Durasteel laminates, vinyl asbestos tile, roofing felt and damp-proof course etc. Pax felt’. ‘Viceroy’ (foil-coated paper). ‘Serval’.</td>
</tr>
<tr>
<td>Textiles</td>
<td>Ropes and yarns.</td>
<td>Crocidolite and chrysotile were widely used due to length and flexibility of fibres. Other types of asbestos have occasionally been used in the past. Chrysotile alone since at least 1970. Asbestos content approaching 100% unless combined with other fibres.</td>
<td>Weaving reduces fibre release from products, but abrading or cutting the materials will release fibres, likely to degrade if exposed, becoming more friable with age. If used with caulking, fibres will be encapsulated and less likely to be released.</td>
</tr>
<tr>
<td></td>
<td>Cloth.</td>
<td>All types of asbestos were used. Since the mid-1960s the vast majority have been chrysotile. Asbestos content approaching 100%.</td>
<td>Fibres may be released if material is abraded.</td>
</tr>
<tr>
<td></td>
<td>Gaskets and washers.</td>
<td>Variable but usually around 90% asbestos, crocidolite used for acid resistance and chrysotile for chlor-alkali. Some gasket materials continued to be used after asbestos prohibition in 1999 (through exemption).</td>
<td>May be dry and damage easily when removed. Mainly a problem for maintenance workers. ‘Klingerit’, ‘Lion jointing’, ‘Permanite’, ‘CAF’ – compressed asbestos fibre or ‘lt’ in German gaskets.</td>
</tr>
<tr>
<td></td>
<td>Strings.</td>
<td>Used for sealing hot water radiators.</td>
<td>Strings have asbestos content approaching 100%.</td>
</tr>
<tr>
<td>Friction products</td>
<td>Resin-based materials.</td>
<td>30–70% chrysotile asbestos bound in phenolic resins. Used up to November 1999.</td>
<td>Normal handling will produce low emissions. Minor emissions when braking. Dust may build up with friction debris. Grinding brake and clutch components to fit and brushing or blowing clean can produce significant peak airborne levels.</td>
</tr>
<tr>
<td></td>
<td>Drive belts/conveyor belts.</td>
<td>Chrysotile textiles encapsulated in rubber.</td>
<td>Low friability, except when worn to expose textile.</td>
</tr>
<tr>
<td>Asbestos product</td>
<td>Location/use</td>
<td>Asbestos and type/date last used</td>
<td>Ease of fibre release and product names</td>
</tr>
<tr>
<td>------------------</td>
<td>-------------</td>
<td>----------------------------------</td>
<td>----------------------------------------</td>
</tr>
<tr>
<td><strong>Cement products</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Profiled sheets.</strong></td>
<td>Roofing, wall cladding. Permanent shuttering, cooling tower elements.</td>
<td>10–15% asbestos (some flexible sheets contain a proportion of cellulose). Crocidolite (1950–1969) and amosite (1945–1980) have been used in the manufacture of asbestos cement, although chrysotile (used until November 1999) is by far the most common type found.</td>
<td>Likely to release increasing levels of fibres if abraded, hand sawn or worked on with power tools. Exposed surfaces and acid conditions will remove cement matrix and concentrate unbound fibres on surface and sheet laps. Cleaning asbestos-containing roofs may also release fibres.</td>
</tr>
<tr>
<td><strong>Semi-compressed flat sheet and partition board.</strong></td>
<td>Partitioning in farm buildings and infill panels for housing, shuttering in industrial buildings, decorative panels for facings, bath panels, soffits, linings to walls and ceilings, portable buildings, propagation beds in horticulture, domestic structural uses, fire surrounds, composite panels for fire protection, weather boarding.</td>
<td>As for profiled sheets. Also 10–25% chrysotile and some amosite for asbestos wood used for fire doors etc. Composite panels contained ~4% chrysotile or crocidolite.</td>
<td>Release as for profiled sheets. Flat building sheets, partition board, ‘Poilite’.</td>
</tr>
<tr>
<td><strong>Other encapsulated materials</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Textured coatings.</strong></td>
<td>Decorative/flexible coatings on walls and ceilings.</td>
<td>3–5% chrysotile asbestos. Chrysotile added up to 1984 but old stock may have been used for several more years.</td>
<td>Generally fibres are well contained in the matrix but may be released when old coating is sanded down or scraped off. ‘Artex’, Wondertex’.</td>
</tr>
</tbody>
</table>
### Other encapsulated materials (continued)

<table>
<thead>
<tr>
<th>Asbestos product</th>
<th>Location/use</th>
<th>Asbestos and type/date last used</th>
<th>Ease of fibre release and product names</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bitumen products</td>
<td>Roofing felts and shingles, semi-rigid asbestos bitumen roofing. Gutter linings and flashings. Bitumen damp-proof courses (DPC). Asbestos/bitumen coatings on metals (e.g. car body underseals). Bitumen mastics and adhesives (used for floor tiles and wall coverings).</td>
<td>Non-asbestos versions were available from the mid-1970s. Chrysotile fibre or asbestos paper (approximately 100% asbestos) in bitumen matrix, usually 8% chrysotile. Used up to 1992. Adhesives may contain up to a few per cent chrysotile asbestos. Used up to 1992.</td>
<td>Fibre release unlikely during normal use. Roofing felts, DPC and bitumen-based sealants must not be burnt after removal. See felts and papers.</td>
</tr>
<tr>
<td>Flooring</td>
<td>Thermoplastic floor tiles. PVC vinyl floor tiles and unbacked PVC flooring. Asbestos paper-backed PVC floors. Magnesium oxychloride flooring used in WCs, staircases and industrial flooring.</td>
<td>Up to 25% asbestos. Normally 7% chrysotile. Paper backing approximately 100% chrysotile asbestos. Used up to 1992. About 2% asbestos.</td>
<td>Fibre release is unlikely to be a hazard under normal services conditions. Fibre may be released when material is cut, and there may be substantial release where flooring residue, particularly paper backing, is power-sanded. ‘Novilon’, ‘Serval asbestos’. Very hard, fibre release unlikely.</td>
</tr>
<tr>
<td>Reinforced PVC</td>
<td>Panels and cladding.</td>
<td>1–10% chrysotile asbestos.</td>
<td>Fibre release is unlikely.</td>
</tr>
<tr>
<td>Reinforced plastic and resin composites.</td>
<td>Used for toilet cisterns, seats, banisters, window seals, lab bench tops.</td>
<td>Plastics usually contain 1-10% chrysotile asbestos. Some amphiboles were used to give improved acid resistance, eg car batteries. Resins were reinforced with woven chrysotile cloth usually contain 20-50% asbestos.</td>
<td>Fibres unlikely to be released, limited emissions during cutting. ‘Siluminite’, ‘Feroasbestos’.</td>
</tr>
</tbody>
</table>
Appendix 3: What ACMs look like and where to find them

1. This appendix gives examples of the main types, locations and uses of ACMs in premises, to help people recognise materials which may contain asbestos. This is only a small selection of the range of ACMs used, but should cover many of the main uses of asbestos in premises.

Loose asbestos insulation

2. Some fire doors contained loose asbestos insulation sandwiched between the wooden or metal facings to give them the appropriate fire rating. Loose asbestos was also packed around electrical cables, sometimes using chicken wire to contain it. Mattresses containing loose asbestos were widely manufactured for thermal insulation. Acoustic insulation has been provided between floors by the use of loose asbestos in paper bags, and in some areas near asbestos works it is not unknown for loose asbestos to have been used as a readily available form of loft insulation.

Sprayed asbestos coatings

3. These are normally homogeneous coatings sprayed or trowelled onto reinforced concrete or steel columns or beams as fireproofing. Sprays were also commonly used on the underside of ceilings for fireproofing and sound and thermal insulation in many high-rise premises. Warehouses and factories commonly had sprayed asbestos applied to walls, ceilings and metal support structures for fireproofing and thermal/anti-condensation insulation purposes. In some larger spaces, sprays were also applied to walls and ceilings for acoustic and decorative purposes (theatres, cinemas, studios, halls etc). The depth of the spray depended on the fire rating and substrate, and may vary from 10 to 150 mm thick. The dry sprayed coatings may have a candyfloss appearance if left untamped (rarely found in the UK). The wet sprayed/trowelled coatings are usually denser, and those with higher proportions of Portland cement that have been well tamped can be quite hard. Surfaces may be sealed with an elasticised paint or proprietary encapsulant, sometimes reinforced with calico or man-made fibre mesh, or left completely unsealed. Spray coatings are vulnerable to accidental damage and also to delamination due to water leakage releasing debris onto the floor and other horizontal surfaces. Overspray onto areas and recesses surrounding the object that was being coated is common. Spray coatings may have deteriorated significantly since installation and must be treated with caution.
Thermal insulation

4 Asbestos was widely used to insulate pipes, boilers and heat exchangers. There are several types and forms of insulation, often with multi-layer construction. Pre-formed sections of asbestos insulation were made to fit the diameter of the pipe. These would be strapped on and calico-wrapped and sometimes painted (eg ‘Decadex’ finish), or sealed with a hard plaster (often asbestos-containing) to protect against knocks and abrasion. Other types of asbestos-containing felts, blankets, tapes, ropes and corrugated papers were also used. For bends, joins,
small sections of pipe and repairs, an asbestos-containing plaster was wet-mixed on-site and hand-applied to the areas. Larger installations were also insulated with asbestos-containing plaster which was marketed as ‘plastic’, but various local names were used for this hand-applied insulation (e.g. ‘muck’). Larger thicknesses of insulation would use pre-formed blocks (e.g. ‘Caposil’) wired in place, and then various other coatings or layers applied, depending on the insulation required. Very hard-wearing coatings were known as ‘Bulldog’ finishes and may contain metal sheets and/or chicken wire reinforcement beneath a hard plaster finish. External pipes may also be clad with sheet metal or painted with bitumen for additional weatherproofing. Installers often used whatever materials were available to hand or in stock, so it is very common to find variations on the same pipe or boiler. Pay particular attention to bends and valves, or where it is evident that repairs have been made.

**Millboard**

5 Millboard was used when a low-cost, relatively soft low-density board with modest mechanical properties but with good fire, insulation, thermal and electrical properties could be specified. Generally found in industrial premises, but has been used as exterior lining to ventilation ducts and was commonly used inside fire doors.

![Asbestos panels inside fire door](image14)

![AIB panel in porch](image15)

**Asbestos insulating board (AIB)**

6 Widely used in premises for internal partition walls and linings and for fire protection, acoustic and thermal insulation. Suspended ceiling tiles were often made from AIB. Insulating boards come in a range of densities and can be subject to damage by the use of moderate force (e.g. kicking). There may be variations due to later construction of partition walls as part of a redevelopment or refurbishment. All kinds of combinations are found and surveyors must be alert to all possibilities. Areas around lift shafts, stairwells and service risers in multi-storey buildings were commonly lined or faced with AIB or composites. Similarly, areas around gas fires and central heating boilers were also constructed from AIB. Fire doors were also faced with AIB to achieve the appropriate fire rating. AIB is usually found inside premises, but weather-protected exterior areas, such as porches and soffits, may contain AIB.

![AIB exterior painted panel](image16)

![AIB ceiling tiles](image17)
AIB in composite materials

7 AIB was used in composite materials and may be sandwiched between or surfaced with non-asbestos products such as strawboard, plywood, metal mesh, sheet metal and plasterboard.

Asbestos papers, felts and cardboard

8 Air-conditioning trunking may be insulated internally with ‘Paxfelt’ or externally with other asbestos-containing felt, cardboard and paper for acoustic and heat insulation. Asbestos papers were widely used to line the surfaces of other boards, ceiling tiles and sheet materials.
Asbestos textiles

9 Asbestos textiles were manufactured for primary heat (e.g., insulation tapes and ropes) or fire protection uses (e.g., fire blankets, fire curtains, fire-resistant clothing). Textiles were also used widely as a reinforcing material in friction products/composites.

Figure 26 Asbestos rope seal on drying oven

Figure 27 Amosite asbestos rope packing on riser door frame

Figure 28 Asbestos rope lagging to boiler thermometer

Figure 29 Chrysotile cloth on pipes

Figure 30 Amosite and chrysotile packing on waste pipes

Asbestos gaskets, washers and strings

10 A wide range of asbestos gaskets have been produced and used for sealing pipe and valve joints in industrial plant, but they may also be found in some older domestic boilers etc. Asbestos string was widely used in the past by plumbers for sealing various screw thread joints.

Figure 31 Chrysotile string on skylights
Asbestos cement sheets and tiles used for roofing and cladding

11 Asbestos cement (AC) has been extensively used for roofing and exterior cladding on industrial, public and some domestic premises. Corrugated/profile sheets are commonly found, but flat sheets have also been widely used for exterior and some interior cladding (eg panels below windows and on walls in older prefabricated housing).

Moulded asbestos cement products

12 A wide range of moulded compressed AC products have been used inside premises (eg waste pipes, cold water tanks, flues etc) and outside premises (eg gutters, downpipes, flues, cowls etc). Many other items have been moulded from asbestos cement. Asbestos cement pipes are also used underground (eg from local drainage to regional water supply systems).

Textured coatings, paints and plasters used for decorative effects

13 These were often manufactured containing up to a few per cent of asbestos. ‘Artex’, ‘Wondertex’, ‘Suretex’, ‘Newtex’, ‘Pebblecoat’ and ‘Marblecoat’ are examples of typical trade products, which usually contained a few per cent of chrysotile asbestos.
Bitumen products

14 Bitumen-based roofing felts and damp-proof courses have been widely reinforced by the addition of asbestos, usually in the form of chrysotile paper. Bitumen-based wall and floor coverings were also produced. Some mastics used to stick the bitumen products commonly had asbestos added to them to provide flexibility. Other sealants also had asbestos added to improve the performance of the product.

Flooring products

15 Polyvinyl chloride (PVC or vinyl) tiles were manufactured with added asbestos to meet a British Standard and often contain a few per cent (5–7%) of very fine chrysotile. Black and brown thermoplastic tiles containing larger amounts and often visible clumps of chrysotile were also produced. Sheet floor coverings were sometimes backed with a thin layer of chrysotile paper (eg ‘Novilon’, a vinyl flooring, which was more common in Europe). Some underfelts for carpets and linoleum were also manufactured containing asbestos. The mastics which were used to bond the floor covering to the surface could also contain asbestos. Some hard-wearing composite floors (eg magnesium oxychloride) also contain about 2% of mineral fibres which could be asbestos.
Asbestos-reinforced plastic/resin composites and friction products

16 Asbestos-reinforced plastics and resin composite material were used for windowsills, capping for banisters, school and laboratory worktops, toilet cisterns etc. The material is often black and has a high density and scratch resistance. Asbestos textiles were widely used as a reinforcing material in friction products (eg conveyor and fan belts, brake and clutch linings). Older asbestos-containing components may still be in use or present in vehicle repair and maintenance workshops and stores.

![Figure 40 Asbestos-reinforced toilet cistern](image1)

![Figure 41 Asbestos brake linings for quarry vehicles](image2)

![Figure 42 Asbestos brake lining on output shaft of AC motor](image3)

Metal-asbestos composites

17 Flues for wood-burning stoves were commonly constructed from a metal-asbestos where the asbestos was added as insulation between the inner and outer layers of stainless steel to give a high degree of insulation when passing through floors and on the outside to prevent sudden cooling of the flue gases. ‘Durasteel’ metal panels were used to provide a strong construction with a certain degree of insulation, by incorporating a layer of asbestos paper.

![Figure 43 Metal clad gas flue containing chrysotile lining](image4)
Wall jointing tapes and fillers

18  Chrysotile textile tapes and webbing were used to reinforce wall joints before plastering. Several types of wall plugs and some wall repair fillers had asbestos added to give additional strength and flexibility. These are very difficult to locate as they are integrated into the plaster finish.

Figure 44  Chrysotile ‘scrim’ tapes

Domestic appliances and products

19  Many domestic appliances and products contain asbestos insulation materials for thermal or electrical insulation, including ironing boards, hairdryers, oven seals, simmering plates etc. Some older electric fires and storage radiators and old gas fires with catalytic elements or coal or log effect gas fires also contained ACMs.

Figure 45  ‘Durasteel’ composite steel and asbestos fire door

Figure 46  Asbestos tape flash guards in a fuse box

Figure 47  Asbestos-containing commercial hairdryer

Industrial sites, factories and plant

20  Industrial sites (eg refineries, power stations, warehouses and factories) often contain substantial amounts of asbestos. Many of the examples given for spray, thermal insulation and pipe lagging come from industry. Higher-performance ACMs were usually specified to cope with the higher temperatures and pressures
prevalent at industrial sites. Some machinery may also incorporate asbestos gaskets and friction products (e.g., clutches, brake pads, drive belts, and conveyor belts). The higher power requirements of industry also saw increased use of asbestos insulation in electrical cables and switchgear.

**Figure 48** Asbestos-insulated supply pipes  

**Figure 49** Electrical switchgear with asbestos flash protection

**Figure 50** Open electrical switchboard with asbestos flash guards  

**Figure 51** Vessel clad in amosite insulation

**Where am I likely to find asbestos materials?**

**Normally non-licensed materials**

1. AC products  
2. Textured coatings  
3. Floor tiles, textiles, and composites

**Normally licensed materials**

4. Sprayed coatings on walls, beams/columns  
5. AIB  
6. Lagging  
7. Loose asbestos in ceiling or floor cavity

Note: This diagram does not show all possible uses and locations of asbestos materials. A detailed survey will be required to identify all asbestos materials in a building.
## Appendix 4: Material assessment algorithm

<table>
<thead>
<tr>
<th>Sample variable</th>
<th>Score</th>
<th>Examples of scores (see notes for more detail)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product type (or debris from product)</td>
<td>1</td>
<td>Asbestos-reinforced composites (plastics, resins, mastics, roofing felts, vinyl floor tiles, semi-rigid paints or decorative finishes, asbestos cement etc).</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>AIB, millboards, other low-density insulation boards, asbestos textiles, gaskets, ropes and woven textiles, asbestos paper and felt.</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Thermal insulation (eg pipe and boiler lagging), sprayed asbestos, loose asbestos, asbestos mattresses and packing.</td>
</tr>
<tr>
<td>Extent of damage/deterioration</td>
<td>0</td>
<td>Good condition: no visible damage.</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Low damage: a few scratches or surface marks, broken edges on boards, tiles etc.</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Medium damage: significant breakage of materials or several small areas where material has been damaged revealing loose asbestos fibres.</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>High damage or delamination of materials, sprays and thermal insulation. Visible asbestos debris.</td>
</tr>
<tr>
<td>Surface treatment</td>
<td>0</td>
<td>Composite materials containing asbestos: reinforced plastics, resins, vinyl tiles.</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Enclosed sprays and lagging, AIB (with exposed face painted or encapsulated) asbestos cement sheets etc.</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Unsealed AIB, or encapsulated lagging and sprays.</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Unsealed lagging and sprays.</td>
</tr>
<tr>
<td>Asbestos type</td>
<td>1</td>
<td>Chrysotile.</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Amphibole asbestos excluding crocidolite.</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Crocidolite.</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Score</th>
<th>Potential to release asbestos fibres</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 or more</td>
<td>High</td>
</tr>
<tr>
<td>7-9</td>
<td>Medium</td>
</tr>
<tr>
<td>5-6</td>
<td>Low</td>
</tr>
<tr>
<td>4 or less</td>
<td>Very low</td>
</tr>
</tbody>
</table>

**Non-asbestos materials have no potential to release asbestos fibres**
Appendix 5: Example of a survey and sampling equipment checklist

Survey equipment

- Site plan.
- Step ladder.
- Camera (film or digital) with flash and preferably with a date and number facility.
- Torch.
- Access keys to rooms and covers.
- Screwdrivers.

PPE for sampling

- Disposable overalls (hooded).
- Disposable overshoes or Wellington boots.
- Disposable gloves.

Bulk sampling equipment

- Pliers.
- Screwdrivers.
- Core samplers or cork borers.
- Aluminium foil or cloth tape.
- Stanley knife with spare blades.
- Hand-spray with diluted PVA or surfactant.
- Sample bags (polythene self-seal bags).
- Sample point labels.
- Type H vacuum.
- Asbestos waste bags of the approved type.
- Warning signs: ‘Asbestos sampling: Keep clear’.
- Wet wipes and tissues.
- Polythene sheeting.

RPE

- As per assessment.
Appendix 6: Quality assurance and quality control

1 All organisations providing an asbestos surveying service (including ‘sole traders’) should have an adequate quality management system, including quality control of survey work. Organisations accredited under UKAS to ISO/IEC 17020 will already have appropriate quality management schemes in place.

2 Non-accredited organisations (including surveyors holding recognised personnel certification) should also implement an effective quality management system to support their work. Quality management systems are set out in ISO/IEC 17020 (or ISO 9001 as a minimum).

3 The following paragraphs outline three of the essential components of a quality management system. Sole traders are not exempt from the need to have such a system and should implement self-checking versions (or other working arrangements) for quality assurance and checking survey reports. It should be possible to engage an independent organisation to conduct an annual audit of completed surveys. All surveying organisations should have written quality management procedures and keep records of their audits and checks.

Quality assurance for site work

4 A proportion of surveys should be ‘reinspected’ (ie rechecked) while the survey is still in progress. It is recommended that about 5% of all surveys are reinspected. The process of site selection is at the discretion of the organisation, but the system should ensure that the sites selected:

- are representative of the different types of survey that the organisation performs;
- are representative of the different types of premises surveyed;
- cover all the surveyors employed.

5 Inspections or audits of newly qualified or recently employed surveyors should be more frequent until it can be established that they are capable of consistently working to the required standards.

6 In some situations it may not be practical (eg very large surveys) to reinspect the whole site. In these circumstances a representative part of the site should be re-examined.

7 The survey reinspection will involve checking all aspects of the site work using the recorded data, samples and photographs to ensure:

- no ACMs or suspect ACMs were omitted from the recorded data;
- all recorded ACMs and suspect ACMs were valid;
- where suspect ACMs have been ‘presumed’ or ‘strongly presumed’, the presumption of asbestos type is valid;
- all identifiers for records, sample numbers and photograph numbers correspond and are unique;
- all areas inspected were correctly and unambiguously identified;
- all ‘no access’ areas were valid and were correctly and unambiguously identified;
- all material types for ACMs and suspect ACMs were correctly listed;
- all recorded ACMs and suspect ACMs were correctly and uniquely located;
all quantities of materials and suspect ACMs were correctly assessed;
the correct assessments have been made and recorded for:
  – asbestos product type;
  – surface treatment;
  – damage;
  – accessibility (vulnerability);
adequate numbers and sizes of samples were collected, correctly labelled and individually double bagged;
adequate cleaning has occurred after sampling; and
sampling sites have been made good in the agreed manner and in accordance with the plan of work.

(Where omissions, deficiencies or errors are identified, there should be arrangements in place to rectify the situation including retraining and supervision of personnel where appropriate.)

Audit of completed surveys

8 There should be an annual audit of the management systems and procedures in place. It would normally be a desk-top audit as the site may have changed from the original survey, eg undergone refurbishment. However, a full site resurvey may be necessary if, for example, significant anomalies were discovered. The audits should include reviewing:

- report formats, structure and content;
- raw data transposition into report;
- authorisation or approval of report checker, surveyor – their authorisations, training records and qualifications etc;
- contract review – documented records of the client’s instructions – ensure that the report meets these in full;
- records and storage of raw data, site logs etc, as well as compiled reports.

Survey reports

9 Every report produced should be checked by an authorised person before being issued to the client. The checks must ensure that the report contents are technically consistent, accurate and complete.

10 In particular, check:

- the client’s instructions for the survey and report have been followed;
- all site notes agree with the final report;
- no observed ACMs have been omitted;
- all appendices (eg certificates of analysis) are included as required;
- all titles, reference numbers and descriptions are correct;
- the assessments and recommendations for any remedial work are appropriate;
- and the report summary is included and is a fair statement.

11 Non-accredited organisations may find it helpful to consult the UKAS document *Accreditation of bodies surveying for asbestos in premises*.

Asbestos: The survey guide
References


9. BS EN ISO/IEC 17020:2012 Conformity assessment. Requirements for the operation of various types of bodies performing inspection British Standards Institution

10. BS EN ISO/IEC 17024:2003 Conformity Assessment. General requirements for bodies operating certification of persons British Standards Institution

11. BS EN ISO 9001:2008 Quality management systems. Requirements British Standards Institution

12. BS 6002-4:2006 ISO 3951-5:2006 Sampling procedures for inspection by variables. Sequential sampling plans indexed by acceptance quality limit (AQL) for inspection by variables (known standard deviation) British Standards Institution

13. BS EN ISO/IEC 17025:2005 General requirements for the competence of testing and calibration laboratories British Standards Institution


18  Accreditation of bodies surveying for asbestos in premises Edition 3 RG8 UKAS 2010 (for the application of ISO/IEC 17020)
Further information

For information about health and safety, or to report inconsistencies or inaccuracies in this guidance, visit www.hse.gov.uk/. You can view HSE guidance online and order priced publications from the website. HSE priced publications are also available from bookshops.

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PRE-COURSE QUIZ

The questions in this pre-course quiz are related to the information found in this guide. The quiz will serve as an immediate self-assessment of your knowledge of some of the basic principles of the Asbestos Hazard Emergency Response Act (AHERA). Please answer all of the following questions. The answers to the questions immediately follow the quiz.

1. Asbestos that is easily crumbled into a powder by hand pressure when dry is:
   A. Friable
   B. Non-friable
   C. Decomposable
   D. Asbestos powder
   E. None of the above

2. Exposure to asbestos may result in:
   A. Asbestosis (a disease characterized by lung scarring)
   B. Lung cancer
   C. Mesothelioma (a cancer arising in the chest cavity or abdominal cavity)
   D. All of the above
   E. None of the Above

3. Asbestos-related diseases are ________________ and have a latency period of ____.
   A. dosed related, 15 to 30 years
   B. fatal, 30 days
   C. non-existent, 60 years
   D. dangerous, 1 hour
   E. serious, 10 years

4. The three main federal government agencies that regulate asbestos are:
   A. Food and Drug Administration, Department of Transportation, Environmental Protection Agency
   B. Department of Transportation, Environmental Protection Agency, Occupational Safety and Health Administration
   C. Department of Health and Human Services, Environmental Protection Agency, Occupational Safety and Health Administration
   D. General Services Administration, Department of Health and Human Services, Occupational Safety and Health Administration
   E. No federal government agencies regulate asbestos
5. Which of the following are not the responsibility of the Local Education Agency?
   A. must conduct periodic surveillance in each building under its authority at least once every six months and use an accredited inspector to conduct the reinspections every three years
   B. must attach a warning label immediately adjacent to any friable and nonfriable asbestos-containing building material (ACBM) and suspected ACBM located in routine maintenance areas, such as boiler rooms, at each school building
   C. must send all notification, inspection, and periodic surveillance records to EPA on an annual basis
   D. ensure that complete and up-to-date records of inspections, reinspections, response activities, periodic surveillances, and operations and maintenance activities are maintained
   E. must comply with the notification requirements to workers, students, building occupants, parents, and short-term workers

6. Which activities must be conducted by an accredited inspector?
   A. Identify all homogeneous areas of material that are suspected to contain asbestos
   B. Gather information on the uses and functions of the spaces within the homogeneous areas
   C. Collect samples of material suspected to be ACBM and send them to the lab for analysis
   D. Perform a physical assessment of the material and document the results in an inspection report
   E. All of the above activities

7. Some of the most common uses of asbestos-containing building materials found include:
   A. Fireproofing on structural members
   B. Plaster, pipe and boiler insulation
   C. Acoustical or sound proofing material
   D. Flooring and ceiling tiles
   E. All of the above

8. In addition to imposing other requirements, the Asbestos Hazard Emergency Response Act requires that a Local Education Agency:
   A. Close buildings in which asbestos is found
   B. Perform inspections to identify asbestos-containing building materials in its buildings
   C. Notify the Environmental Protection Agency on the locations of asbestos-containing building materials in the schools of the district
   D. Remove all asbestos-containing building materials from its buildings
   E. B and D
Pre-Course Quiz

9. A management plan must contain appropriate response actions. Which of the following is **not** an appropriate response action:
   A. Replace damaged asbestos-containing building materials with new undamaged asbestos-containing building materials
   B. Repair damaged asbestos-containing building materials to an undamaged or intact condition
   C. Encapsulate asbestos-containing building materials with a material that surrounds or embeds asbestos fibers
   D. Enclose asbestos-containing building materials in an airtight, impenetrable permanent barrier
   E. None, all of these are appropriate response actions

10. At least once every ____ months, the Local Education Agency must conduct a visual inspection of all areas identified in the management plan as asbestos-containing building materials (ACBM) or assumed to contain asbestos-containing building materials to determine whether the condition of the ACBM or assumed ACBM has changed. This is called a(n) _____.
    A. 12, periodic surveillance
    B. 12, inspection
    C. 6, periodic surveillance
    D. 6, inspection
    E. 24, reinspection

11. Final air clearance of a functional space after a response action to remove, encapsulate, or enclose ACBM involves the following:
    A. visual inspection
    B. collection of air samples
    C. analysis of samples by PLM
    D. analysis of samples by TEM, unless the project involves less than 160 square feet or 260 linear feet, in which PCM may be used
    E. A, B, D

12. How can the Local Education Agency best minimize accidental disturbances of ACBM during maintenance and renovations activities?
    A. establish a permit system that calls for all work orders and requests to be processed through the AHERA designated person
    B. require the AHERA designated person to maintain AHERA inspector and management planner accreditations
    C. require the principals of all schools to attend asbestos awareness training
    D. require all periodic surveillance inspections to be conducted by accredited inspectors
    E. assure that all AHERA management plans are updated on an annual basis
13. A designated person must:
   A. Receive training that provides basic knowledge of a number of asbestos-related subjects, as listed in EPA’s asbestos regulations
   B. Complete EPA-or State-approved inspector course and become accredited
   C. Have a college degree
   D. Pass an EPA test on Designated Person roles and responsibilities
   E. Complete no training

14. An asbestos management program is subject to which EPA statutes and regulations:
   A. Asbestos Hazard Emergency Response Act
   B. Asbestos Hazard Emergency Response Act, National Emissions Standards for Hazardous Air Pollutants
   C. Asbestos Hazard Emergency Response Act, National Emissions Standards for Hazardous Air Pollutants, EPA Worker Protection Rule
   D. Asbestos Hazard Emergency Response Act, National Emissions Standards for Hazardous Air Pollutants, EPA Worker Protection Rule and Asbestos School Hazard Abatement Reauthorization Act
   E. None of these

15. Local Education Agencies must conduct the following notifications:
   A. annually to parents, teachers, and employee organizations on the availability of the asbestos management plan
   B. annually to workers, building occupants and their guardians on recent or planned asbestos activities (such as inspections, response action, etc.)
   C. to short-term workers (e.g. telephone repair workers, utility workers, or exterminators) who may come into contact with asbestos on the locations of asbestos-containing building materials (or assumed ACBM)
   D. annually to EPA or state agencies on updates to the management plan.
   E. A, B, C

16. The management plan must:
   A. be kept in the Local Education Agency’s administrative office
   B. be kept in the administrative office of each school building
   C. be available to persons for inspection without cost or restriction
   D. be complete and up-to-date
   E. all of the above

USING THE SELF-STUDY GUIDE

Aim of the Guide

EPA requires schools to appoint an asbestos management coordinator, called the "AHERA designated person" to be responsible for a number of asbestos-related activities, including the implementation of the plan for managing asbestos-containing building materials (ACBM) in the school buildings and compliance with the federal asbestos regulations.

Even though the AHERA requirements have been in place for some time, EPA inspectors have found misunderstanding and confusion on how to implement the requirements, as well as how to best manage asbestos in school buildings. EPA has designed this self-study guide to help the designated person understand his or her responsibilities and comply with the federal asbestos requirements. This manual is recommended for persons recently appointed to the position of AHERA Designated Person, as well as persons who have held the position for some time.

Background

On October 22, 1986, Congress promulgated the Asbestos Hazard Emergency Response Act (AHERA), Public Law 99-519. AHERA mandated that EPA develop regulations to respond to asbestos in schools. On October 30, 1987, EPA promulgated the Asbestos-Containing Materials in Schools Rule (hereinafter referred to as the AHERA Rule), 40 CFR Part 763, Subpart E. This rule requires that all of the nation's nonprofit elementary and secondary schools, both public and private, inspect their school buildings for asbestos-containing building materials (ACBM), develop a plan to manage the asbestos for each school building, notify parents and staff regarding management plan availability, provide asbestos awareness training to school maintenance and custodial workers, and other requirements described in detail in this manual. A list of key responsibilities for school districts is located on page 18. (Note that certain States consider pre-schools the first step of the elementary education process and therefore have included pre-schools under their State AHERA regulations.)

The governing authority responsible for AHERA compliance is the Local Education Agency (LEA). "Local Education Agency" means either any local educational agency as defined in Section 198 of the Elementary and Secondary Education Act of 1965 (often called school district), the owner of any private, non-profit elementary or secondary school building, or the governing authority of any school operated under the Defense Department's education system.

In July 1991, EPA released the results of an evaluation of AHERA implementation. The results showed that certain elements of school asbestos programs were not being effectively implemented. The agency concluded that schools needed better guidance on how to run their...
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Using the Self-Study Guide

Asbestos programs. Shortly after, EPA hired a contractor to develop the Designated Person Self-Study Guide. Due to the shortage of funding, this project was abandoned in 1992.

Over the past seven years, EPA staff have observed that the quality of school asbestos programs depend heavily on the dedication and work of the AHERA Designated Person (DP). Schools without a competent DP tend to have more AHERA violations. Common violations are listed on the table “Frequent Problems with the Management Plan” on page 47. Schools with DPs who know the AHERA requirements can effectively prevent the release of asbestos fibers through their own actions, as well as their ability to hire and oversee the work of personnel conducting asbestos-related activities at their school buildings.

The AHERA Designated Person Self Study Guide is an important tool to improve LEA's compliance with AHERA and to protect the health of school building occupants through preventing the release of asbestos fibers. With the support from EPA HQ and all the other EPA regional offices, the Seattle office of EPA undertook the task of updating and finalizing this manual on August 1995.

Responsibilities of the AHERA Designated Person

The responsibilities of the AHERA Designated Person include:
• ensure that all activities of anyone who conducts the following are carried out in accordance with the AHERA requirements: conduct inspections, reinspections, periodic surveillance; develops, implements and updates management plans; and plans and implements asbestos-related activities (such as maintenance or removal);
• ensure that all custodial and maintenance employees are properly trained;
• ensure that all workers, building occupants, students, and their parents are notified annually about management plan availability and recent and upcoming asbestos-related activities;
• ensure that short-term workers who may come into contact with asbestos are provided information regarding the location of this asbestos;
• ensure that all warning labels are posted; and
• consider any conflicts of interest that may arise when selecting accredited personnel to conduct asbestos-related activities.

AHERA Designated Person Required Training

AHERA requires that the DP be adequately trained to carry out his or her responsibilities. Due to the differing needs of school districts based on the size of the district and the amount and condition of the ACBM, AHERA does not list a specific training course or specific number of hours of training for the DP. Further, AHERA does not require the DP to be accredited. Specifically, the regulations note the training must include the following topics:
• health effects of asbestos;
• detection, identification and assessment of asbestos-containing building materials (ACBM);
• options for controlling asbestos-containing building materials; and
• asbestos management programs.
• relevant Federal and State regulations concerning asbestos, including AHERA and its implementing regulations and the regulations of the Occupational Safety and Health
CHAPTER 1
Using the Self-Study Guide

Administration, the U.S. Department of Transportation, and the U.S. Environmental Protection Agency (See Chapter 11 for further information on regulations related to AHERA.)

Instructions for Using this Guide

To use this guide effectively:

• Assemble all documents that appear in the list entitled "Documents Required for Completion of Self-Study Guide."

• Make copies of the tables, figures and supplemental materials that appear in this guide to use as working copies.

• Review the chapter summaries and supplemental materials at the end of each chapter as you proceed through the guide.

• Take the Quiz before and after you have completed this Self-Study Guide.

Documents Required for Completion of Self-Study Guide

A designated person using this guide should have copies of the following documents for reference:

• Environmental Protection Agency
  40 CFR Part 763; Asbestos-Containing Materials in Schools; Final Rule (October 30, 1987), the Model Accreditation Plan, Interim Final Rule (February 3, 1994), and Asbestos Abatement Projects; Worker Protection; Final Rule (February 25, 1987; note: this rule must undergo revision to conform to the OSHA Worker Protection Rule, 29 CFR 1926.1101, 8/10/94).

100 Commonly Asked Questions About the New Asbestos-in-Schools Rule (May 1988).

• Your School Asbestos Inspection Report/Management Plan
  Choose a document that is representative of your school buildings if you have multiple schools.

• Occupational Safety and Health Administration

Useful References

-3-
A designated person may also wish to refer to one or more of the following EPA documents in completing this guide:

- **Environmental Protection Agency**
  40 CFR Part 61; *National Emission Standards for Hazardous Air Pollutants; Asbestos NESHAP Revision*; Final Rule (November 20, 1990);

  *Guidance for Controlling Asbestos-Containing Materials in Buildings (Purple Book)*: (June, 1985; 560/5-85-024);

  *Managing Asbestos in Place: A Building Owners Guide to Operations and Maintenance Programs for Asbestos-Containing Materials (Green Book)* (July, 1990; 20T-2003);

  *Asbestos in Buildings; Guidance for Service and Maintenance Personnel* (June 1985; 560/5-85-018);

  *A Guide to Performing Reinspections Under the Asbestos Hazard Emergency Response Act (AHERA) (Yellow Book)* (February 1992);

  *Answers to the Most Frequently Asked Questions About Reinspections Under AHERA* (May 1991);


To obtain any of the documents listed above, contact the EPA Toxic Substances Control Act (TSCA) Hotline at (202) 554-1404 or the U.S. Government Printing Office.
AN INTRODUCTION TO ASBESTOS

The History of Asbestos

The word "asbestos" is derived from the Greek language. The Greeks admired the "miracle mineral" because of its softness and flexibility and its ability to withstand heat. The Greeks used asbestos much like cotton, spinning and weaving it into cloth. Asbestos was not widely available anywhere in the world until the late 1800s, when major deposits were found in Canada. Thereafter, asbestos was used to make thermal insulation for boilers, pipes, and other high temperature applications, and was also used as a fireproofing and reinforcement material. During World Wars I and II, the military used asbestos extensively in ships and other applications. Commercial usages of asbestos in buildings increased greatly thereafter, but growing concerns about the health risks associated with asbestos exposure resulted in a voluntary reduction in the use of asbestos beginning in the 1970s.

Characteristics of Asbestos

Asbestos is comprised of a group of natural minerals. Unlike other minerals, however, the crystals of asbestos form long, thin fibers. Asbestos deposits are found throughout the world, but the primary sites of commercial asbestos production are Canada, Russia, and South Africa. Commercial mining of asbestos in the United States was halted in the 1980s.

Once extracted from the earth, asbestos-containing rock is crushed, milled (or ground), and graded. This produces long, thread-like fibers of material. What appears to the naked eye as a single fiber is actually a bundle of hundreds or thousands of fibers, each of which can be divided even further into tiny fibers (fibrils), invisible without the aid of a microscope.

Asbestos materials are divided into two groups -- serpentine and amphibole. All asbestos in the serpentine group is called Chrysotile. This is the most common type of asbestos found in buildings in the United States, accounting for approximately 95 percent of the asbestos found in the nation's buildings. It is commonly known as "white asbestos" because of its natural color.

The amphibole group contains five types of asbestos. Amosite, the second most common type of asbestos found in buildings in the United States, is often referred to as "brown asbestos" for the color of the natural mineral. Crocidolite, or "blue asbestos" has been used in high-
CHAPTER 2
An Introduction to Asbestos

temperature insulation products and on chemical resistant surfaces, such as laboratory tables for chemistry and biology classes (upon occasion, the custodial staff will drill holes in table tops for new fixtures without realizing that the material may contain crocidolite. The remaining three types of asbestos in the amphibole group -- Anthophyllite, Tremolite, and Actinolite -- are rare and have little commercial value. They are occasionally found as contaminants or minor constituents in asbestos-containing materials.

Uses of Asbestos

Asbestos has been used in thousands of products, largely because it is plentiful, readily available, cheap, strong, does not burn, conducts heat and electricity poorly, and is resistant to chemical corrosion. Products made with asbestos are often referred to as asbestos-containing materials (ACM).

Asbestos proved particularly useful in the construction industry. Building materials that contain asbestos are referred to as asbestos-containing building materials (ACBM). Commercial usage of asbestos products in the construction industry was most common from about 1945 to 1980. Some of the most common uses of ACBM include:

- **Fireproofing material** -- Usually spray-applied to steel beams used in construction of multi-story buildings to prevent structural members from warping or collapsing in the event of fire.

- **Insulation material** -- Usually spray-applied, trowel-applied, or manually installed after being preformed to fit surfaces such as pipes for thermal insulation and condensation control.

- **Acoustical or soundproofing material** -- Trowel- or spray-applied. May also be used for decoration. Asbestos was mixed with other materials and sprayed onto ceilings and walls to produce a soft, textured look.

- **Miscellaneous materials** -- Asbestos has been added to asphalt, vinyl, cement and other materials to make products like roofing felts, exterior siding and roofing shingles, wallboard, pipes for water supply, combustion vents, and flues for waste gases and heat. Fibers in asbestos cement, asphalt, and vinyl materials are usually firmly bound into materials in good condition and typically will be released only if the material is damaged mechanically -- for example through drilling, cutting, grinding, or sanding. In addition, asbestos in roofing shingles and siding exposed to weathering may slowly deteriorate and has the potential to release fibers.

Examples of the more common ACBM found in schools are flooring, vinyl base, mastic, roofing materials, gaskets in heating and air-conditioning equipment, ceiling panels and tiles, wallboard, joint compound, plaster, pipe and boiler insulation, duct-wrap insulation, duct joint tape, duct vibration dampening cloth, fireproofing on structural members, fire brick for boilers, fire doors, acoustical spray-on, cement pipes, and panels.
Friable vs. Nonfriable ACBM

Friable ACBM will release fibers into the air more readily than nonfriable ACBM. Therefore, the AHERA Rule differentiates between friable and nonfriable ACBM. The regulations define friable ACBM as material that may be crumbled, pulverized, or reduced to powder by hand pressure when dry. Friable ACBM also includes previously nonfriable material when it becomes damaged to the extent that when dry it may be crumbled, pulverized, or reduced to powder by hand pressure. **Undamaged non-friable ACBM should be treated as friable if any action performed on the material will make them friable.**

Categories of Asbestos-Containing Building Materials

EPA identifies three categories of ACBM *(See the definitions appearing in § 763.83 of the AHERA Rule)*:

- **Surfacing Materials** -- Interior ACBM that has been sprayed on, troweled on, or otherwise applied to surfaces (structural members, walls, ceilings, etc.) for acoustical, decorative, fireproofing, or other purposes. This includes acoustical plaster, hard plasters (wall or ceiling), fireproofing insulation, spray-applied or blown-in thermal material, joint or patching compound (wall or ceiling), and textured paints or plasters.

- **Thermal System Insulation** -- Insulation used to control heat transfer or prevent condensation on pipes and pipe fittings, boilers, breeching, tanks, ducts, and other parts of hot and cold water systems; heating, ventilation, and air conditioning (HVAC) systems; or other mechanical systems. These insulation materials include pipe lagging, pipe wrap, HVAC duct insulation, block insulation, cements and muds, and a variety of other products such as gaskets and ropes.

- **Miscellaneous Materials** -- Other, mostly nonfriable products and materials found on structural components, structural members or fixtures, such as floor tile, ceiling tile, construction mastic for floor and ceiling materials, sheet flooring, fire doors, asbestos cement pipe and board, wallboard, acoustical wall tile, and vibration damping cloth. "Miscellaneous materials" do not include thermal system insulation or surfacing materials.

Please note that batt, blanket, and blown-in insulation should be placed in one of the above categories according to use.
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This chapter introduces some important terms used in the AHERA Rule. The designated person should be especially familiar with the following:

**Asbestos-Containing Material (ACM)** -- Any material or product that contains more than one percent asbestos.

**Asbestos-Containing Building Material (ACBM)** -- 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.

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

**Nonfriable ACBM** -- Material that, when dry, may not be crumbled, pulverized, or reduced to powder by hand pressure.

**Surfacing ACM** -- Interior ACM that has been sprayed on, troweled on, or otherwise applied to surfaces (structural members, walls, ceilings, etc.) for acoustical, decorative, fireproofing, or other purposes.

**Thermal System ACM** -- Insulation used to control heat transfer or prevent condensation on pipes and pipe fittings, boilers, breeching, tanks, ducts, and other parts of hot and cold water systems; heating, ventilation, and air-conditioning (HVAC) systems; or other mechanical systems.

**Miscellaneous ACM** -- Other, mostly nonfriable, products and materials (found on structural components, structural members or fixtures) such as floor tile, ceiling tile, construction mastic for floor and ceiling materials, sheet flooring, fire doors, asbestos cement pipe and board, wallboard, acoustical wall tile, and vibration damping cloth.

*Undamaged non-friable ACBM should be treated as friable if any action performed would render these materials friable. When previously non-friable ACBM becomes damaged to the extent that when dry it may be crumbled, pulverized, or reduced to powder by hand pressure, it should be treated as friable.*
3 ASBESTOS HEALTH RISKS

Health Effects Associated with Asbestos Exposure

The health effects associated with asbestos exposure have been studied for many years. Results of these studies show that inhalation (breathing in) of asbestos fibers leads to increased risk of developing several diseases. Exactly why some people develop these diseases remains a mystery, but it has been well demonstrated that most asbestos-related illnesses are dose-response related (i.e., the greater the exposure to airborne asbestos fibers, the greater the risk of developing an illness).

Relative Hazards of Asbestos Exposure

Almost daily, we are exposed to some prevailing level of asbestos fibers in buildings or experience some existing level in the outdoor air. Some fibers that are inhaled remain in the lungs. Brief "bursts" of exposure, when added to the background level, increase the potential to cause or trigger the development of an asbestos related disease. These brief bursts of exposure occur in many ways. For example, when a carpenter drills a hole in an asbestos fire door without taking any precautions, an increased amount of asbestos may be released into the air. The more often these bursts of exposure occur, the greater the risk of breathing asbestos fibers.

People most at risk for this additional exposure are maintenance and construction workers who work on and disturb asbestos in buildings. This clearly demonstrates the need for an active asbestos policy and an ongoing operations and maintenance (O&M) plan for buildings that contain ACBM.

It is important to recognize that the majority of people who have developed diseases because of asbestos exposures are former asbestos workers. These workers were frequently exposed to high levels of asbestos fibers each working day, with little or no protection. Today's asbestos maintenance workers and AHERA-trained asbestos abatement workers are trained to follow specific work practices and wear appropriate protection, including respirators, to minimize the risk of exposure. However, increased risk may occur when a worker who does not use a respirator or follow specific work practices disturbs any ACBM.
The Respiratory System

The effects of asbestos exposure most often involve the lungs. Air breathed into the body passes through the mouth and nose, continuing into the windpipe. The windpipe divides into smaller and smaller tubes that end up in the lungs as air sacs called alveoli. It is in these air sacs that respiration occurs. Oxygen is absorbed into tiny blood vessels (or capillaries), and waste gases, such as carbon dioxide, pass out of the blood and are exhaled.

The body has several mechanisms to "filter" the air it breathes. First, large particles are removed in the nose and mouth. Many smaller particles are caught on the mucus-coated walls of the airway tubes. These airways have "hairy" linings (ciliate cells) that constantly propel mucus upward. Particles caught in the mucus are swept up into the back of the mouth. From here they are swallowed or expelled (spit out). Unfortunately, cigarette smoking temporarily paralyzes these hair-like cells, disabling one of the body's natural defenses against unwanted dust or fibers.

Despite natural bodily defenses, some dust particles inevitably reach the tiny air sacs in the lungs. When this occurs the human immune system dispatches large cells called macrophages to engulf the particles and "digest" them. These cells deposit a coating on the particles and may begin forming scar tissue around them. This is just another natural defense mechanism the body uses against unwanted debris in the lungs.

Asbestos-Related Diseases

If the body's defenses fail to control or remove asbestos fibers that enter the lungs, the risk of developing an asbestos-related disease increases. Asbestos-related diseases include asbestosis, lung cancer, mesothelioma, and other cancers.

- **Asbestosis** -- Asbestosis is a disease characterized by lung scarring. It reduces lung elasticity -- the ability to inhale and exhale in response to muscular contractions of the diaphragm -- and makes breathing very difficult. Asbestosis is most common among workers who have been exposed to large amounts of asbestos fibers over a period of time. It is a serious disease and, in those persons exposed to high levels of asbestos, can eventually lead to disability or death. All forms of asbestos are suspected to have the potential to cause asbestosis. Like all diseases associated with asbestos exposure, it may take many years for the disease to show up. The typical latency period for asbestosis is 15 to 30 years. Available data indicate that the frequency of occurrence of asbestosis rises and the disease worsens with increasing dust exposure. The Occupational Safety and Health Administration (OSHA) Asbestos Standards were developed to minimize the incidence of asbestosis among asbestos workers by reducing their exposure to asbestos.

- **Lung Cancer** -- As with asbestosis, there appears to be a dose-response relationship between asbestos exposure and lung cancer. In addition, lung cancer arising from
Asbestos exposure also has a latency period before development -- typically 30 years or longer. The risk of contracting lung cancer as a result of exposure to asbestos increases if the worker is a cigarette smoker. Cigarette smokers who are exposed to asbestos are over 50 times more likely to develop lung cancer than the normal, non-smoking population. As a result, a program to help workers stop smoking and an asbestos operations and maintenance program will help reduce the risk of lung cancer among asbestos maintenance workers.

- **Mesothelioma** -- Mesothelioma is a cancer that occurs in the chest cavity lining or in the lining of the abdominal (stomach) lining. This type of cancer spreads rapidly and is always fatal. Cases of mesothelioma have been found in people who have had a limited exposure to asbestos. The onset of this disease appears to be independent of smoking behavior but related to dose and to time from first known asbestos exposure. Mesothelioma tends to have a long latency period -- usually 30 to 40 years.

- **Other Diseases** -- Several other diseases seem to occur more frequently among people who have been exposed to asbestos. These include cancer of the esophagus, stomach, colon, and pancreas; pleural (fibrous) plaques; pleural thickening; and pleural effusion.

The risks of contracting any of these diseases make it extremely important that asbestos maintenance workers utilize proper work practices and respiratory protection.

**Risks Associated with Low Exposure**

While studies of asbestos workers and laboratory animals clearly reveal that asbestos is hazardous, the risks associated with low-level, non-occupational exposure (i.e., an occupant of a building who is not actually disturbing the asbestos) have not been directly demonstrated. Estimating low-level risks from exposure data is not a straightforward process, and the validity of current methodologies is questionable.

Based on a thorough review of the literature available on the health effects of asbestos, the National Institute for Occupational Safety and Health (NIOSH) has concluded that there is no level below which the risks of contracting an asbestos-related disease are zero. This means that there is no established safe level of exposure to asbestos.
EPA Policy for Asbestos Control in Schools

EPA bases its policy for asbestos control in schools on the following premises:

- Although asbestos is hazardous, the risk of asbestos-related disease depends upon exposure to airborne asbestos fibers.

- Based upon available data, the average airborne asbestos levels in buildings seem to be very low. Accordingly, the health risk to most building occupants also appears to be very low.

- Removal is often not a building owner’s best course of action to reduce asbestos exposure. In fact, an improper removal can create a dangerous situation where none previously existed.

- EPA only requires asbestos removal to prevent significant public exposure to airborne asbestos fibers during building demolition or renovation activities.

- Asbestos that has been identified will pose little risk if it is well maintained under an operations and maintenance program. Improper operations and maintenance also can cause dangerous situations. Therefore, EPA requires a pro-active, in-place management program whenever ACBM is discovered and is not removed.
Asbestos-related diseases are dose-response related (the greater the exposure to airborne fibers, the greater the risk of developing an illness) and have a latency period (typically 15 to 30 years).

Exposure to asbestos may result in asbestosis (a disease characterized by lung scarring, which reduces the lungs' ability to function), lung cancer, mesothelioma (always-fatal cancer arising in the chest or abdominal cavity), and other diseases.

Risks associated with low-level, non-occupational exposure (e.g., a building occupant who is not actually disturbing the asbestos) are not well established. The National Institute for Occupational Safety and Health (NIOSH) has determined, however, that there is no established safe level of exposure.

Asbestos that has been identified will pose little risk if it is well maintained under an operations and maintenance program. EPA only requires asbestos removal to prevent significant public exposure to airborne asbestos fibers during building demolition or renovation activities.
WHAT IS REQUIRED OF THE LEA?

Scope and Purpose of AHERA

Broadly stated, AHERA requires that each Local Education Agency (LEA) perform inspections to identify asbestos-containing materials in each of the public and private elementary and secondary schools under its authority; develop, implement and update asbestos management plans; take appropriate response actions; safely maintain asbestos-containing building materials (ACBM); and comply with AHERA's recordkeeping requirements.

The AHERA Rule outlines the general responsibilities of a LEA in § 763.84 and the specific duties of the LEA in the succeeding sections of the rule.

General LEA Responsibilities

Under § 763.84 of the AHERA Rule, the LEA has the following general responsibilities:

- Ensure that the activities of any persons who perform inspections, reinspections, and periodic surveillance, develop and update management plans, develop and implement response actions, and conduct operations and maintenance activities are in compliance with all of the AHERA requirements.

- Ensure that all custodial and maintenance workers are properly trained.

- Ensure that workers and building occupants or their legal guardians are notified at least annually about activities relating to ACBM.

- Ensure that short-term workers who may come in contact with asbestos in a school are provided the locations of ACBM and suspected ACBM assumed to be ACBM.

- Ensure that warning labels are properly posted.

- Ensure that management plans are available for inspection.
CHAPTER 4
What is Required of the LEA?

• Appoint a "designated person" to ensure proper implementation of the AHERA requirements.

• Ensure that the designated person receives adequate training to perform duties assigned.

• Consider whether any conflict of interest may arise among personnel undertaking activities related to the ACBM in a school or schools.

(See the Checklist of LEA General Responsibilities Under AHERA at the end of this chapter.)

Conflicts of Interest

The AHERA Designated Person (school asbestos coordinator) should take into consideration any conflict of interest and determine whether it should influence their selection of contractors to accomplish asbestos related work in their schools. The AHERA Rule identifies several situations where a conflict of interest may arise. For example, the abatement contractor is not allowed to conduct final air sampling for clearance by TEM analysis (See 40 CFR Part 763, Appendix A to Subpart E ((II)(B)(2)). The group that determines whether an abatement site is acceptable for re-occupancy should not be the same (or a related group) that is conducting the abatement work. Similarly, if the LEA requires a management planner to sign a statement certifying that the management plan is in compliance with AHERA, then the LEA may not want the planner signing the statement to be the one who implements or will implement the plan. The LEA may have unique concerns regarding potential conflicts that should be discussed with and addressed by the designated person.

Specific Responsibilities of the LEA

Sections 763.85-763.99 of the AHERA Rule detail the specific responsibilities of the LEA. These responsibilities are listed below, followed by brief descriptions. The responsibilities are discussed in greater detail in subsequent chapters of this guide.

• **Inspections** -- An accredited inspector must conduct inspections of each school building under the authority of the LEA. This involves visually inspecting buildings for friable and nonfriable ACBM, sampling such materials unless they are assumed to be ACBM, and having samples analyzed in accordance with the AHERA regulations. Only accredited laboratories may be used to perform bulk material sampling analyses.

• **Reinspections** -- An accredited inspector must conduct a reinspection of all friable and nonfriable known or assumed ACBM in each school building at least once every three years that a management plan is in effect. A management planner must review all three year inspection reports.
CHAPTER 4  
What is Required of the LEA?

- **Assessment** -- For each inspection and reinspection, an accredited inspector must provide a written assessment of all friable known or assumed ACBM in the school building.

- **Management Plans** -- Each LEA must complete an asbestos management plan for each school under its authority. An accredited management planner must prepare the management plan based on the results of the inspection. In the management plan, the management planner recommends appropriate response actions, prepares cost estimates on the response actions, and schedules the response actions. The management plan must be updated on a timely basis.

- **Response Actions** -- Based on the recommendations of the management planner, the LEA must select the appropriate response actions consistent with the assessment of the ACBM. The designated person must see to it that the response actions are carried out in a timely manner and in compliance with the AHERA requirements. "Timely manner" is not defined in the regulations but involves the joint development of a schedule for plan implementation by the management planner and the designated person. Only accredited laboratories may be used to perform final clearance air sample analyses.

- **Operations and Maintenance** -- The LEA must implement an operations and maintenance (O&M) program whenever any friable ACBM is present or assumed to be present in a building under its authority. Where material identified as nonfriable ACBM or nonfriable assumed ACBM is about to become friable as a result of activities performed in the building, it must be treated as friable and thus must also be subject to an O&M program. EPA recommends that the LEA also manage nonfriable ACBM in their school buildings under an O&M program.

- **Training** -- AHERA requires that building inspectors, management planners, project designers, contractors/supervisors, and asbestos workers be accredited before they can perform asbestos-related activities. The AHERA regulations details specific training requirements for the designated person and for custodial and maintenance workers, although these individuals are not required to complete any EPA-approved courses or receive accreditation.

- **Notification** -- The LEA must issue the following notifications regarding asbestos identified in its schools:
  
  -- An annual notice to all workers and building occupants, or their legal guardians, of all inspections, re-inspections, and activities being conducted to control asbestos exposure, including periodic surveillance and asbestos removal, that are planned or in progress. This notification should be documented in the management plan.

  -- An annual written notice informing parent, teacher, and employee
organizations of the availability of the management plan for their review. A dated copy of this notice must be maintained as part of the management plan.

-- A notice to short-term workers (e.g., telephone repair workers, utility workers, or exterminators) who may come into contact with asbestos in a school identifying the location of ACBM or assumed ACBM in the building. This notification should be documented in the management plan.

A description of all notification processes must be maintained as part of the management plan. The Parent Teacher Association (PTA) or school newsletter may be used as a means to distribute the notifications to the students and their families.

• **Periodic Surveillance** -- The LEA must conduct periodic surveillance in each building under its authority at least once every six months after a management plan is in effect. The periodic surveillance inspection report must be kept in the management plan.

• **Recordkeeping** -- Records involving the inspection of and response to ACBM must be kept in a centralized location in the administrative office of both the school and the LEA. EPA recommends keeping these records in the management plan for each school building and the overall management plan for all school buildings. Recordkeeping is the responsibility of the designated person. The following records must be kept:

  -- Descriptions of preventive measures and response actions taken for friable and nonfriable ACBM and suspected ACBM
  -- Sampling information
  -- Training information
  -- Periodic surveillance information
  -- Information on initial and additional cleaning performed
  -- Information on operations and maintenance activities, including information on any maintenance activities disturbing friable ACBM
  -- Notifications to parents, building occupants, and short-term workers
  -- Information on any fiber-release episodes

• **Warning Labels** -- The LEA must attach a warning label immediately adjacent to any friable and nonfriable ACBM and suspected ACBM assumed to be ACBM located in routine maintenance areas (such as boiler rooms) at each school building.
### Chapter 4 Summary

**Key Points About LEA Responsibilities**

The LEA must have an accredited inspector conduct **inspections** of each school building under its authority. A **reinspection** of all friable and nonfriable known or assumed ACBM in each school building must be conducted at least once every three years that a management plan is in effect. A management planner must review all three year inspection reports.

For each inspection and reinspection, an accredited inspector must provide a written **assessment** of all friable known or assumed ACBM in the school building.

The LEA must have an accredited management planner review the results of the inspection/reinspection and the assessment and make written recommendations on appropriate response actions. The accredited management planner also prepares the asbestos **management plan** for each school under its authority.

The LEA must select the appropriate **response actions** consistent with the assessment of the ACBM and the recommendations of the management planner.

The LEA must implement an **operations and maintenance (O&M) program** whenever any friable ACBM is present or assumed to be present in a building under its authority.

Building inspectors, management planners, project designers, contractors/ supervisors, and asbestos workers must complete EPA- or State-approved courses and receive accreditation before they can perform any asbestos-related activities. The AHERA Rule also specifies training requirements for LEA designated persons and custodial and maintenance workers, although these individuals are not required to complete any EPA-approved courses or receive accreditation.

The LEA must conduct **periodic surveillance** in each building under its authority at least once every six months after a management plan is in effect.

The LEA must comply with the requirements to provide **notification** about asbestos activities to workers, students, parents, teachers, and short-term workers.

The LEA must maintain **records** in accordance with the AHERA regulations.

The LEA must attach a **warning label** immediately adjacent to any friable and nonfriable ACBM and assumed ACBM located in routine maintenance areas (such as boiler rooms) at each school building.
### Checklist of the Local Education Agency's General Responsibilities Under AHERA

The AHERA Designated Person must complete and sign a statement that the Local Education Agency has met (or will meet) the responsibilities listed below. All references are to specific provisions to the AHERA regulations (under § 763.84). The AHERA Designated Person should be able to answer "yes" to each statement below.

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<td><em>1.</em></td>
<td>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 40 CFR Part 763, Subpart E.</td>
</tr>
<tr>
<td><em>2.</em></td>
<td>All custodial and maintenance employees are properly trained as required in 40 CFR Part 763, Subpart E and all 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).</td>
</tr>
<tr>
<td><em>3.</em></td>
<td>All workers and building occupants, or their legal guardians, are informed at least once each school year about inspections, response actions, post-response action activities, including periodic reinspections and surveillance activities, that are planned or in progress.</td>
</tr>
<tr>
<td><em>4.</em></td>
<td>All short-term workers (e.g., telephone repair workers, utility workers, or exterminators) who may come in contact with asbestos in school are provided information regarding the locations of ACBM and assumed ACBM.</td>
</tr>
<tr>
<td><em>5.</em></td>
<td>All warning labels are posted in accordance with § 763.95.</td>
</tr>
<tr>
<td><em>6.</em></td>
<td>All management plans are available for inspection, and notification of this availability has been provided in accordance with § 763.93(g).</td>
</tr>
<tr>
<td><em>7.</em></td>
<td>The undersigned person designated by the LEA according to § 763.84(g)(1) has received adequate training as required by § 763.84(g)(2).</td>
</tr>
<tr>
<td><em>8.</em></td>
<td>The LEA has and will consider whether any conflict of interest may arise from the interrelationship between accredited personnel, and whether this potential conflict should influence the selection of accredited personnel to perform activities under 40 CFR Part 763, Subpart E.</td>
</tr>
</tbody>
</table>
THE AHERA INSPECTION

Introduction

An AHERA inspection must be conducted by an "accredited inspector," i.e., one who has attended and successfully completed a course approved by EPA or an EPA-approved State program, passed an exam and received an accreditation number and certificate. This accreditation must be updated annually. Once an AHERA inspection is complete, the inspector must submit the results to the LEA in an inspection report. There are two elements to an AHERA inspection: identification and physical assessment.

Identification of ACBM

The initial inspection to identify all the ACBM in a building begins with locating and listing all "homogeneous areas" of material that are suspected to contain asbestos. A "homogeneous area" is an area of surfacing material, thermal system insulation, or miscellaneous material that is uniform in color and texture. Suspected ACBM in a homogeneous area or functional space must then be treated as ACBM unless samples are taken and the sample analyses show the material to be non-asbestos. "Functional space" means a room, group of rooms, or homogeneous area designated by a person accredited to prepare management plans, design abatement projects, or conduct response actions.

Homogeneous Areas

As was discussed in Chapter 2, interior materials suspected of containing asbestos must be categorized as one of the following three types:

- Surfacing Materials
- Thermal System Insulation (TSI)
- Miscellaneous Materials

Once a material is classified as a particular type, the inspector should identify areas where the materials are all of one type.

Note, EPA suggests that wings or additions added to a building should not be considered homogeneous with the original structure. Building materials used in different buildings should not be considered homogeneous. If there is any reason to suspect that materials
might be different, even if they appear similar, they should be assigned to separate homogeneous areas, and if it is determined that sampling is needed, such materials should be sampled separately. It is important that the inspector correctly identify all homogeneous areas in the inspection report.

(See Example Form 1 at the end of this chapter for an example of how to record information about the homogeneous areas in a school building.)

**Functional Spaces**

Once the inspector has identified the homogeneous areas in a building, he or she must gather information that will tie each area to the uses or functions occurring within it. The management planner will use the information gathered by the inspector to determine functional spaces. Under the AHERA Rule, a functional space is essentially a room, group of rooms, or space in a building that has an identified use. Examples of functional spaces are classrooms, hallways, offices, mechanical rooms, ceiling plenums, tunnels, and crawl spaces.

(See Example Form 2 at the end of this chapter for an example of how to record information relating each homogeneous area to a functional space.)

**Bulk Sampling**

Under the AHERA Rule, all material suspected to be ACBM must be assumed to be ACBM unless:

- The homogeneous area is sampled as required by § 763.86 of the AHERA Rule, and the samples are analyzed as required by § 763.87 of the AHERA Rule and found to be non-asbestos; or
- The suspect or assumed ACBM is in a building built after October 12, 1988, that is certified by an architect or developer as being asbestos-free.

Where sampling and analysis is performed on suspected ACBM, the procedures must be properly documented and the sample's asbestos content must be below the EPA definition of ACM (See Glossary in Appendices) in order for any of the suspect material to be treated as asbestos-free.

Section 763.86 of the AHERA Rule sets forth requirements for bulk sampling based on the type of material involved. Table 5-1 shows the number of samples required to be collected from each type of homogeneous area to meet the regulation requirements.
## Table 5-1

<table>
<thead>
<tr>
<th>Type of Material</th>
<th>Samples Required</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Friable Surfacing Material</strong></td>
<td></td>
</tr>
<tr>
<td>Area $\leq 1,000$ sq. ft.</td>
<td>3</td>
</tr>
<tr>
<td>Area $&gt; 1,000$ sq. ft. but $\leq 5,000$ sq. ft.</td>
<td>5</td>
</tr>
<tr>
<td>Area $&gt; 5,000$ sq. ft.</td>
<td>7</td>
</tr>
<tr>
<td><strong>Thermal System Insulation (TSI)</strong></td>
<td></td>
</tr>
<tr>
<td>TSI not assumed to be ACBM</td>
<td>3</td>
</tr>
<tr>
<td>Patched TSI not assumed to be ACBM (if patched section $&lt; 6$ linear or sq. ft.)</td>
<td>1</td>
</tr>
<tr>
<td>Each insulated mechanical system not assumed to be ACBM where cement or plaster is used on fittings such as tees, elbows, or valves</td>
<td>Samples in a manner sufficient to determine if material is or is not ACBM*</td>
</tr>
<tr>
<td><strong>Friable Miscellaneous Material not Assumed to Be ACBM</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Nonfriable Suspected ACBM not Assumed to Be ACBM</strong></td>
<td></td>
</tr>
</tbody>
</table>

* EPA recommends that three samples be taken to meet this requirement

Note: The designation of ACM for a homogeneous area based on one positive bulk sample result is acceptable.
The regulations do not indicate how many samples are required to meet the "in a manner sufficient to determine." However, the EPA policy statement in the document *100 Commonly Asked Questions About the New AHERA Asbestos-in-Schools Rule* recommends that a minimum of three samples be taken from any homogeneous area to prove that a material does not contain asbestos. However, the designation of ACM for a homogeneous area based on one positive bulk sample result is acceptable.

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.

It is recommended that all samples taken always be analyzed, since one sample analysis is rarely representative of a homogeneous area. EPA recommends the use of an improved test method entitled "Method for the Determination of Asbestos in Bulk Building Materials" in place of the 1982 procedures as found in 40 CFR Part 763, Appendix E to Subpart E. Further EPA recommends that LEAs which have Polarized Light Microscopy (PLM) laboratory results indicating floor tiles to be non-asbestos containing may want to retest these materials using this new method. This method should be considered for the following: 1) floor tiles which may contain thin fibers and which were analyzed under the 1982 method and found not to contain asbestos, and 2) materials such as hard wall and acoustical plaster, stucco or other similar multi-layered materials or systems which were not analyzed and reported by layers.

*(See Example Form 3 at the end of this chapter for a form that is representative of a bulk sampling log that should appear in your inspection report.)*

**Exclusions to the AHERA Inspection Requirements**

Under the AHERA Rule, all ACM that are used as interior building materials in a school must be identified by ACBM category so that they may be properly sampled and assessed for appropriate response action. However, identification of ACM at schools is not required for ACM that is not installed (stored on site) or for consumer products at the school (auditorium curtains, electrical wiring stored on-site, fire blankets, etc.). ACM installed outside of the building (such as roofing materials and siding) is also excluded from inspection under AHERA. However, this exemption does not extend to the underside of any portico or covered exterior hallway or walkway or to any exterior portion of a mechanical system.

Section 763.99 of the AHERA Rule also excludes from the inspection requirements any sampling area or homogeneous area of a school building where:

- An accredited inspector has determined that, based on sampling records, friable ACBM was identified in the area during an inspection conducted before December 14, 1987. However, such ACBM must still be physically assessed by the accredited
inspector.

- An accredited inspector has determined that, based on sampling records, nonfriable ACBM was identified in the area during an inspection conducted before December 14, 1987. In such a case, the accredited inspector must identify whether material that was nonfriable has become friable since the previous inspection and must assess the newly friable ACBM.

- Based on sampling records and inspection records, an accredited inspector has determined that no ACBM is present in the area and the records show that the area was sampled before December 14, 1987, in substantial compliance with the AHERA Rule.

- The lead agency responsible for asbestos inspection in a State that has been granted a waiver from the inspection requirements of the AHERA Rule has determined that, based on sampling records and inspection records, no ACBM is present in the area. The records must show that the area was sampled before December 14, 1987, in compliance with the AHERA Rule.

- An accredited inspector has determined that, based on records of an inspection conducted before December 14, 1987, suspected ACBM identified in the area is assumed to be ACBM. In such a case, the inspector must identify whether material that was nonfriable suspected ACBM assumed to be ACBM has become friable since the previous inspection and must assess any newly friable material and previously identified friable suspected ACBM assumed to be ACBM.

- Based on inspection records and contractor and clearance records, an accredited inspector has determined that all ACBM was previously removed from the area.

- An architect or project engineer responsible for the construction of a new school building built after October 12, 1988, or an accredited inspector signs a statement that no ACBM was specified as a building material in any construction document for the building or no ACBM was used as a building material in the building.

**Physical Assessment**

Once the inspector has identified all of the ACBM in a building, he or she must perform a physical assessment of all TSI and friable material. Under § 763.88 of the AHERA Rule, the physical assessment of ACBM involves classifying the material into one of the following seven Physical Assessment Categories:

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

The physical assessment may include the following considerations:

- Location and amount of the material
- Condition of the material, specifying:
  - Type of damage or significant damage
  - Severity of damage
  - Extent or spread of damage
- Whether the material is accessible
- Material's potential for disturbance
- Known or suspected causes of damage or significant damage
- Preventive measures that might eliminate the reasonable likelihood of undamaged ACBM from becoming significantly damaged

To determine which of the seven Physical Assessment Categories a material should be placed into, several terms must be defined. The preamble to the AHERA Rule, Federal Register, October 30, 1987, p. 41830, examines the difference between "damaged material" and "significantly damaged" material. According to the preamble, significant damage exists where damage is evenly distributed across 10 percent or more of a functional space or is localized over 25 percent of a functional space.

(See Example Form 4 at the end of this chapter for a form that may be used to show why ACBM was assigned to a particular category.)

The preamble goes on to state that 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 or, under certain circumstances, vibration or air erosion. If the accredited inspector determines that there is a high or strong likelihood of major disturbance due to accessibility, vibration, or air erosion, there is a potential for significant damage. If the likelihood of any of these factors occurring is moderate, there is only a potential for damage. If the likelihood of any of these factors occurring is low, the inspector should assign Physical Assessment Category No. 7 (any remaining friable ACBM or friable suspected ACBM) to the material.

Because the physical assessment is used to determine which response actions will be chosen to manage the asbestos, proper identification and assessment of ACBM are vital to the effective implementation of the AHERA program. The decision tree that follows can help
determine the correct assessment category for material in a functional space (See the Exercise at the end of this chapter for a brief exercise for determining the correct Physical Assessment Category for a functional space).
The Inspection Report

The results of an AHERA inspection or reinspection must be documented in an inspection report. All decisions regarding ACBM in the LEA's buildings will be based on the information found in this report, so it is vital that the report information be correct. If materials are incorrectly identified as containing asbestos, the LEA will take on needless expense for preventive measures, while if materials are incorrectly identified as not containing asbestos, the LEA may expose building occupants to increased health risks and itself to legal liability.

Contents of the Inspection Report

Section 763.85 of the AHERA Rule lists the required elements of the inspection report:

General Inspection Information

- Date of the inspection
- Signature of each accredited person who conducts inspection-related activities
- Ideally, a copy of the accreditation certificate for each accredited person making the inspection; at minimum, the state of accreditation and accreditation number of each accredited person who conducts inspection-related activities.

Information on Sampling/Assumed ACBM

- 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 ACBM
- Homogeneous areas where nonfriable suspected ACBM is assumed to be ACBM
- Description of the manner used to determine sampling locations
- Name and signature of each accredited inspector who collected the samples
- State of accreditation of each accredited inspector who collected the samples
- Accreditation number of each accredited inspector who collected the samples, if applicable

Identification and Assessment Information

- List of whether the homogeneous areas identified in the report are surfacing material, thermal system insulation, or miscellaneous material
- Assessments made of friable material and reasons for these assessments
- Name and signature of each accredited inspector making the assessment
- State of accreditation of each accredited inspector making the assessment
• Accreditation number of each accredited inspector making the assessment, if applicable

The inspection report should list the required elements in the order in which they are listed above to promote uniformity and ease of comprehension. The inspection report should also contain an introductory summary that briefly explains what will be found in the report. Documentation such as field data sheets and optional photographs should appear in appendices to the report.

*(See the Inspection Report Compliance Checklist at the end of this chapter.)*

**Common Inspection Report Problems and Deficiencies**

The designated person should ensure that the inspection report is complete. *Asbestos in Schools: Evaluation of the Asbestos Hazard Emergency Response Act: A Summary Report* identifies several areas in which inspection reports are often deficient. Examples include:

• Many inspection reports failed either to indicate areas where ACBM were present or did so incompletely.

• Vibration dampening cloth, duct insulation, fire doors and linoleum were not regularly identified as suspect ACBM.

• Eighty-two percent of school buildings had at least one ACBM unidentified in the original AHERA inspection.

The best time to review the inspection report for completeness is during a building walk-through, which is usually performed during the 6 month periodic surveillance inspection. Such problems as missing or confusing warning labels, improper identification of homogeneous areas, incomplete lists of suspect materials, and inaccurate or unclear sample locations may be identified during the walk-through. Correction of problems identified should be started immediately.

The designated person should be aware that an adequate number of samples must be collected in order to determine whether an area is considered asbestos-containing *(See Table 5-1 above).* If an adequate number of samples was not collected, the area must be considered to be ACBM regardless of the results of the analyses. In such a situation, the management planner, who reviewed the inspection/reinspection report, may advise the LEA to either collect additional samples or may update the management plan to assume that the areas in question are ACBM.
Chapter 5 Summary
Key Points About the AHERA Inspection

An AHERA inspection must be conducted by an **accredited inspector**.

The inspector must identify all **homogeneous areas** of material that are suspected to contain asbestos. Homogeneous areas contain asbestos that is uniform (alike) in color and texture.

All material suspected to be ACBM must be assumed to be ACBM unless the homogeneous area is **sampled**, and the analysis of the samples shows them to be non-asbestos. Adequate number of samples must be taken or the area will be considered to be ACBM regardless of the results of the analyses.

Once the inspector has identified all ACBM in a building, he or she must perform a **physical assessment** of all TSI and friable ACBM. This involves categorizing the material into one of seven Physical Assessment Classifications.

The results of an AHERA inspection and the assessment must be documented in an **inspection report**. This report will be used by the management planner to make written recommendations on appropriate response actions.
On the following are blank forms, similar to those used by AHERA accredited inspectors.

**Form 1** requires that the inspector enter information pertaining to homogeneous areas of *suspected and known ACBM* in a school building. Using the inspection report, the inspector will: 1) list all of the homogeneous areas in the school buildings, 2) enter the number of linear or square feet for each area, 3) indicate whether the material is friable or non-friable, 4) enter the type of ACBM that is present, and 5) indicate whether the ACBM is assumed to be ACBM.

**Form 2** requires that the inspector enter information in order to relate each homogeneous area to a functional space. Using the inspection report, the information entered on Form 1, and the building's floor plan, the inspector will 1) link the homogeneous areas to a functional space, 2) assign a number to each homogeneous area, 3) assign a letter to each functional space, and 4) create a key for the numbers and letters that are used.

**Form 3** is representative of a bulk sampling log that should be in the inspection report.

**Form 4** may be used to gather the information needed to show why a certain category was assigned to ACBM.

<table>
<thead>
<tr>
<th>Chapter 5 Forms</th>
</tr>
</thead>
<tbody>
<tr>
<td>On the following are blank forms, similar to those used by AHERA accredited inspectors.</td>
</tr>
<tr>
<td><strong>Form 1</strong> requires that the inspector enter information pertaining to homogeneous areas of <em>suspected and known ACBM</em> in a school building. Using the inspection report, the inspector will: 1) list all of the homogeneous areas in the school buildings, 2) enter the number of linear or square feet for each area, 3) indicate whether the material is friable or non-friable, 4) enter the type of ACBM that is present, and 5) indicate whether the ACBM is assumed to be ACBM.</td>
</tr>
<tr>
<td><strong>Form 2</strong> requires that the inspector enter information in order to relate each homogeneous area to a functional space. Using the inspection report, the information entered on Form 1, and the building's floor plan, the inspector will 1) link the homogeneous areas to a functional space, 2) assign a number to each homogeneous area, 3) assign a letter to each functional space, and 4) create a key for the numbers and letters that are used.</td>
</tr>
<tr>
<td><strong>Form 3</strong> is representative of a bulk sampling log that should be in the inspection report.</td>
</tr>
<tr>
<td><strong>Form 4</strong> may be used to gather the information needed to show why a certain category was assigned to ACBM.</td>
</tr>
</tbody>
</table>
### Example Form 1

**Inspection Report: List of Homogeneous Areas**

<table>
<thead>
<tr>
<th>Area #</th>
<th>Area Description</th>
<th>Linear or Sq. Ft.</th>
<th>L</th>
<th>S</th>
<th>Friable Y/N</th>
<th>Type S/T/M</th>
<th>ACBM Y/N</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>
# Example Form 2

## Functional Spaces/Homogeneous Areas

<table>
<thead>
<tr>
<th>Building:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td></td>
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<tr>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Functional Space Letter</th>
<th>Homogeneous Areas by Number (Obtained from Form 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
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<td></td>
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</tbody>
</table>

Key: L/S = Linear Feet/Square Feet  S/T/M = Surfacing/Thermal/Miscellaneous
### Example Form 3

#### Bulk Sample Log

<table>
<thead>
<tr>
<th>School:</th>
<th>Date Sampled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homogeneous Area:</td>
<td>Sampler’s Name:</td>
</tr>
<tr>
<td>Functional Space/Room:</td>
<td>Accreditation No.</td>
</tr>
<tr>
<td>Linear Feet:</td>
<td>Type of Suspect Material:</td>
</tr>
<tr>
<td>Square Feet:</td>
<td>Surfacing:</td>
</tr>
<tr>
<td></td>
<td>Friable:</td>
</tr>
<tr>
<td>Manner of Sampling:</td>
<td></td>
</tr>
<tr>
<td>AREA DESCRIPTION:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
<tr>
<td></td>
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</tr>
</tbody>
</table>
### Example Form 4

**Individual Assessment Form**

<table>
<thead>
<tr>
<th>AREA #:</th>
<th>AHERA CATEGORY #:</th>
</tr>
</thead>
<tbody>
<tr>
<td>DESCRIPTION:</td>
<td></td>
</tr>
</tbody>
</table>

1. **Location & Amount:**
   - 
   - 

2. **Condition, Type of Damage:**
   - 
   - 
   - **Severity of Damage:**
   - 
   - **Extent/Spread of Damage:**
   - 

3. **Accessibility:**
   - 
   - 

4. **Potential for Disturbance:**
   - 
   - 

5. **Causes of Damage:**
   - 
   - 

6. **Preventive Measures:**
   - 
   - 

<table>
<thead>
<tr>
<th>TYPE NAME:</th>
<th>SIGNATURE:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>ACCREDITATION AGENCY:</th>
<th>STATE:</th>
<th>ACCREDITATION:</th>
<th>DATE ISSUED:</th>
</tr>
</thead>
</table>
## Inspection Report Compliance Checklist

This checklist is designed to enable you to determine if the inspection report is complete and contains each and every element required by law.

### GENERAL:
1. The date of the inspection
2. The signature of each accredited person making the inspection
3. The State of accreditation of each accredited person making the inspection
4. If applicable, the accreditation number of each accredited person making the inspection

### INVENTORY OF LOCATIONS:
5. An inventory of the locations of the homogeneous areas where samples were collected
6. The exact location where each bulk sample was collected
7. The date(s) that each sample was collected
8. The homogeneous areas where friable suspected ACBM is assumed to be ACBM
9. The homogeneous areas where nonfriable suspected ACBM is assumed to be ACBM

### SAMPLING:
10. A description of the manner used to determine sampling locations
11. The name and signature of each accredited inspector who collected the samples
12. The State of accreditation of each accredited inspector who collected the samples
13. If applicable, the accreditation number of each accredited inspector who collected the samples

### MATERIALS IDENTIFIED IN HOMOGENEOUS AREAS:
14. A list of whether the homogeneous areas identified are surfacing material, thermal system insulation, or miscellaneous material

### ASSESSMENTS:
15. Assessments made of friable material
16. The name and signature of each accredited inspector who made the assessment
17. The State of accreditation of each accredited inspector who made the assessment
18. If applicable, the accreditation number of each accredited inspector who made the assessment
Introduction

Once the accredited inspector has identified the ACBM in the building(s) and has documented this information in the inspection report, an accredited management planner will use the report to identify and address hazards or potential hazards relating to the friable ACBM identified. The information from the inspection report will become part of the management plan. The management plan, which is a site-specific guidance document that the LEA designated person must follow in managing the ACBM present in each school building, must be prepared by an accredited management planner. A management plan must be updated to keep it current with ongoing operations and maintenance, periodic surveillance, inspection, reinspections and response action activities.

Table 6-1 identifies the elements required to be in the management plan under § 763.93 of the AHERA Rule. These requirements are discussed in greater detail in the remainder of this chapter.

Table 6-1

Contents of the Management Plan

General Information
- List of the names and addresses of all school buildings
- Whether the school building contains friable ACBM, nonfriable ACBM, assumed friable ACBM or assumed nonfriable ACBM

Designated Person Information
- Name, address, and telephone number of the LEA designated person
- Course name, dates, and hours of training taken by the designated person

Inspector Information
- Date of inspection or reinspection
- Name and signature of each accredited person making the inspection or reinspection
- State and accreditation number of each accredited person making the inspection or reinspection
reinspection (or copy of accreditation)

**Information on Sampling/Assumed ACBM**
- Blueprint, diagram, or written description of each school building that identifies clearly each location and approximate square or linear footage of homogeneous areas where material was sampled for ACBM
- Exact location where each bulk sample was collected
- Date of collection of each bulk sample
- Homogeneous areas where friable suspected ACBM is assumed to be ACBM
- Homogeneous areas where nonfriable suspected ACBM is assumed to be ACBM
- Description of the manner used to determine sampling locations
- Name and signature of each accredited inspector collecting samples
- State of accreditation and accreditation number of each accredited inspector collecting samples (or copies of the accreditation certificates)

**Analysis of Samples**
- Copy of the analyses of any bulk samples collected and analyzed
- Name and address of any laboratory that analyzed bulk samples
- Statement that any laboratory used meets the accreditation requirements of § 763.87(a) of the AHERA Rule
- National Voluntary Laboratory Accreditation Program number (or certificate)
- Dates of any analyses performed
- Name and signature of the person performing each analysis

**Physical Assessment Information**
- Description of the assessments required by § 763.88 of the AHERA Rule of all friable ACBM and suspected ACBM assumed to be ACM.
- Name and signature of each accredited person making the assessments
- State of accreditation and accreditation number of each accredited person making the assessment (or copies of the accreditation certificates)

**Response Action Information**
- Recommendations made to the LEA by (an) accredited management planner(s) regarding response actions
- Name and signature of each person making the recommendations
- State of accreditation and accreditation number of each person making the recommendations (or copies of the accreditation certificates)
- Detailed description of preventive measures and response actions to be taken, including methods to be used, for any friable ACBM
- Locations where such measures and actions will be taken
- Reasons for selecting the response action or preventive measure
- Schedule for beginning and completing each preventive measure and response action
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Information on ACBM Remaining after Response Actions

• A blueprint, diagram, or written description of any ACBM or suspected ACBM assumed to be ACBM that remains in the school once response actions are undertaken. This should be updated as soon as response actions are completed,
CHAPTER 6
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Information on Future Activities
• A plan for reinspection under § 763.85 of the AHERA Rule
• A plan for operations and maintenance (O&M) activities under § 763.91 of the AHERA Rule
• A plan for periodic surveillance under § 763.92 of the AHERA Rule
• Description of the management planner recommendations regarding additional cleaning under § 763.91(c)(2) of the AHERA Rule as part of an O&M program
• The response of the LEA to any recommendation for additional cleaning

Information on Required Notifications
• Copies of the notifications and description of steps taken to inform workers and building occupants (and their guardians) about inspections, re inspections, response actions, and post-response actions, including periodic surveillance, and the location and availability of the management plan on an annual basis

Periodic Surveillance Inspection Reports

Cost Estimate
• Evaluation of the resources needed to complete response actions and carry out reinspection, O&M activities, periodic surveillance and training

Consultant Information
• Name of each consultant who contributed to the management plan and accreditation certificates

Optional Information
• The LEA 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 AHERA. The statement should 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.

(See the Management Plan Compliance Checklist at the end of this chapter.)

The Laboratory Report

AHERA requires that laboratories that perform the bulk material sampling analysis and final clearance air sample analysis using Transmission Electron Microscopy (TEM) be accredited. The National Institute of Standards and Technology (NIST) has developed an accreditation program for laboratories, known as the National Voluntary Laboratory Accreditation Program (NVLAP). This program replaces the older EPA interim laboratory proficiency program; after October 30, 1989, all laboratories accredited under the EPA
interim laboratory proficiency program were required to become NIST accredited. Laboratories performing analyses under AHERA must maintain appropriate NVLAP certification. If analyses of either bulk material samples collected during the inspection process or final clearance air samples collected after a response action and analyzed using Transmission Electron Microscopy (TEM) are performed by a laboratory without current NVLAP credentials, the analyses may not be used for AHERA compliance purposes.

Under § 763.87 of the AHERA Rule, a laboratory performing a bulk sample analysis must submit the following documentation for inclusion into the management plan:

- The name and address of each laboratory performing an analysis.
- The date of the analysis.
- The name and signature of the person performing the analysis. The name and signature requirements apply to the microscopist(s) who actually performed each analysis; it is recommended that the laboratory manager also sign the reports.
- Proof that the laboratory has received NVLAP accreditation. This proof should consist of a copy of the laboratory's NVLAP certificate, not just a statement that the laboratory is accredited. For laboratory reports prepared before the NVLAP program was started, proof of the laboratory's EPA interim accreditation is acceptable but should include the laboratory's EPA laboratory accreditation number.

**Response Actions**

In the management plan, the accredited management planner must recommend an appropriate response action (operations and maintenance, repair, encapsulation, enclosure, or removal) for all areas of thermal system insulation (TSI) and friable ACBM. The final decision on which action should be taken, however, rests with the LEA. Under AHERA, the response action to be taken must be "sufficient to protect human health and the environment." Once it is determined which response actions meet these criteria, the LEA may choose the action that is the "least burdensome."

AHERA identifies five possible response actions for managing asbestos in schools:

- **Operations and Maintenance (O&M) Program** -- This is a program of work practices designed to maintain friable ACBM in good condition and ensure cleanup of asbestos fibers previously released. An effective O & M program can prevent further release by minimizing and controlling friable ACBM disturbance or damage. *(See Chapter 8 for a complete description of the O&M Program.)*

- **Repair** -- This involves returning damaged ACBM to an undamaged condition or to an intact state by replacing limited sections or patching damaged areas.
• **Encapsulation** -- This involves the treatment of ACBM with a material that surrounds or embeds asbestos fibers in an adhesive matrix to prevent the release of fibers. The encapsulant either creates a membrane over the surface (bridging encapsulant) or penetrates the material and binds its components together (penetrating encapsulant). Both types of encapsulants are applied to the material surface using airless spray equipment at low pressure to reduce release of fibers during the application.

• **Enclosure** -- This involves creating an airtight, impermeable, permanent barrier around ACBM to prevent the release of asbestos fibers into the air. The barrier is typically attached physically or sprayed on. For example, materials such as PVC or corrugated metal may be fastened around insulated piping, or a barrier may be constructed around asbestos fireproofing on structural members by spraying material that cures into a hard shell.

• **Removal** -- This involves 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.

**Selecting the Appropriate Response Action**

The LEA is required to implement an O&M program whenever any friable ACBM is present or assumed to be present in a building. An O&M program is not appropriate as an initial response action for any damaged or significantly damaged material, however. The flow charts on Figure 6-1 on the following page illustrate when each response action is appropriate.

**Project Design**

All persons who design response actions for schools or public and commercial buildings (including removal, encapsulation, enclosure, or repair -- other than small scale, short duration repairs) must be accredited as a project designer. A response action is defined by AHERA as a method that protects human health and the environment from friable ACBM. Activities which create a high probability that ACBM will be damaged or weakened to such an extent that it would be rendered friable are also considered response actions.

Although a written design is not mandated, EPA cannot recommend them strongly enough. To undertake a response action without the benefit of a written design plan to guide the work in progress is not only highly imprudent, but may unnecessarily expose the public to an asbestos fiber release and/or the building owner to certain liabilities. A written project design must be prepared by an accredited project designer. An accredited project designer is one who has received accreditation under AHERA by completing a prescribed training course for project designers and passing an exam (See Chapter 9 for further information).
CHAPTER 6
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Final Air Clearance After Response Actions

Final clearance of a functional space after a response action to remove, encapsulate, or enclose ACBM or material assumed to be ACBM involves two steps: visual inspection and the collection and analysis of air samples.

Visual Inspection

A visual inspection involves visually examining the asbestos removal area for evidence that the abatement has been successfully completed, including thorough clean-up. Visual inspections are also an important means of determining acceptable completion of small-scale, short-duration O&M or repair operations.

To avoid a potential conflict of interest, it is highly recommended that the visual inspection be performed by an inspector not affiliated with the abatement contractor or anyone else financially associated with the conducting of the asbestos response action.

The inspection should be conducted as rigorously as possible, with all spaces and surfaces where the abatement was conducted being extensively examined for residual ACBM debris. The inspection may involve:

- Scrutinizing every corner and crevice of the area within the containment barriers used to isolate the functional space for the response action
- Using a ladder to inspect hard-to-physically-reach areas
- Brushing or wiping surfaces to detect dust
- Using a flashlight beam to detect loose debris or airborne residue
- Using a damp cloth to detect dust
- Inspecting permanent fixtures in the area, such as ceiling tile grid bars, pipes, ducts, etc.
- Inspecting for asbestos-laden water, which may have leaked from the enclosure onto floor surfaces beneath the abatement area
CHAPTER 6
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• Examining surfaces for water and/or debris markings
• Checking crawl spaces on hands and knees; dirt floors may contain pulverized or impacted asbestos debris

The aim of the visual inspection is to ensure that:

• Seals on windows, doors, and vents remain in place during final air monitoring
• Isolation barriers separating the abatement area from non-abatement areas are in place
• No evidence of residue, debris, or dust is present in the abatement area

The presence of any visible residue on surfaces within the abatement area indicates a need for additional cleaning of the surfaces. If an area passes visual inspection but then fails to meet air sampling and analysis requirements after that inspection, the site must be recleaned and an additional visual inspection be conducted to detect any material that may have been uncovered or released during recleaning. Only after visual inspection clearance has been completed may final air sampling be done.

The results of the visual inspection should always be documented and signed by the person conducting the visual inspection.

Final Air Sampling and Analysis

Section 763.90 of the AHERA Rule requires that the LEA accomplish final air sampling and analysis of all removal, encapsulation, or enclosure projects by using the transmission electron microscopy (TEM) method, unless the project involves no more than 160 square feet or 260 linear feet of ACBM, in which case phase contrast microscopy (PCM) may be used. Note that no final air clearance is required for small-scale, short-duration O&M projects. (See Appendix B of the AHERA Rule for information on the types of projects that qualify as small-scale, short-duration.)

Sampling operations for airborne asbestos following an asbestos abatement action must be performed by qualified individuals completely independent of the abatement contractor to avoid possible conflict of interest. EPA recommends that the LEA obtain professional assistance to perform the sampling and analysis.

• The TEM Method

The TEM Method involves the collection of at 13 samples (five samples inside the functional space; five samples representative of air entering the abatement site; and three quality control “blank” samples). The air samples must be collected using "aggressive" methods or artificially disturbing the air in the functional space before and during sampling, as described in Appendix A, Section III(B)(7)(d) of the AHERA Rule. In most cases, only the 5 samples collected inside the functional space will be analyzed. If the average result of
the five samples collected inside the functional space is less than 70 structures per square millimeter (70 s/mm$^2$), the response action is considered complete.

If the Z-test calculation is used, all 13 samples will be needed. The response action may be considered complete when the average concentration of asbestos of the five air samples collected within the affected functional space and analyzed by the TEM method is not statistically significantly different from the average asbestos concentration of the five air samples collected outside the affected functional space and analyzed in the same manner, and the average asbestos concentration of the three quality control samples is below 70 s/mm$^2$. If the average of the three quality control samples exceeds 70 s/mm$^2$, the test is voided and resampling must be done. If the difference in average asbestos concentration between the indoor and outdoor samples is statistically significant, the contractor must reclean the functional space and resampling must be done -- usually at the contractor's expense.

- The PCM Method

The PCM method may only be used on functional spaces affecting ACBM up to 160 square feet or 260 linear feet or less. In all areas affecting larger amounts of ACBM, the TEM method must be used.

The PCM method involves collecting at least five samples inside the work area by aggressive methods as described in Appendix A, Section III (B)(7)(d) of the AHERA Rule and having them analyzed on a PCM microscope. Unlike the TEM method, the PCM method does not call for the samples to be averaged; each sample stands on its own. The clearance standard for PCM is 0.01 fibers per cubic centimeter of air (0.01 f/cc). If all five samples pass this standard, the response action is considered complete. If even one sample fails to pass the standard, the contractor must reclean the area and resampling must be done.

(See the Final Air Clearance Documentation Checklist at the end of this chapter; see Chapter 10 for a further discussion on documenting final air clearances.)

**Implementation of the Management Plan**

The LEA designated person is responsible for ensuring that the management plan is implemented and updated in a timely manner. Table 6-2 below identifies some of the activities and time requirements that must be met to achieve compliance with the AHERA Rule. If the designated person determines that an element has not been implemented as required, it must be implemented as soon as possible to limit exposure and possible enforcement actions against the school.
### Table 6-2

<table>
<thead>
<tr>
<th>Requests</th>
<th>Deadline</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The Management Plan</strong></td>
<td>The plan must be kept current with ongoing O &amp; M, periodic surveillance, inspection, reinspection, and response action activities, including updating the locations of ACBM after response actions and O &amp; M activities.</td>
</tr>
<tr>
<td><strong>O&amp;M Program</strong></td>
<td>Must begin immediately upon the identification of any friable ACBM present or assumed to be present in the building.</td>
</tr>
<tr>
<td><strong>O&amp;M Training</strong></td>
<td>In order to work in a building that may contain asbestos, custodial workers and maintenance staff members must have completed the 2-hour training class described in § 763.92(a)(1) within 60 days of employment. Workers must have completed the 14-hour training requirement described in § 763.92(a)(2) to conduct O&amp;M activities which may disturb ACBM.</td>
</tr>
<tr>
<td><strong>Periodic Surveillance</strong></td>
<td>Under § 763.92(b)(1) of the AHERA Rule, periodic surveillance must be conducted at least once every 6 months after a management plan is in effect.</td>
</tr>
<tr>
<td><strong>Warning Labels</strong></td>
<td>Must be posted as soon as possible after identification of ACBM in any routine maintenance area.</td>
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<tr>
<td>(cont.)</td>
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</tbody>
</table>
CHAPTER 6  
The Management Plan

Implementation Requirements for Operations Associated with the Management Plan (cont.)

<table>
<thead>
<tr>
<th>Requests</th>
<th>Deadline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management Plan Availability for Public Review</td>
<td>The plan must have been made available for public review in the administrative office of the LEA on the date on which it was submitted to the Governor for review. Notification of the plan availability must be made annually.</td>
</tr>
<tr>
<td>Isolate a Functional Space with Significantly Damaged Friable Surfacing ACBM</td>
<td>Must be isolated immediately and access restricted if such measures are needed to protect human health and the environment.</td>
</tr>
<tr>
<td>Repair and Maintain Damaged or Significantly Damaged TSI</td>
<td>Must begin as soon as a management planner and LEA determine that these conditions exist.</td>
</tr>
</tbody>
</table>

Common Management Plan Problems and Deficiencies

EPA has found two common problems in management plans:

- Although management plans were generally complete, in many instances the location of homogeneous materials was not described clearly, and the material classification (TSI, surfacing material, or miscellaneous) was often incorrect.

- Many management plans were not "user-friendly" and required specialized instruction to understand. Because the management plan is the basis for all asbestos work done in the school and is a guide for anyone who could disturb ACBM during maintenance or custodial work, EPA recommends that the LEA review the management plan for clarity and usability. In doing so, the LEA should ensure that the response actions described in the plan are specific to the site and to the ACBM involved, and that the implementation schedule is clear.

Management plans also often omit the description of final air sample clearance locations. The designated person should check the management plan to see that all clearance criteria were met and documented. Because of the complexity of the sampling requirements, it is recommended that a professional consultant/air monitoring firm be retained to assist in this activity.
FREQUENT PROBLEMS WITH MANAGEMENT PLANS

The Asbestos Management Plans (Plan) should be considered "living" document. Some Plans are left exactly the same as they were when they were created, with no updates whatsoever. This is particularly true with respect to required records of periodic surveillances, annual notifications, response actions or fiber releases, and for records of the two-hour and sixteen-hour training for school employees and maintenance workers. In fact, the administrative staff at individual schools are sometimes unaware of the existence of management plans and/or do not know where the school's copy of the plan is kept.

Copies of all pertinent certification credentials for AHERA inspectors, management planners, project designers, workers and supervisors who have participated in any response actions are required to be in the management plan, but are not always included. Also proper documentation of air samplers' and laboratories' accreditations are sometimes missing from Plans.

Homogeneous areas are often not clearly (and frequently are not properly) defined on the basis of color, texture, size. Plaster and sheetrock are probably the most often overlooked materials which are likely to comprise major areas of suspected asbestos-containing building materials (ACBM). Sampling locations within the individual homogenous areas are often not described precisely enough to provide for any relocation of individual original sampling sites with any degree of certainty.

Frequently insufficient numbers of samples are collected from individual homogeneous areas (the correct minimum number being dependent upon the type of building material and the homogeneous area size), and the sites for the sampling which was done may have been selected in a manner other than as is set forth in the management plan for how sampling locations were to have been determined. Also, where warning signs are required, they may be missing, or if present, they may not employ the prescribed text.

Sometimes functional areas are not taken into consideration in the preparation of assessment and response actions recommendations. Also recommended response actions may not have been carried out according to schedules shown in the management plans and explanations or changes in the schedules may be absent.

Portable buildings on school grounds are sometimes overlooked in management plans, or these units may have been moved onto or off of a school's grounds without the school's management plan having been updated.
### Chapter 6 Summary

#### Key Points About the Management Plan

The management plan is a **site-specific guidance document** that the LEA designated person must follow in managing the ACBM present in a school building.

The management plan must be prepared by an **accredited management planner** and must be updated in a timely manner.

The management plan must include the documentation required under § 763.87 of the AHERA Rule for each laboratory performing a bulk sample analysis and the results of each analysis.

In the management plan, the management planner must recommend an **appropriate response action** (operations and maintenance, repair, encapsulation, enclosure, or removal) for all areas of TSI and friable ACBM (including ACBM which has the potential of becoming friable).

All of the initial response actions implemented to control friable asbestos require a **project design** specifying how to conduct the abatement project.

**Final air clearance** of a functional space after a response action to remove, encapsulate, or enclose ACBM involves a **visual inspection** and the collection and analysis of **air samples**.

Final air sampling must be done using the transmission electron microscopy (TEM) method, unless the project involves no more than 160 square feet or 260 linear feet, in which case phase contrast microscopy (PCM) may be used.

The LEA designated person is responsible for ensuring that the activities related to the management plan are implemented and that the management plan is updated in a timely manner.
<table>
<thead>
<tr>
<th><strong>GENERAL INFORMATION</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. List of the name and address of each school building</td>
</tr>
<tr>
<td>2. Whether the school building contains friable ACBM, nonfriable ACBM, and friable and nonfriable ACBM assumed to be ACBM</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>DESIGNATED PERSON INFORMATION</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>3. The name, address, and telephone number of the designated person</td>
</tr>
<tr>
<td>4. The course name, dates, and hours of training taken by the designated person to carry out his or her duties</td>
</tr>
<tr>
<td>5. Signed statement by the AHERA designated person that the LEA responsibilities under AHERA Rule has been or will be met</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>INSPECTOR INFORMATION</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>6. The date of inspection or reinspection</td>
</tr>
<tr>
<td>7. The name and signature of each accredited person making the inspection or reinspection</td>
</tr>
<tr>
<td>8. The State, accreditation number, and name of training provider for each accredited inspector making the inspection or reinspection (copy of certificate is ideal)</td>
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</tbody>
</table>

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<tr>
<th><strong>SAMPLING INFORMATION</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>9. A blueprint, diagram, or written description of each school building that identifies clearly each location and approximate square or linear footage of homogeneous areas where material was sampled for ACM</td>
</tr>
<tr>
<td>10. The exact location where each bulk sample was collected</td>
</tr>
<tr>
<td>11. The date of collection of each bulk sample</td>
</tr>
<tr>
<td>12. The homogeneous areas where friable suspected ACBM is assumed to be ACBM</td>
</tr>
<tr>
<td>13. The homogeneous areas where nonfriable suspected ACBM is assumed to be ACBM</td>
</tr>
<tr>
<td>14. A description of how sampling locations were determined</td>
</tr>
<tr>
<td>15. The name and signature of each accredited inspector who collected the samples</td>
</tr>
<tr>
<td>16. State, accreditation number and name of training provider of each accredited inspector who collected the samples (copy of accreditation certificate is ideal)</td>
</tr>
</tbody>
</table>
CHAPTER 6
The Management Plan

ANALYSIS OF SAMPLES

17. A copy of the analyses of any bulk samples collected and analyzed
18. The name and address of any laboratory that analyzed bulk samples
19. A statement that any laboratory used meets the accreditation requirements of § 763.87(a) (copy of the accreditation is ideal)
20. The dates of any analyses performed
21. The name and signature of the person performing each analysis

PHYSICAL ASSESSMENT INFORMATION

22. A description of the assessments required by § 763.88 of all friable ACBM and suspected ACBM assumed to be ACBM.
23. The name and signature of each accredited person making the assessments
24. The State, accreditation number and name of training provider for each person making the assessments (copy of certificate is ideal).

RESPONSE ACTION INFORMATION

25. Recommendations made to the LEA regarding response actions
26. The name and signature of each person making the recommendations
27. The State, accreditation number, and name of training provider for each person making the recommendations (copy of certificate is ideal).
28. A detailed description of preventive measures and response actions to be taken, including methods to be used, for any friable ACBM
29. The locations where such measures and actions will be taken
30. The reasons for selecting the response action or preventive measure
31. A schedule for beginning and completing each preventive measure and response action

INFORMATION ON ACBM REMAINING AFTER RESPONSE ACTIONS

32. A blueprint, diagram, or written description, updated as response actions are completed, of any ACBM or suspected ACBM assumed to be ACBM that remains in the school once response actions are completed

INFORMATION ON OTHER ACTIVITIES

33. A plan for reinspection and copies of the reports required under § 763.85
Management Plan Compliance Checklist (cont.)

34. A plan for operations and maintenance (O&M) activities under § 763.91
35. A plan for periodic surveillance and copies of the reports (see § 763.92)
36. A description of the management planner recommendations regarding additional cleaning under § 763.91(c)(2) as part of an O&M program and documentation of cleaning
37. A description of steps taken to inform workers and building occupants about inspections, reinspections, response actions, and post-response actions, including periodic surveillance
38. An evaluation of the resources needed to complete response actions and carry out reinspection, O&M activities, periodic surveillance and training
39. The name of each consultant who contributed to the management plan
40. With respect to each consultant who contributed to the management plan, a copy of the accreditation certificate (or name of training provider, State and accreditation number)
41. The response of the LEA to any recommendation for additional cleaning

Checklist of Final Air Clearance Documentation

This checklist will indicate whether each final clearance was properly documented.

1. The name and signature of any person collecting any air sample required to be collected at the completion of a response action
2. The locations where those samples were collected
3. The name and address of the laboratory, analyzing the samples
4. The date(s) of analysis
5. The results of analysis
6. The method of analysis
7. The name and signature of the person performing the analysis
8. Evidence that the laboratory is NVLAP accredited
REINSPECTIONS AND PERIODIC SURVEILLANCE

Introduction

Every three years after implementation of a management plan, an accredited inspector must conduct a reinspection of all friable and nonfriable known or assumed ACBM in every school building in order to determine if there has been any change in the condition of the ACBM. An accredited management planner must then review the reinspection report to identify any new hazard potential and revise the management plan to address newly identified hazards. Based on the updated data, new response actions to address these hazards must be selected, and these actions must be carried out in a timely manner.

The reinspection process presents an ideal time for an accredited inspector and management planner to address any problems found in the initial inspection report and management plan. EPA's document *A Guide to Performing Reinspections Under the Asbestos Hazard Emergency Response Act (AHERA)* (March 1992) is useful in planning and assessing the reinspection requirements.

Inspector Responsibilities

Under § 763.85(b) of the AHERA Rule, in conducting a reinspection, the inspector must:

- Visually reinspect and reassess the condition of all friable known or assumed ACBM.
- Visually inspect material that was previously considered nonfriable and touch the material to determine whether it has become friable since the last inspection or reinspection.
- Identify any homogeneous areas in which material has become friable since the last inspection or reinspection.
- Bulk samples may be collected and submitted for analysis for any homogeneous area of newly friable material that is already assumed to be ACBM.
- Perform a physical assessment, in accordance with § 763.88 of the AHERA Rule, of the condition of the newly friable material in areas where samples are collected and of newly friable materials in areas assumed to be ACBM.
- Reassess the condition of friable known or assumed ACBM previously identified.
CHAPTER 7
Reinspections and Periodic Surveillance

- Record and submit the following information for inclusion in the management plan to the LEA designated person within 30 days of the reinspection:
  - Date of the reinspection
  - Name and signature of the person conducting the reinspection
  - State, accreditation number, and training provider name for any person conducting the reinspection (copy of certificate is ideal)
  - Exact locations where samples were collected during the reinspection
  - Description of the manner used to determine sampling locations
  - Name and signature of each accredited inspector who collected the samples
  - State, accreditation number, and training provider name for each inspector who collected the samples (copy of certificate is ideal)
  - Any assessments or reassessments made of friable material
  - Name and signature of the accredited inspector making the assessments
  - State, accreditation number and training provider name for each inspector making the assessments (copy of certificate is ideal)

**Management Planner Responsibilities**

Once a reinspection is completed, the management planner must:

- Review the results of the reinspection. This includes reviewing the original inspection report, periodic surveillance records, and the completed reinspection forms and report. The management planner should conduct school visits and gather other information so that he or she can make effective response action recommendations.

- Make written response action and preventive measure recommendations for each area of friable surfacing and miscellaneous ACBM and each area of TSI ACBM. The management planner should determine whether additional cleaning is necessary and, if so, specify how, when, and where to perform cleaning. The management planner should also include an implementation schedule for the recommended activities and make an estimate regarding the resources (cost, personnel, equipment, etc.) needed to conduct the activities.

- Review the adequacy of the Operations & Maintenance Program.

- The recommendations should include a record of the name, signature, State, accreditation number and training provider name for the management planner (copy of certificate is ideal) and the date on which the management planner submitted the recommendations.

Reinspections and Periodic Surveillance

Periodic Surveillance

At least once every six months after a management plan is in effect, the LEA must conduct periodic surveillance in each building that contains ACBM or is assumed to contain ACBM. The surveillance does not have to be conducted by an accredited person, but it should be conducted either by the LEA designated person (if he or she is trained) or by someone who is appropriately trained on asbestos (such as a maintenance person).

Periodic surveillance involves a visual inspection of all areas that are identified in the management plan as ACBM or assumed ACBM. In evaluating each homogeneous area, the person conducting the surveillance must visually inspect all areas identified in the management plan as ACBM or suspected ACBM and record whether there are any changes in the condition of the material (including if there are no changes). The date of the surveillance, the name of the person conducting the surveillance, and any change in condition of the ACBM or assumed ACBM must be documented and included in the management plan within a reasonable amount of time, such as 30 days from the periodic surveillance.

<table>
<thead>
<tr>
<th>Chapter 7 Summary</th>
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<tbody>
<tr>
<td>Key Points About Reinspections and Periodic Surveillance</td>
</tr>
</tbody>
</table>

As long as any ACBM remains in a school building, the building must be **reinspected** at least once every three years.

The reinspection and assessments/reassessments must be conducted by an **accredited inspector**. The results of the inspection must be submitted to the Designated Person within 30 days to include into the management plan.

The **management planner** must: 1) review the results of the reinspection, 2) make written response action and preventive measure recommendations for each area of friable surfacing and miscellaneous ACBM and each area of TSI ACBM, 3) determine whether additional cleaning is necessary and, if so, specify how, when, and where to perform cleaning, 4) include an implementation schedule for the recommended activities and make an estimate regarding the resources needed to conduct the activities, and 5) review the adequacy of the Operations & Maintenance Program.

At least once every six months after a management plan is in effect, the LEA must conduct **periodic surveillance** in each building that contains ACBM or is assumed to contain ACBM.
THE OPERATIONS AND MAINTENANCE PROGRAM

Introduction

As discussed in Chapter 6, the management planner is responsible for recommending appropriate response actions for managing ACBM found in a school building. An operations and maintenance (O&M) program must be implemented whenever any asbestos-containing building materials are found in a school building. The purpose of the O&M program is to prevent the release of asbestos fibers through careful management of asbestos-containing building materials.

*Managing Asbestos in Place, A Building Owner's Guide to Operations and Maintenance Programs for ACM* (the "Green Book") offers important information on how to implement an O&M program effectively.

Objectives of the O&M Program

An O&M program consists of a set of procedures and practices for operating and maintaining a building to keep it as free of asbestos contamination as possible. The program should be designed specifically to address the ACBM present in the building involved.

An O&M program has three main objectives:

- Clean up existing contamination.
- Minimize future fiber release by controlling access to ACBM and instituting proper work practices.
- Properly maintain the ACBM until it is removed.

Since National Emission Standards for Hazardous Air Pollutants (NESHAP) regulations (See Chapter 11 for a discussion of NESHAP) require that friable and nonfriable ACBM which is likely to become friable be removed from buildings before demolition, the O&M program is not a permanent solution. In addition, the asbestos NESHAP may regulate the removal of asbestos as part of a renovation. It is also not a means by which full-scale
asbestos abatement can be accomplished. The intentional disturbance of ACBM should be limited to the repair or removal of small areas of significantly damaged ACBM or to small areas where removal is necessary to make maintenance or minor renovation activities easier. Some small scale, short duration activities may be subject to asbestos NESHAP requirements if enough ACBM will be disturbed during a calendar year. Larger abatement projects that require extensive planning and technical expertise may not be part of the AHERA O&M program. Limited encapsulation and enclosure could be used to enhance an O&M program by reducing the likelihood of contact with the ACBM, however.

**Required Elements of An O&M Program**

Under § 763.91 of the AHERA Rule, the LEA must ensure that the O&M program involve the following elements:

- Cleaning
- Specialized work practices and procedures for O&M activities disturbing friable ACBM
- Training
- Emergency Response Procedures

**Cleaning**

All areas of a building where friable ACBM and suspected ACBM, or significantly damaged TSI ACBM is present must be cleaned at least once after the completion of the AHERA inspection. It must also be cleaned before the initiation of any response action (other than O&M activities or repair). The exception would be where the building had been cleaned using similar methods within the previous six months. The cleaning must include the following:

- HEPA-vacuuming or steam-cleaning all carpets
- HEPA-vacuuming or wet-cleaning all other floors and all other horizontal surfaces
- Disposing of all debris, filters, mopheads, and cloths in sealed, leak-tight containers

The management planner may also recommend that additional cleaning be performed. The methods and frequency of any additional recommended cleaning should be included in the management plan.

**Specialized Work Practices and Procedures**

The LEA must ensure that the following procedures are followed for any O&M activities disturbing friable ACBM:

- Restrict entry into the area by persons other than those necessary to perform the
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The Operations & Maintenance Program

maintenance project.

- Post signs to prevent entry by unauthorized persons.

- Shut off or temporarily modify the air-handling system and restrict other sources of air movement.

- Use work practices or other controls, such as wet methods, protective clothing, HEPA vacuums, mini-enclosures, and glove bags, as necessary to inhibit the spread of any released fibers.

- Clean all fixtures or other components in the immediate work area.

- Place the asbestos debris and other cleaning materials in a sealed, leak-tight container.

Training

Within 60 days of hire, maintenance and custodial staff who may work in a building that contains ACBM must receive at least two hours of asbestos awareness training. Those members of the maintenance and custodial staff who conduct any activity that will disturb ACBM must receive an additional 14 hours of training. Other state and local training requirements may apply. (See Chapter 9 for further information on training requirements.)

Emergency Response Procedures

As long as ACBM remains in a building, there is a risk of a fiber release episode. Custodial and maintenance workers should be aware of this and should always report any of the following occurrences to the LEA designated person:

- Any debris found on the floor or other horizontal surface
- Any water or physical damage to the ACBM
- Any other evidence of possible fiber release

There are two types of fiber release episodes: minor episodes and major episodes. The specific procedures that must be followed depend on which type of episode occurs.

Minor Fiber Release Episode

A minor fiber release episode consists of the falling or dislodging of three square or linear feet or less of friable ACBM. Section 763.91(f)(1) of the AHERA Rule requires that when such an event occurs, the LEA must ensure that:

- The debris is thoroughly saturated using wet methods
- The area is cleaned
- The asbestos debris is placed in a sealed, leak-tight container
• The area of damaged ACBM is repaired with such materials as asbestos-free spackling, plaster, cement, or insulation; sealed with latex paint or an encapsulant; or an appropriate response action is implemented as required by § 763.90 of the AHERA Rule.

When a minor fiber release episode occurs, AHERA allows the designated person to assign an appropriately trained O&M in-house team to clean up the debris and make repairs as soon as possible. (See Chapter 9 on training requirements.) Note, however, that local regulations may be more stringent than the AHERA requirements.

**Major Fiber Release Episode**

A major fiber release episode consists of the falling or dislodging of more than three square or linear feet of friable ACBM. Section 763.91(f)(2) of the AHERA Rule requires that when such an episode occurs, the LEA must ensure that:

- Entry into the area is restricted and signs posted to prevent entry into the area by persons other than those necessary to perform the response action.
- The air-handling system is shut off or temporarily modified to prevent the distribution of fibers to other areas in the building.
- The response action for any major fiber release episode is designed by persons accredited to design response actions and conducted by persons accredited to conduct response actions.

After a response action is implemented to manage a major fiber release episode, the final air clearance requirements of AHERA must be met before the response action is considered complete. (See Chapter 6 on the final air clearance requirements.)

**Major and minor fiber-release episodes must be documented and included in the management plan regardless of whether the LEA uses in-house staff or an outside asbestos abatement contractor to implement an appropriate response action.** If an outside contractor is used, be sure that the contractor's crew has been properly trained or certified before signing a contract. (See the Fiber Release Episode Report at the end of this chapter.)

**Other Elements of an O&M Program**

In addition to the elements required by § 763.91 of the AHERA Rule, other elements are either recommended or required by the rule or related regulations. These include:

- Notification
- Labeling
- Employee Protection and Medical Surveillance
- Maintenance and Renovation Permit System
- Special Work Practices for Maintenance Activities
CHAPTER 8
The Operations & Maintenance Program

- Special Work Practices for Renovation/Remodeling

Notification

Once ACBM is identified or assumed to be present in a building, the LEA must provide an annual written notification to building occupants, employees, and parents on the locations of asbestos-containing building materials in the school buildings, the availability of the asbestos management plan, and recent and upcoming asbestos activities, such as abatement projects, reinspections, etc. Other types of information to include in the notification are: what asbestos is and how it is typically used; the health effects associated with asbestos exposure; the type(s) of ACBM present in the building; the location(s) of these materials; how individuals can avoid disturbing the ACBM; how damage is recognized and to whom it should be reported; how custodial and maintenance personnel are dealing with these materials to prevent fiber release; the asbestos-related training for custodial and maintenance personnel; the steps that will be taken to protect the health and safety of building occupants; and the name and telephone number of the LEA designated person responsible for asbestos-related activities in the building.

Such a notification alerts affected parties to a potential hazard in the building. Building occupants, employees, and others who are aware of the presence of ACBM are less likely to disturb the material and cause fiber release.

Notification of building occupants, employees, parents and others is best accomplished through distributing written notices, which may be tailored to specific parties. A common practice is to publish the notification in the school's newsletter, which is distributed to school employees and parents. The designated person must document the notification process and maintain records of all notifications made.

Labeling

Under § 763.95 of the AHERA Rule, the LEA must attach a warning label immediately adjacent to any friable and nonfriable ACBM and suspected ACBM that is located in routine maintenance areas (such as boiler rooms) at each school building. Such material includes friable ACBM that was responded to by a means other than removal (e.g., encapsulation) and ACBM for which no response action was carried out.

The labels must be prominently displayed in readily visible locations, must be in print that is readily visible due to its large size or bright color, and must remain posted until the ACBM that is labeled is removed. The warning label must read:

CAUTION: ASBESTOS. HAZARDOUS. DO NOT DISTURB WITHOUT PROPER TRAINING AND EQUIPMENT.

Unlike notification, labeling is not intended as a way to disseminate general information. Instead, it is a last line of defense to prevent unprotected individuals from unknowingly
disturbing ACBM.

Employee Protection & Medical Surveillance Programs

The OSHA Asbestos Standard for the Construction Industry and the EPA Worker Protection Rule explain when employees are required to wear a negative-pressure respirator and must be involved in a medical surveillance program (see also OSHA Asbestos Standard for General Industry). The purpose of a medical surveillance program is to determine whether or not an employee is healthy enough to wear a respirator and to detect any health changes in an employee's body resulting from working in asbestos-contaminated areas. Changes in health may indicate the onset of an asbestos-related disease.

In addition, any employee who works in an environment where fiber levels are at the permissible exposure limit or higher or who wears a negative-pressure respirator as part of his or her job must participate in a respiratory protection program. The only way to determine whether these fiber levels exist is to collect air samples during projects that disturb ACBM. In an O&M program, the use of negative-pressure respirators will make it necessary for most custodial and maintenance workers to participate in both the medical surveillance program and the respiratory protection program. Even if fiber levels are below the permissible exposure limit described above, it is strongly suggested that an LEA establish these programs and require that employees wear respirators any time they are likely to disturb ACBM.

Maintenance & Renovation Permit System

One of the most difficult tasks that the LEA designated person faces is minimizing accidental disturbances of ACBM during maintenance and renovation operations. One way that a designated person can control such disturbances is by establishing a permit system where all work orders or requests are processed through the designated person.

In a permit system, all requests for maintenance or renovation activities are given to the designated person before a work order to proceed is issued. The designated person then checks the management plan for information about the presence of ACBM where work is to be performed and physically inspects the area in question to make sure that the records reflect actual conditions. If no asbestos is present, the designated person can sign and issue the work order. If ACBM is present, the designated person can sign the work order and then either ensure that trained maintenance or renovation workers are properly equipped to handle the ACBM or dispatch an "emergency response" team to remove the ACBM. In situations where there are large amounts of ACBM, maintenance or renovation work that does not have to be done immediately should be postponed until the ACBM in the area can be removed by an accredited contractor. The permit system should be in place for all facility maintenance work conducted by the LEA staff, outside contractors, and outside short-term workers.

When outside contractors or short-term workers are likely to come into contact with
ACBM in a school building, they must be notified of the locations of ACBM or suspected ACBM in the building. This notification should be documented. These workers should have documentation of appropriate training, should they disturb ACBM during their work. Note that State licensing requirements vary.

(See Example Form 5 at the end of this chapter for an example of a maintenance and renovation permit application.)

Special Work Practices for Maintenance Activities

In buildings where ACBM is present, routine maintenance activities, such as work on light fixtures, plumbing fixtures and pipes, air registers, HVAC ducts, and other accessible parts of a building's utility systems, can disturb ACBM and raise levels of airborne asbestos. As a result, maintenance workers should be instructed not to perform any maintenance work that could disturb ACBM unless they are appropriately trained and use specific work practices. These work practices should be tailored to reflect the likelihood that an activity will disturb the ACBM and cause fibers to be released. In determining which work practices should be followed, activities should be placed in one of four categories:

- **Contact with ACBM Unlikely** -- In some buildings with ACBM, many routine maintenance activities can be conducted without contacting the ACBM. Changing a light bulb in a fixture that has asbestos-containing acoustical plaster nearby can usually be performed without jarring the fixture, for example. *(Note that under the AHERA Rule, the top of the fixture should already have been wet-cleaned to remove settled fibers.)* In such situations where contact with ACBM is unlikely, the only precaution other than normal care generally necessary is to ensure that respirators and a HEPA vacuum are available if needed. These do not have to be taken to the site of the project; they should just be available at a known location in the building.

When maintenance is performed in parts of the building that are free of ACBM, no special precautions are usually necessary. An exception would be work in an area containing no ACBM that causes vibrations to be transferred to a location where ACBM is present.

- **Accidental Disturbance of ACBM Possible** -- Where routine maintenance and repair activities are conducted on fixtures or system parts that are located near friable ACBM, maintenance workers may unintentionally disturb the ACBM and release asbestos fibers. Maintenance work on ventilation ducts in an air-handling room where asbestos fireproofing is on the structural beams could accidentally disturb the fireproofing, for example.

For a discussion of the work practices needed where an accidental disturbance of ACBM is possible, see the Green Book.

- **Disturbance of ACBM Intended or Likely** -- Some maintenance and repair activities
will make ACBM disturbance almost unavoidable. Installing new sprinkler or piping systems will make it necessary to hang pipes from structural members or from the ceiling, and if the beams or ceilings are insulated with ACBM, the ACBM will be scraped away to install hangers. Similarly, pulling cables or wires through spaces with ACBM or ACBM debris is likely to dislodge pieces of the ACBM or disturb ACBM debris and dust. Any time ceiling tiles are moved to allow for entry into the space above a suspended ceiling, settled dust on top of the tiles will be recirculated into the air. If the beams or decking above the ceiling are covered with ACBM, the dust is likely to contain asbestos fibers.

A designated person should not allow such intentional disturbances of ACBM to proceed in an uncontrolled manner. The designated person should ensure that the elements required under § 763.91 of the AHERA Rule to be part of an O&M program are implemented effectively and that the regulatory requirements of the EPA Worker Protection Rule and the OSHA Asbestos Standard for the Construction Industry are followed.

• **A Large Amount of ACBM Will be Disturbed** -- If the maintenance work is part of general building renovation, federal regulations may require that ACBM be removed before the project begins. Even if smaller amounts of ACBM are to be disturbed, building owners should consider removing all ACBM from the area of the building where the maintenance work is planned. Typically, an outside abatement contractor would be hired for the removal project before the maintenance work begins. If the LEA decides to use its own staff to remove the ACBM, these workers must be fully trained and accredited in asbestos abatement. *(See Chapter 9 for information on the training and accreditation requirements for asbestos abatement.)*

**Maintenance of Vinyl Asbestos Tile**

(Revised from a "Guidelines for the Maintenance of Asbestos-Containing Floor Coverings" developed by Rhode Island Department of Health and the Environmental Protection Agency, New England)

Vinyl Asbestos Tile (VAT) is the most prevalent source of asbestos containing material in our schools and most likely will be for years to come. Although VAT is considered non-friable, the frictional forces exerted on these materials during routine floor-care maintenance operations can release asbestos fibers.

The principle types of floor covering maintenance performed routinely on resilient floor tiles include:
1) spray-buffing and dry burnishing; and
2) wet scrubbing and stripping followed by refinishing.

The following are guidelines on the maintenance of asbestos-containing floor coverings. When properly implemented, these guidelines should help you reduce the potential for the release of asbestos fibers into the air. You may want to keep a copy of these guidelines in the Operations and Maintenance section of your AHERA Management Plan.
Stripping of Vinyl Asbestos Floor Coverings

Training
Custodial and maintenance personnel who are responsible for the care and maintenance of asbestos containing floor coverings should be thoroughly trained to safely and properly operate the machines, pads and floor care chemicals used at the facility.

Frequency of Stripping
Stripping of vinyl asbestos floor coverings should be done as infrequently as possible (e.g., once per year maximum and preferably when the building is unoccupied). Excessive stripping of floors using aggressive techniques will result in increased levels of asbestos fibers in the air.

Prior to Stripping
Prior to machine operation, apply an emulsion of chemical stripper in water to the floor. Use a mop to soften the wax or finish coat.

Stripping Operations
When stripping floors becomes necessary, the machine used for stripping the finish should be equipped with the least abrasive pad as possible (black pads are usually the most abrasive and the white pad the least abrasive). Consult with your floor tile and floor finish product manufacturer for recommendations on which pad to use on a particular floor covering. Incorporate the manufacturer's recommendations into your floor maintenance work procedures.

The machine used to remove the wax or finish coat should be run at a low rate of speed (i.e., ranging between 175-300 rpm) during the stripping operation. There is a direct correlation between machine speeds and the release of asbestos fibers from asbestos containing floor coverings. The higher the machine speed the greater the probability of asbestos fiber release.

Never perform dry stripping. Always strip floors while wet. Do not operate a floor machine with an abrasive pad on unwaxed or unfinished floor containing-asbestos materials.

Consult with floor tile and floor finish product manufacturers concerning specific or unique problem(s) on the maintenance of your floors.

After Stripping
After stripping and before application of a high solids floor finish, the floor should be thoroughly cleaned, while wet, preferably with a Wet-Vac HEPA filtration vacuum system.

Finishing of Vinyl Asbestos Floor Coverings
Use of Sealer and Solids Finish
Prior to applying a finish coat to a vinyl asbestos floor covering, apply 2 to 3 coats of sealer. Continue to finish the floor with a high percentage solids finish.

It is an industry recommendation to apply several thin coats of a high percentage solid finish to obtain a good sealing of the floor's surface, thereby minimizing the release of asbestos fibers during finishing work.

Spray-Buffing Floors
When spray-buffing floors, always operate the floor machine at the lowest rates of speed possible and equip the floor machine with the least abrasive pad as possible. A recent EPA study indicated that spray-buffing with high-speed floor machines resulted in significantly higher airborne asbestos fiber concentrations than spray-buffing with low speed machines.

Burnishing Floors
When dry-burnishing floors, always operate the floor machine at the lowest rate of speed possible to accomplish the task (i.e., 1200-1750 rpms), and equip the floor machine with the least abrasive pad as possible.

Cleaning After Stripping & Sealing Floors
After stripping a floor and applying a new coat of sealer and finish, use a wet mop for routine cleaning whenever possible. When dry mopping, a petroleum-based mop treatment is not recommended for use.

Maintenance During Winter
During the winter months when sanding and/or salting of icy parking lots becomes necessary, it is an industry recommendation that matting be used at the entrance way to the school building and inside the doorway where feasible. This would significantly eliminate the scuffing of floors by abrasive sanding materials brought into the building on the shoes of building occupants. More frequent wet mopping and dry mopping of floors should be performed during the winter months to minimize damage to the floors.

The same recommendations holds true of schools located on coastal areas where building occupants could track sand into the schools.

Additional Precautions

Conditions of Glides
Check to see if chair and desk glides are in good condition and replace where indicated. Worn glides can gouge the floor coverings and possibly cause asbestos fiber release.

Parking Lot/Walkway Maintenance
During the winter months, have parking lots and walkways swept to avoid tracking salt and ice-melting compounds into the school by students. These materials can cause severe scuffing of floor coverings and lead to the release of asbestos fibers into the school.
 CHAPTER 8  
The Operations & Maintenance Program  

building(s).

Use of Mats
Where feasible, use mats at entrance ways to cafeterias, gymnasiums, libraries, etc., to protect against possible scuffing of floor covering(s), etc. from salt and ice-melting compounds and from ocean sand.

Special Work Practices for Renovation/Remodeling

Building renovation or building system replacement can cause major disturbances of ACBM that are beyond the scope of school O&M programs. Moving walls, adding wings, and replacing heating or air conditioning systems are likely to involve breaking, cutting, or otherwise disturbing ACBM that may be present. It is highly recommended that ACBM that may be disturbed be removed before any of these activities are begun. The LEA may be required to remove the ACBM if the amount of ACBM that is likely to be disturbed exceeds the threshold amounts of 160 square feet or 260 linear feet established by the National Emission Standards for Hazardous Air Pollutants (NESHAP) regulations. (See Chapter 11 for further information on the Asbestos NESHAP regulations.)

Although remodeling projects change the building structure less dramatically than renovation projects, disturbances of ACBM are still possible. When a remodeling project involves direct contact with ACBM (such as painting or wallpapering over ACBM), the O&M procedures described in § 763.91(d) of the AHERA Rule must be followed. If the work to be done will make the material friable, the work must either be limited to small-scale, short-duration or be treated as a response action.

Handling and Disposing of Asbestos Wastes

The amount and type of asbestos present both determine whether the LEA must notify EPA (or delegated states) and what procedures that the LEA must follow to control asbestos emissions. If the amount exceeds the regulatory threshold, then a written notification must be submitted ten working days prior to any asbestos stripping or removal operation or demolition operation. EPA regulations (along with state and local requirements) provide detailed instructions on the handling, transport, and disposal of asbestos materials. This includes emission control methods (such as wetting and leak proof wrapping), labels on the containers, recordkeeping and a trained representative on-site. Waste must be disposed of at a site meeting federal, state and local requirements. For a site in your area, contact the local public health department.
**Chapter 8 Summary**

**Key Points About the Operations and Maintenance Program**

<table>
<thead>
<tr>
<th>An O&amp;M program must be implemented whenever any friable ACBM is present or assumed to be present in a school building or whenever any nonfriable ACBM or assumed nonfriable ACBM is about to become friable as a result of activities performed in the school building.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unless the building has been cleaned using similar methods in the previous 6 months, all areas of a building where friable ACBM, friable suspected ACBM assumed to be ACBM, or significantly damaged TSI ACBM is present must be cleaned using the methods described at § 763.91(c) of the AHERA Rule at least once after the completion of the AHERA inspection and before the initiation of any response action, other than O&amp;M activities or repair.</td>
</tr>
<tr>
<td>Specialized work practices and procedures must be followed for any O&amp;M activities disturbing friable ACBM.</td>
</tr>
<tr>
<td>When a fiber release episode occurs, the work practices that must be followed depend on whether the episode is minor or major in nature. A <strong>minor fiber release episode</strong> consists of the falling or dislodging of 3 square or linear feet or less of friable ACBM. A <strong>major fiber release episode</strong> consists of the falling or dislodging of more than 3 square or linear feet of friable ACBM.</td>
</tr>
<tr>
<td>Once ACBM is identified or assumed to be present, the LEA should start a <strong>notification and warning program</strong> to alert affected parties to a potential hazard in the building and to provide basic information on how to avoid the hazard.</td>
</tr>
<tr>
<td>The LEA is required to attach a <strong>warning label</strong> immediately adjacent to any friable and nonfriable ACBM and suspected ACBM that is assumed to be ACBM that is located in routine maintenance areas.</td>
</tr>
<tr>
<td>Where employees work in areas where fiber levels exceed permissible exposure limits or are required to wear pressure respirators, the LEA must establish <strong>medical surveillance and respiratory protection programs</strong>.</td>
</tr>
<tr>
<td>A designated person can minimize accidental disturbances of ACBM during maintenance and renovation activities by establishing a <strong>permit system</strong> that calls for all work orders and requests to be processed through the designated person.</td>
</tr>
<tr>
<td>The specific work practices that must be followed when routine maintenance activities are being conducted depend on the likelihood that the activities will disturb the ACBM and cause fibers to be released.</td>
</tr>
</tbody>
</table>
## Fiber Release Episode Report

1. Address, building, and room number(s) (or description of area) where episode occurred:
   
2. The release episode was reported by __________________________ on _____________ (date).

3. Describe the episode:
   
4. The asbestos-containing material was ____/was not ____ cleaned up according to approved procedures.

   Describe the cleanup:

Signed _______________ Date: _______________

(Asbestos Program Manager)
# Example Form 5

## Work Permit Application

1. **Address, building, and room number (or description) where work is to be performed:**
   
2. **Requested starting date:**
   **Anticipated finish date:**

3. **Description of work:**

4. **Description of any asbestos-containing material that might be affected, if known (include location and type):**

5. **Name and telephone number of requestor:**

6. **Name and telephone number of supervisor:**

Submit this application to the asbestos program manager:

**NOTE:** An application must be submitted for all maintenance work whether or not asbestos-containing material might be affected. This authorization must then be signed before any work can proceed.

- [ ] Granted (Work Permit No. ___)
- [ ] Denied (See Asbestos Program Manager)
- [ ] Denied (until further sampling is conducted)

Signed: ________________________ Date: ________________

Asbestos Program Manager
Introduction

AHERA requires that LEAs employ accredited persons to perform most of the activities associated with asbestos management. Building inspectors, management planners, project designers, contractors/supervisors, and asbestos workers must all complete EPA- or State-approved courses that result in accreditation. The specific training requirements for each of these categories of workers are outlined in Appendix C to the AHERA Rule (the AHERA Model Accreditation Plan). The AHERA Rule also details specific training requirements for LEA designated persons and maintenance and custodial workers, although these individuals are not required to complete any EPA-approved courses or receive accreditation.

Designated Person Training

AHERA requires that the AHERA Designated Person be adequately trained to carry out his or her responsibilities. Due to the differing needs of school districts based on the size of the district and the amount and condition of the ACBM, AHERA does not list a specific training course or specific number of hours of training for the DP. Further, AHERA does not require the DP to be accredited. Specifically, the regulations note the training must include the following topics:

• health effects of asbestos;
• detection, identification and assessment of asbestos-containing building materials;
• options for controlling asbestos-containing building materials; and
• asbestos management programs.
• Relevant Federal and State regulations concerning asbestos, including AHERA and its implementing regulations and the regulations of the Occupational Safety and Health Administration, the U.S. Department of Transportation, and the U.S. Environmental Protection Agency (See Chapter 11 for further information on regulations related to AHERA.)

The training completed by the designated person must be documented by course name, dates, and hours of training. This documentation must be kept as a permanent part of the management plan.

To determine whether reviewing this document would satisfy the training requirements for the DP, school personnel should consult with the regional asbestos coordinator in the EPA
Regional Office serving their state.

**Maintenance and Custodial Workers**

The LEA must ensure that all maintenance and custodial staff who work in a building that contains ACBM receive a minimum of two hours awareness training, whether or not they are required to work with ACBM. New custodial and maintenance employees must be trained within 60 days after the commencement of employment.

The awareness training must include, but is not limited to:

- Information regarding asbestos and its various uses and forms
- Information on the health effects associated with asbestos exposure
- Locations of ACBM identified throughout each school building in which they work
- Information on how to recognize damaged, deteriorated, and delaminated ACBM
- The name and telephone number of the LEA designated person
- Information on the availability and location of the management plan

Staff that disturb ACBM must receive an additional 14 hours of training. Once this additional training is completed, attendees will be adequately trained to conduct small-scale, short-duration activities and/or minor fiber release episode cleanup and repair procedures. The additional training must include, but is not limited to:

- Descriptions of the proper methods for handling ACBM
- Information on the use of respiratory protection as contained in the EPA/NIOSH Guide to Respiratory Protection for the Asbestos Abatement Industry (September 1986) and other personal protection measures
- The provisions of the AHERA Rule relating to O&M activities (§ 763.91) and training and periodic surveillance (§ 763.92) as well as Appendices A-E of the Rule, EPA regulations contained in 40 CFR Part 763, subpart G, and in 40 CFR Part 61, Subpart M, and OSHA regulations
- Hands-on training in the use of respiratory protection, other personal protection measures, and good work practices

Maintenance and custodial worker training does not require EPA approval, although some States may have more stringent training requirements. It is recommended that the LEA check with its State on the training requirements for maintenance and custodial workers.

The completion of all training by maintenance and custodial workers must be documented. *(See Chapter 10 under "Training Information" for a discussion of the training records that must be kept.)*

**Accredited Personnel**
Under AHERA, LEAs may employ the following individuals only if they have completed EPA- or State-approved training courses, passed the exams, and received accreditation.

**Building Inspectors** -- Building inspectors must complete a minimum of three days (24 hours) of training. Training course information covers technical information needed to identify and describe ACBM and information needed to write an inspection report.

**Management Planners** -- Management planners must complete a two-day (16 hours) course after they have completed and passed the exam for the building inspector training described above. This course is an extension of the building inspector training and teaches how to develop a schedule (or plan) for implementation of response actions for hazards or potential hazards identified in the inspection report, how to develop an O&M plan, and how to prepare and update a management plan.

**Project Designers** -- Project designers must complete a three-day (24 hours) abatement project designer training course. The project designer course teaches how to design response actions and abatement projects. It also covers basic concepts of architectural design, engineering controls and proper work practices as required by the regulation.

**Contractors/Supervisors** -- Contractors/supervisors must complete a minimum of five days (40 hours) of training. The course teaches proper work practices and procedures and covers contractor issues such as legal liability, contract specifications, insurance and bonding, and air monitoring. The course fulfills the OSHA "competent person" training requirement and the NESHAP "trained representative" requirement.

**Asbestos Workers** -- An asbestos worker must complete a minimum of four days (32 hours) of training. The course covers work practices and procedures, personal protective equipment, health effects of asbestos exposure, and other information critical to individuals who work in an abatement area with hazardous materials.

**Update Training**

All project designers, contractors/supervisor, and asbestos workers must complete a one day annual refresher training course for reaccreditation. Building inspectors must complete a half-day refresher course. Management planners must attend the half-day building inspector refresher course as well as a half-day management planner refresher course. Documentation of any annual training should be kept in the management plan.

Although not specifically required by the AHERA Rule, annual refresher/update training for maintenance workers is recommended. OSHA requires annual training.
Table 9-1

<table>
<thead>
<tr>
<th>Job Title</th>
<th>Subject Matter of Training</th>
<th>Amount of Training (Hours)</th>
<th>Annual Training Update (Hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Designated Person</td>
<td>Health effects of asbestos; detection, identification and assessment of ACBM; options for controlling ACBM; asbestos management program; related federal and state laws</td>
<td>Adequate</td>
<td>None</td>
</tr>
<tr>
<td>All Maintenance Workers</td>
<td>Asbestos and its uses and forms; health effects associated with asbestos exposure; locating ACBM identified throughout each school building in which they work; recognizing various conditions of ACBM; name and telephone number of LEA designated person; information pertaining to the availability and location of management plan</td>
<td>2</td>
<td>None</td>
</tr>
<tr>
<td>Maintenance Workers Who Disturb ACBM</td>
<td>Proper methods for handling ACBM; information on proper use of respiratory protection; hands-on training in the use of respiratory protection, other personal protection measures, and good work practices; information pertaining to various regulations; technical information</td>
<td>16 (asbestos awareness and 14 additional hours)</td>
<td>None</td>
</tr>
</tbody>
</table>

* These 14 hours of training are in addition to the 2 hours of asbestos awareness training that all maintenance workers receive

Note that state and local requirements may be more stringent.
## CHAPTER 9
Training and Accreditation

### Table 9-2

<table>
<thead>
<tr>
<th>Job Title</th>
<th>Subject Matter of Training</th>
<th>Amount of Training (Days)</th>
<th>Annual Training Update (Days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Inspectors</td>
<td>Technical information needed to identify and describe ACBM; information needed to write an inspection report</td>
<td>3</td>
<td>1/2</td>
</tr>
<tr>
<td>Management Planners</td>
<td>Extension of the building inspector training, plus how to develop a schedule (or plan) for implementation of response actions for hazards or potential hazards identified in the inspection report, how to develop an O&amp;M plan, and how to prepare a management plan.</td>
<td>2&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Project Designers</td>
<td>How to design response actions and abatement projects; basic concepts of architectural design, engineering controls and proper work practices</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Contractors/Supervisors</td>
<td>Proper work practices and procedures; contractor issues such as legal liability, contract specifications, insurance, and bonding; air monitoring</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Asbestos Workers</td>
<td>Work practices and procedures, personal protective equipment, health effects of asbestos exposure, and other critical information</td>
<td>4</td>
<td>1</td>
</tr>
</tbody>
</table>

<sup>a</sup> Management planners must first complete the building inspector training and pass the exam.

<sup>b</sup> This includes the one-half day building inspector training update.
### Chapter 9 Summary

**Key Points About Training and Accreditation**

<table>
<thead>
<tr>
<th>AHERA does not require that designated persons complete EPA- or State-approved courses and become accredited, but § 763.84(g)(2) of the AHERA Rule requires that training for the designated persons provide basic knowledge of a number of asbestos-related subjects.</th>
</tr>
</thead>
<tbody>
<tr>
<td>The LEA must ensure that all maintenance and custodial staff who may work in a building that contains ACBM receive a minimum of <strong>two hours awareness training</strong>, whether or not they are required to work with ACBM. All new maintenance and custodial staff must receive asbestos awareness training within 60 days of hire.</td>
</tr>
<tr>
<td>Staff that may disturb ACBM must receive an additional <strong>14 hours</strong> of training.</td>
</tr>
<tr>
<td>Building inspectors, management planners, project designers, contractors/supervisors, and asbestos workers must successfully complete EPA- or State-approved courses, pass an exam and receive accreditation before they can perform any asbestos-related activities.</td>
</tr>
<tr>
<td>Building inspectors, management planners, project designers, contractors/supervisors, and asbestos workers must complete annual EPA- or State-approved refresher courses to maintain their accreditation.</td>
</tr>
</tbody>
</table>
Recordkeeping of Management Plans

Under § 763.93(g) of the AHERA Rule, each LEA is required to keep in its administrative office a copy of the management plans for each school. *(See Table 6-1 for a comprehensive list of the required contents of the management plan.*) The management plan must be available, without cost or restriction, for inspection by the public, including teachers, other school personnel and their representatives, and parents, as well as by representatives of EPA and the State.

In addition, each school is required to maintain in its administrative office a complete and updated copy of the management plan for that school. The school must make the plan available for inspection to those individuals listed above as well as to workers before work begins in any area of a school building.

It is the responsibility of the LEA designated person to ensure that complete and up-to-date records are maintained and included in the management plan. Section 763.94 of the AHERA Rule requires that the LEA maintain the following records *(Note that some of these requirements have been listed in other portions of this guide).*

**Training Information**

For each person required to be trained under §§ 763.92(a)(1) and (2) of the AHERA Rule (maintenance and custodial worker training), the LEA must provide:

- The person's name and job title
- The date that training was completed
- The location of the training
- The number of hours completed in the training

**Periodic Surveillance Information**

Each time that periodic surveillance is conducted under § 763.92(b) of the AHERA Rule, the LEA must record:

- The name of each person conducting the surveillance
- The date of the surveillance
• Any changes in the conditions of the materials being examined

Cleaning Information

Each time that cleaning, as required under § 763.91(c), is conducted, the LEA must record:

• The name of each person performing the cleaning
• The date of the cleaning
• The locations cleaned
• The methods used to perform the cleaning

Small-Scale, Short-Duration O&M Activity Information

Each time that O&M activities under § 763.91(d) of the AHERA Rule are performed, the LEA must provide:

• The name of each person performing the activity
• The start and completion date of the activity
• The locations where such activity occurred
• A description of the activity, including the preventive measures used
• If ACBM is removed, the name and disposal site of the ACBM

Information on O&M Activities Other Than Small-Scale, Short-Duration

Each time maintenance activities are performed that are not of small scale and short duration under § 763.91(e) of the AHERA Rule, the LEA must provide:

• The name and signature of each person performing the activity
• The State, accreditation number, and training provider name of each person performing the activity (a copy of a certificate is ideal)
• The start and completion dates of the activity
• A description of the activity, including preventive measures used
• If the ACBM is removed, the name and location of the ACBM storage or disposal site

Information on Fiber Release Episodes

For each fiber release episode occurring as the result of O&M activities, the LEA must 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
• If ACBM is removed, the name and location of the ACBM storage or disposal site
Information on Response Actions and Preventive Measures

For each preventive measure and response action taken for friable and nonfriable ACBM and friable and nonfriable suspected ACBM assumed to be ACBM, the LEA must provide:

- A detailed written description of the measure or action, including the method used
- The location where the measure or action was taken
- Reasons for selecting the measure or action
- The start and completion dates of the work
- If applicable, the names and addresses of all contractors involved with the work
- If applicable, the State, accreditation number, and training provider name of all contractors involved with the work (a copy of the certificate)
- If ACBM is removed, the name and location of the ACBM storage or disposal site

Air Sampling Information

In addition to the information required to be provided for each preventive measure and response action taken for friable and nonfriable ACBM and friable and nonfriable suspected ACBM assumed to be ACBM (See above), when air sampling is performed for final air clearance of response actions, the LEA must provide:

- The name and signature of any person collecting any air sample required to be collected at the completion of a response action
- The locations where samples were collected
- The date(s) of collection
- The name and address of the laboratory analyzing the samples
- The date(s) of analysis
- The results of the analysis
- The method of analysis
- The name and signature of the person performing the analysis
- A statement that the laboratory is NVLAP accredited or EPA approved
## Chapter 10 Summary

### Key Points About Recordkeeping

Each **LEA** must maintain a copy of its management plan in its administrative office, and the plan must be available to persons for inspection without cost or restriction.

Each **school** must maintain a copy of the management plan for that school in its administrative office, and the plan must be available to persons for inspection without cost or restriction.

The LEA must also maintain records of events that occur after submission of the management plan; these records include training information, periodic surveillance information, cleaning information, small-scale, short-duration O & M activity information, information on O & M activities other than small-scale, short-duration, information on fiber release episodes, information on response actions and preventive measures, and air sampling information. These records should be included in the management plans in a timely manner.

For each homogeneous area where all ACBM has been removed, the LEA must retain the records of events for **three years** after the next reinspection, or for an equivalent period.

It is the responsibility of the LEA designated person to ensure that complete and up-to-date records are maintained and included in the management plans.
Introduction

Although AHERA and its implementing regulations, the AHERA Rule, set out many of the responsibilities of the LEA, there are several other federal regulations that the LEA should be aware of when implementing an asbestos management program. These regulations include:

- National Emission Standards for Hazardous Air Pollutants (NESHAP)
- The EPA Worker Protection Rule (40 CFR § 763.121)
- Department of Transportation (DOT) regulations governing the transport and disposal of asbestos-containing materials (49 CFR Parts 171 and 172)

Each of these regulations is discussed in greater detail below. By following the requirements of these related regulations, the LEA can protect not only the people in its buildings from negative health effects but also may protect itself from legal liability. These regulations should be considered to establish minimum standards; going beyond these requirements may help keep buildings as safe as possible. For further information about these related regulations, call the Asbestos Ombudsman Clearinghouse Hotline at (800) 368-5888 between 8:00 a.m. and 4:30 p.m., Eastern.

National Emission Standards for Hazardous Air Pollutants

The LEA (school district) must comply with the National Emission Standards for Hazardous Air Pollutants for Asbestos (NESHAP) regulations when removing asbestos materials. These regulations specify control requirements for most asbestos emissions, and include work practices to be followed to minimize the release of asbestos fibers during the handling, removal and disposal of asbestos waste materials. NESHAP regulations are frequently enforced by the State or Local Agencies.

A significant term, which is used through NESHAP, is Regulated Asbestos-Containing
Materials (RACM). RACM is where the amount of friable asbestos-containing material equals or exceeds the threshold amount of 260 linear feet, 160 square feet, or 35 cubic feet.

Prior to the beginning work, an AHERA accredited inspector must inspect the facility for the presence of asbestos. The amount and type of asbestos present both determine whether the LEA must notify EPA (or delegated states) and what procedures that the LEA must follow to control asbestos emissions. If the amount exceeds the regulatory threshold, then a written notification must be submitted ten working days prior to any asbestos stripping or removal operation or demolition operation. The LEA must remove RACM from the facility that is to be demolished or renovated before any other activity begins that would break up, dislodge, or similarly disturb this material. The RACM must be handled in accordance with the asbestos NESHAP regulations, including properly labeling the waste. However, prior removal is not required if the RACM is in a condition that is excepted from prior removal, e.g., it is on a facility component that is encased in concrete or other similarly hard material and is adequately wet whenever exposed during demolition.

Of particular importance to the LEA are the standards for the demolition and renovation of facilities (40 CFR § 61.145) and for waste disposal for demolition and renovation operations (40 CFR § 61.150). The standard for asbestos waste disposal for demolition and renovation operations require that the LEA to: (1) discharge no visible emissions to the outside air during the collection processing, packaging, or transporting of any asbestos-containing waste material; (2) adequately wet the asbestos-containing waste material; (3) process the asbestos-containing waste material into nonfriable forms; or (4) use an alternative emission control and waste treatment method that has received prior approval by EPA or the delegated state.

As soon as possible, all asbestos-containing waste material must be taken to an asbestos waste disposal site or an EPA-approved site that converts regulated asbestos-containing material and asbestos-containing waste material into asbestos-free material as provided by law. If non-RACM will not be made friable during the disposal processes, it may be disposed of at a landfill that accepts normal building debris. Waste shipment records (WSRs), which are only required for RACM, must be maintained by the LEA and contain the information required by law. The WSRs must be retained for at least two years.

**Occupational Safety and Health Administration**

The Occupational Safety and Health Administration’s (OSHA) Construction Industry Standard (29 CFR § 1926.1101) and General Industry Standard (29 CFR § 1910.1001) establish minimum standards for the protection of workers involved in asbestos-related work or employees exposed to asbestos-contaminated workplaces. OSHA regulations exclude federal, state, or local government employees (including public school employees) from its worker protection rules (except in states with OSHA approved programs).
However, EPA has promulgated Worker Protection Rules to cover these employees (see below). These standards include required work practices, engineering controls, permissible exposure limits, written programs for respiratory protection and medical surveillance, methods for compliance, hazard communication, housekeeping, competent person training and responsibilities, and required recordkeeping. Also included are demolition, removal, alteration, repair, maintenance (such custodial workers who clean vinyl asbestos tile floors), installation, clean-up of spills, transportation, disposal and storage of asbestos.

OSHA revised its standards on August 10, 1994. Significant changes to the standards included the following:

- PEL decrease to 0.1 f/cc; action level deleted;

- Asbestos Containing Material defined as material containing more than 1% asbestos (now consistent with EPA);

- Building owners are now covered and have specific duties to identify building materials and notify/communicate with others;

- All asbestos work, regardless of exposure levels, requires at least basic controls and work practices, and exposure monitoring;

- Construction work is classified according to friability of the asbestos and hazardousness of the operation. Increasingly friable and hazardous operations require increasingly stringent engineering controls, work practices, protective equipment, training and monitoring; and

- Training requirements changed to correspond to EPA training.

Two programs are of particular importance to the LEA. OSHA requires establishment of a respiratory protection program (29 CFR § 1910.134) that is designed to protect persons, including the designated person and any employees, who do any work with ACBM. The program requires that such persons be equipped with a respirator that provides adequate protection against asbestos. Further, the program must include written standard operating procedures governing the selection and use of respirators, selection of respirators based on the hazards to which workers are exposed, an instruction and training program in the proper use of respirators and its limitations, and requirements for the cleaning, disinfecting, inspecting, and storing of respirators. The written program must be on the job site when asbestos work is being conducted. *(See Chapter 8 under the heading “Employee Protection & Medical Surveillance Programs” for a further discussion of this program.)*

*(See the Model Respiratory Protection Program Checklist at the end of this chapter.)*

The second program is the medical surveillance program, which requires that every person
who is assigned to work using a respirator must first have a medical examination to
determine whether he or she is fit to work in a respirator. A written assurance to that
effect signed by the examining physician is required and must be maintained with the
employee's medical surveillance records. The employer must keep proof of a medical
surveillance program on site where the asbestos work is being performed. (See Chapter 8
under the heading "Employee Protection & Medical Surveillance Programs" for a further
discussion of this program.)

(See the Medical Examination Checklist at the end of this chapter.)

**EPA Worker Protection Rule**

The OSHA asbestos standards do not cover all state and local government employees. The
EPA Worker Protection Rule (40 CFR § 763.121) extends the protection afforded by the
OSHA standards to all state and local government employees who are engaged in asbestos
abatement and who are not otherwise covered by OSHA or an OSHA-approved state plan.
Thus, when conducting asbestos abatement activities, an employee of a school district is
either covered by the OSHA asbestos standards or that employee is protected by EPA's
Worker Protection Rule.

**Department of Transportation Regulations**

Department of Transportation (DOT) regulations (49 CFR Parts 171 and 172) require that
asbestos-containing materials be labeled as Class 9 hazardous materials and establish
requirements relating to the shipment of ACBM by air, rail or motor vehicles, including the
type of packaging, labeling, shipping papers and placards required.

The designated person is responsible for having the ACBM properly transported from a
site. The LEA is the generator of the waste product and maintains this responsibility
during transportation and disposal. Disposal of asbestos waste also is subject to each
state's solid waste regulations.
<table>
<thead>
<tr>
<th>Chapter 11 Summary</th>
<th>Key Points About Related Regulations</th>
</tr>
</thead>
<tbody>
<tr>
<td>An asbestos management program is subject not only to AHERA and the AHERA Rule, but also may be subject to NESHAP, OSHA, and DOT regulations, and the <strong>EPA Worker Protection Rule</strong>.</td>
<td></td>
</tr>
<tr>
<td>Relevant provisions of NESHAP establish <strong>work practices for asbestos air emission control</strong> when a facility is being demolished or renovated, and for the disposal of <strong>asbestos-containing waste material</strong>.</td>
<td></td>
</tr>
<tr>
<td>The OSHA established <strong>minimum standards for the protection of workers involved in asbestos-related work or employees exposed to asbestos-contaminated workplaces</strong>. These standards include required work practices, engineering controls, permissible exposure limits, written programs for respiratory protection and medical surveillance, methods for compliance, hazard communication, housekeeping, competent person training and responsibilities, and required recordkeeping. OSHA excludes federal, state, or local government employees from its worker protection rules (including public school employees).</td>
<td></td>
</tr>
<tr>
<td>The EPA Worker Protection Rule <strong>extends the protection afforded by OSHA</strong> to all employees in asbestos abatement who may have been excluded from protection by OSHA.</td>
<td></td>
</tr>
<tr>
<td>Relevant provisions of DOT regulations establish <strong>labeling, packaging and shipping standards</strong> for the transporting of asbestos-containing materials.</td>
<td></td>
</tr>
</tbody>
</table>
Protecting workers from exposure is the responsibility of the employer. Employers are required by law to establish and maintain an effective respiratory protection program as outlined in American National Standards Institute (ANSI) Standard Z88.2-1969. (The more recent edition of ASNI Z88.2 (1980) contains more comprehensive requirements which are not yet incorporated in the OSHA regulation.) This checklist presents a model respiratory protection program for asbestos abatement operations which meets or exceeds the requirements of the present OSHA standard.

The recommendations of this guide not only satisfy the current respiratory protection requirements of existing Federal regulations, but also include recommendations based on current information on respiratory protection.

An effective respirator program should include:

1. A written statement of company policy, including assignment of individual responsibility, accountability, and authority for required activities of the respiratory protection program

2. A written standard operating procedures governing the selection and use of respirators

3. Respirator selection (from NOISH/MSHA approved and certified models) on the basis of hazards to which the worker is exposed

4. The medical examination of workers to determine whether or not they may be assigned an activity where respiratory protection is required

5. User training in the proper use and limitations of respirators (which also is a way to evaluate the skill and knowledge obtained by the worker through training)

6. Respirator fit testing

7. Regular cleaning and disinfecting of respirators

8. Routine inspection of respirators during cleaning, and at least once a month and after each use for those respirators designated for emergency use

9. Storage of respirators in convenient, clean, and sanitary locations

(cont.)
### Model Respiratory Protection Program Checklist (cont.)

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>__</td>
<td>10. Surveillance of work area conditions and degree of employee exposure</td>
</tr>
<tr>
<td></td>
<td>(e.g., through air monitoring)</td>
</tr>
<tr>
<td>__</td>
<td>11. Regular inspection and evaluation of the continued effectiveness of the</td>
</tr>
<tr>
<td></td>
<td>program</td>
</tr>
<tr>
<td>__</td>
<td>12. Recognition and resolution of special problems as they affect respirator</td>
</tr>
<tr>
<td></td>
<td>use (e.g., facial hair, eye glasses, etc.)</td>
</tr>
<tr>
<td>__</td>
<td>13. Proper respirator use (e.g., procedures for putting on and taking off</td>
</tr>
<tr>
<td></td>
<td>respirators when entering and exiting the abatement area)</td>
</tr>
</tbody>
</table>
## Medical Examination Checklist

A medical examination is the first step in a medical surveillance program. This checklist may be used to determine the thoroughness of the medical examination administered. Although the scope of a medical examination may vary among medical facilities, at a minimum it should include the following:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Medical History (completed by examinee)</td>
</tr>
<tr>
<td>2</td>
<td>Initial or Periodic Medical Questionnaire for Asbestos Exposure</td>
</tr>
<tr>
<td>3</td>
<td>Respiratory History</td>
</tr>
<tr>
<td>4</td>
<td>Anthropometric Measurements</td>
</tr>
<tr>
<td>A</td>
<td>Height</td>
</tr>
<tr>
<td>B</td>
<td>Weight</td>
</tr>
<tr>
<td>5</td>
<td>Vital Signs</td>
</tr>
<tr>
<td>A</td>
<td>Blood Pressure</td>
</tr>
<tr>
<td>B</td>
<td>Pulse</td>
</tr>
<tr>
<td>C</td>
<td>Temperature</td>
</tr>
<tr>
<td>6</td>
<td>Ophthalmologic Screening</td>
</tr>
<tr>
<td>A</td>
<td>Visual Acuity - Near and Far</td>
</tr>
<tr>
<td>B</td>
<td>Color Vision</td>
</tr>
<tr>
<td>C</td>
<td>Depth perception</td>
</tr>
<tr>
<td>7</td>
<td>Urinalysis</td>
</tr>
<tr>
<td>8</td>
<td>Pulmonary Function Screen</td>
</tr>
<tr>
<td>9</td>
<td>Chest X-ray (administered at the discretion of the physician)</td>
</tr>
<tr>
<td>10</td>
<td>Complete Physical Examination by Physician</td>
</tr>
<tr>
<td>11</td>
<td>Physician Evaluation for Respirator Use/Clearance</td>
</tr>
<tr>
<td>12</td>
<td>Report of Medical Evaluation</td>
</tr>
</tbody>
</table>
Glossary

**Air erosion**: the passage of air over friable ACBM which may result in the release of asbestos fibers.

**Asbestos**: the asbestiform varieties of Chrysotile (serpentine); crocidolite (riebeckite); amosite (cummingtonite-grunerite); anthophyllite; tremolite; and actinolite.

**Asbestos-containing material (ACM)**: any material or product which contains more than 1 percent asbestos.

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

**Damaged friable surfacing ACM**: 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, scrapes, gouges, mars 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**: 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**: 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**: an airtight, impermeable, permanent barrier around ACBM to prevent the release of
asbestos fibers into the air.

**EPA Worker Protection Rule**: extends the protection afforded by OSHA to all employees in asbestos abatement who may have been excluded from protection by OSHA.

**Fiber release episode**: 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.

**Friable asbestos-containing material (ACM)**: any material containing more than one percent asbestos which has been applied on ceilings, walls, structural members, piping, duct work, or any other part of a building, which when dry, may be crumbled, pulverized, or reduced to powder by hand pressure. Includes non-friable asbestos-containing material after such previously non-friable material becomes damaged to the extent that when dry it may be crumbled, pulverized, or reduced to powder by hand pressure.

**Friable asbestos-containing building material (ACBM)**: any friable ACM that is in or on interior structural members or other parts of a school or public and commercial building.

**Functional space**: a room, group of rooms, or homogeneous area (including crawl spaces or the space between a dropped ceiling and the floor or roof deck above), 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**: an area of surfacing material, thermal system insulation material, or miscellaneous material that is uniform in color and texture.

**Inspection**: an activity undertaken in a school building, or a public and commercial building, to determine the presence or location, or to assess the condition of, friable or non-friable asbestos-containing building material (ACBM) or suspected ACBM, whether by visual or physical examination, or by collecting samples of such material. This term includes reinspections of friable and non-friable known or assumed ACBM which has been previously identified. The term does not include the following:

1. Periodic surveillance of the type described in 40 CFR 763.92(b) solely for the purpose of recording or reporting a change in the condition of known or assumed ACBM;
2. Inspections performed by employees or agents of Federal, State, or local government solely for the purpose of determining compliance with applicable statutes or regulations; or
3. Visual inspections of the type described in 40 CFR 763.90(i) solely for the purpose of determining completion of response actions.

**Local education agency**:

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.).

**Major fiber release episode**: any uncontrolled or unintentional disturbance of ACBM, resulting in a visible emission, which involves the falling or dislodging of more than 3 square or linear feet of friable ACBM.

**Management Plan**: a site-specific guidance document that the LEA designated person must follow in managing the ACBM present in a school building.

**Minor fiber release episode**: any uncontrolled or unintentional disturbance of ACBM, resulting in a visible emission, which involves the falling or dislodging of 3 square or linear feet or less of friable ACBM.

**Miscellaneous ACM**: other, mostly nonfriable ACM, products and materials (found on structural components, structural members or fixtures) such as floor tile, ceiling tile, construction mastic for floor and ceiling materials, sheet flooring, fire doors, asbestos cement pipe and board, wallboard, acoustical wall tile, and vibration damping cloth.

miscellaneous material that is ACM in a school building.

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

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

**Operations and maintenance program**: 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**: 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**: 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 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**: actions taken to reduce disturbance of ACBM or otherwise eliminate the
reasonable likelihood of the material's becoming damaged or significantly damaged.

**Public and commercial building:** the interior space of any building which is not a school building, except that the term does not include any residential apartment building of fewer than 10 units or detached single-family homes. The term includes, but is not limited to: industrial and office buildings, residential apartment buildings and condominiums of 10 or more dwelling units, government-owned buildings, colleges, museums, airports, hospitals, churches, preschools, stores, warehouses and factories. Interior space includes exterior hallways connecting buildings, porticos, and mechanical systems used to condition interior space.

**Removal:** 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:** returning damaged ACBM to an undamaged condition or to an intact state so as to prevent fiber release.

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

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

**School:** any elementary or secondary school as defined in section 198 of the Elementary and Secondary Education Act of 1965 (20 U.S.C. 2854).

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

**Significantly damaged friable miscellaneous ACM:** damaged friable miscellaneous ACM where the damage is extensive and severe.

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

**Small-scale, short-duration activities (SSSD):** 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 or removal of a small section of drywall.
5. Installation of electrical conduits through or proximate to asbestos-containing materials.
SSSD can be further defined by the following considerations:
(1) Removal of small quantities of ACM only if required in the performance of another maintenance activity not intended as asbestos abatement.
(2) Removal of asbestos-containing thermal system insulation not to exceed amounts greater than those which can be contained in a single glove bag.
(3) Minor repairs to damaged thermal system insulation which do not require removal.
(4) Repairs to a piece of asbestos-containing wallboard.
(5) Repairs, involving encapsulation, enclosure, or removal, to small amounts of friable ACM 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 mini-enclosure. Such an enclosure shall conform spatially and geometrically to the localized work area, in order to perform its intended containment function.

*Surfacing ACM:* interior ACM that has been sprayed on, troweled on, or otherwise applied to surfaces (structural members, walls, ceilings, etc.) for acoustical, decorative, fireproofing, or other purposes. Surfacing material that is ACM.

*Surfacing material:* 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:* 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:* insulation used to control heat transfer or prevent condensation on pipes and pipe fittings, boilers, breeching, tanks, ducts, and other parts of hot and cold water systems; heating, ventilation, and air-conditioning (HVAC) systems; or other mechanical systems that is ACM.

*Vibration:* the periodic motion of friable ACBM which may result in the release of asbestos fibers.
Acronyms

**ACM**: Asbestos-Containing Material

**ACBM**: Asbestos-Containing Building Material

**AHERA**: Asbestos Hazardous Emergency Response Act

**ASHARA**: Asbestos School Hazard Abatement Reauthorization Act

**DOT**: Department of Transportation

**EPA**: Environmental Protection Agency

**HEPA**: High Efficiency Particulate Air

**HVAC**: Heating, Ventilation and Air-Conditioning

**LEA**: Local Education Agency

**MAP**: Asbestos Model Accreditation Plan

**NESHAP**: National Emission Standard for Hazardous Air Pollutants

**NIOSH**: National Institute of Occupational Safety and Health

**O&M**: Operations and Maintenance

**OSHA**: Occupational Safety and Health Administration

**PCM**: Phase Contrast Microscopy

**PLM**: Polarized Light Microscopy

**SSSD**: Small Scale, Short Duration

**TEM**: Transmission Electron Microscopy

**TSI**: Thermal System Insulation

**VAT**: Vinyl Asbestos Tile

**VOC**: Volatile Organic Compounds
History of Asbestos

Although asbestos dates back to prehistoric times, the mineral came into popularity during the Industrial Age. Its fire retardant properties made it essential in the automobile and construction industries, as well as the military. In the last few decades, the mineral is mostly known as a carcinogen that causes mesothelioma.

Despite all those uses, asbestos remains a danger to human health, causing crippling diseases like asbestosis, mesothelioma and lung cancer.

Asbestos in the Ancient World

Asbestos occurs naturally in large deposits on every continent in the world. Archeologists uncovered asbestos fibers in debris dating back to the Stone Age, some 750,000 years ago. It is believed that as early as 4000 BC, asbestos' long hair-like fibers were used for wicks in lamps and candles.

Between 2000-3000 BC, embalmed bodies of Egyptian pharaohs were wrapped in asbestos cloth to protect the bodies from deterioration. In Finland, clay pots dating back to 2500 BC contained asbestos fibers, which are believed to strengthen the pots and make them resistant to fire. Around 456 BC, Herodotus, the classical Greek historian, referred to the use of asbestos shrouds wrapped around the dead before their bodies were tossed onto the funeral pyre to prevent their ashes from being mixed with those of the fire itself.

Some scholars claim the word asbestos comes from the ancient Greek term, sasbestos, meaning inextinguishable or unquenchable, a characterization of the material's invincibility from the intense heat of the fire pits used by the Greeks for cooking and warmth.
Others believe that the word's origin can be traced back to a Latin idiom, amiantus, meaning unsoiled, or unpolluted, since the ancient Romans were said to have woven asbestos fibers into a cloth-like material that was then sewn into table cloths and napkins. These cloths were purportedly cleaned by throwing them into a blistering fire, from which they came out miraculously unharmed and essentially whiter than when they went in.

While Greeks and Romans exploited the unique properties of asbestos, they also documented its harmful effects on those who mined the silken material from ancient stone quarries. Greek geographer Strabo noted a "sickness of the lungs" in slaves who wove asbestos into cloth. Roman historian, naturalist and philosopher, Pliny the Elder, wrote of the "disease of slaves," and actually described the use of a thin membrane from the bladder of a goat or lamb used by the slave miners as an early respirator in an attempt to protect them from inhaling the harmful asbestos fibers as they labored.

**Asbestos in the Middle Ages and Beyond**

Around 755 AD, King Charlemagne of France ordered a tablecloth made of asbestos to prevent it from burning during the accidental fires that frequently occurred during feasts and celebrations. Like the ancient Greeks, he also wrapped the bodies of his dead generals in asbestos shrouds. By the end of the first millennium, cremation cloths, mats and wicks for temple lamps were fashioned from chrysotile asbestos, from Cyprus, and tremolite asbestos, from northern Italy.

In 1095, the French, German and Italian knights who fought in the First Crusade used a catapult, called a trebuchet, to fling flaming bags of pitch and tar wrapped in asbestos bags over city walls during their sieges. In 1280, Marco Polo wrote about clothing made by the Mongolians from a "fabric which would not burn." Polo visited an asbestos mine in China to disproved the myth that asbestos came from the hair of a wooly lizard.
Chrysotile asbestos was mined during the reign of Peter the Great, Russia's tsar from 1682 to 1725. A purse made of fireproof asbestos, now part of London's Natural History Museum collection, was brought to England by Benjamin Franklin during his first visit there as a young man in 1725. Paper made from asbestos was discovered in Italy in the early 1700s. By the 1800s, the Italian government was utilizing asbestos fibers in its bank notes. The Parisian Fire Brigade in the mid-1850s wore jackets and helmets made from asbestos.

**Asbestos Is No Longer a Novelty**

Despite earlier uses of asbestos products, they were mostly novelties. Asbestos manufacturing was not a flourishing industry. It wasn't until the late 1800s, at the start of the Industrial Revolution, that asbestos mining sustained strong and steady growth. That's when the practical and commercial uses of asbestos, with its myriad applications, became widespread. As the mining and manufacturing of asbestos exploded, so did its poisonous health effects on those who mined and refined the mineral, as well as those who used it.

> While the remarkable physical properties of asbestos were known even to the ancient and medieval worlds, it was the coming of the Industrial Revolution, during the latter part of the 19th century, that elevated asbestos mining and manufacturing into a thriving and lucrative intercontinental enterprise.

Its resistance to chemicals, water and electricity made it an excellent insulator for the steam engines, turbines, boilers, ovens and electrical generators that powered the New Age. The malleable properties of asbestos made it an important building, binding and strengthening commodity.
Asbestos Mining Around the Globe

In the early part of the 19th century, crocidolite (blue asbestos) had already been found in Free State, Africa. In 1876, chrysotile (white asbestos) was discovered in the Thetford Township, in southeastern Quebec. Shortly afterward, Canadians established the world's first commercial asbestos mines. They joined Russia in excavating the soft, fibrous form of the mineral, which is found in more than 95 percent of all asbestos products.

The early 1870s also saw the founding of large asbestos industries in Scotland, Germany and England. Italy had been mining tremolite asbestos for decades. Australians began mining asbestos in Jones Creek, New South Wales, in the 1880s. By the early 1900s, anthophyllite asbestos was mined in Finland. Amosite (brown asbestos) was discovered in Transvaal, South Africa; while chrysotile from the mines of Swaziland and Zimbabwe was mined and marketed around the world.

Production of Asbestos Increases

Before the late 1800s, asbestos mining was not mechanized. The heavy work of chipping away rock and extracting the asbestos for further processing was performed manually. Horses and drays were utilized for transporting the mined product. But once the commercial applications for asbestos were realized and demand grew, asbestos mining became industrialized. Its manpower multiplied by steam-driven machinery and new mining methods.

By the early 1900s, asbestos production had grown worldwide to more than 30,000 tons annually. Children and women were added to the asbestos industry workforce, preparing, carding and spinning the raw fibers, while men toiled in the mines.
The uses of asbestos expanded just as rapidly as its manufacture. In 1858, 21-year-old Henry Ward Johns founded the H.W. Johns Manufacturing Company in lower Manhattan, selling a new, fireproof roofing material made of burlap, asbestos, tar and other ingredients. The anthophyllite asbestos he used came from a quarry in nearby Staten Island. For the next 40 years, before he died from "dust phthisis pneumonitis," believed to be asbestosis, Johns greatly expanded the number of asbestos applications. His firm merged with the Manville Covering Company in 1901. Johns Manville became the largest manufacturing enterprise that used asbestos in the U.S.

In 1896, the first asbestos brake linings for new horseless carriages were made by the Ferodo company in England. Three years later, in Germany, the first patent was issued for the manufacture of asbestos cement sheets. High pressure asbestos gaskets were turned out in 1900 by Klinger in Austria. The first asbestos pipes were developed in Italy in 1913.

**Documenting the Hazardous Effects of Asbestos**

As early as 1897, an Austrian doctor attributed pulmonary troubles in one of his patients to the inhalation of asbestos dust. An 1898 report regarding the asbestos manufacturing process in England, where factories had been routinely inspected since 1833 to protect the health and safety of workers, cited "widespread damage and injury of the lungs, due to the dusty surrounding of the asbestos mill."

In 1906, the first documented death of an asbestos worker from pulmonary failure was recorded by Dr. Montague Murray at London's Charring Cross Hospital. The autopsy of the 33-year-old victim revealed large amounts of asbestos fibers in his lungs. Reports of worker deaths from "fibrosis" in asbestos plants in Italy and France echoed studies in the U.S. that suggested that asbestos workers were dying unnaturally young. And as early as 1908, insurance companies in the U.S. and Canada began decreasing
coverage and benefits, while increasing premiums, for workers employed in the asbestos industry.

**Asbestos Industry: An Unstoppable Engine**

Despite consistent health warnings, asbestos mining and manufacturing was an engine that could not be stopped. In 1910, world production exceeded 109,000 metric tons, more than three times the total in 1900. In the United States, increased consumption stemmed from the population's growing demand for cost-effective, mass-produced construction materials. Asbestos products filled that need. The U.S. quickly became the world leader in asbestos usage, with neighboring Canada furnishing a steady supply. In fact, the onset of World War I, followed by the Great Depression, temporarily slowed the asbestos industry’s exponential growth. The start of World War II revived that growth.

*Several factors contributed to a rise in the production and consumption of asbestos products, especially in the United States. A brisk rise in the domestic construction industry increased demand for a growing number of asbestos-based products.*

While mining and manufacturing during World War II actually declined in many asbestos-producing countries, Canada, South Africa and the U.S. were able to supply much of America’s increasing wartime need of the minerals. U.S. asbestos consumption by 1942 had increased to about 60 percent of world production, up from 37 percent in 1937.
Asbestos in Common Products

As cars became a common element of the American landscape, so did new more durable roads. Some of the roads built in the U.S. between the 1930s and 1950s contained asbestos-laced asphalt.

Other products that contained asbestos:

- Asbestos cement
- Asbestos millboard and paper for electrical panels
- Asbestos insulation for electric wiring
- Spray-on, fire-retardant coating for steel girders in buildings
- Asbestos roofing and flooring compounds
- Thermal insulation for homes and offices
- Heat and acid-resistant gaskets and packing materials
- Fillers and reinforcement for plasters, caulking compounds and paints
- Automotive and airplane clutches
- Car, truck and airplane brake pads and linings, seals and gaskets

Ebb and Flow of Asbestos Demand

Global demand for asbestos increased after the war as economies and countries struggled to rebuild. U.S. consumption also grew in the post-war years because of a
massive expansion of the American economy, as well as sustained construction of military hardware during the Cold War.

U.S. consumption of asbestos peaked in 1973 at 804,000 tons. Peak world demand for asbestos was realized around 1977. Some 25 countries were producing almost 4.8 million metric tons per year, and 85 countries were producing thousands of asbestos products.

But by the late 1970s, a dramatic decline began in the use of asbestos throughout the industrialized nations. The public was beginning to understand the connection between asbestos exposure and debilitating lung diseases.

Organized labor and trade unions were demanding safer and healthier working conditions, and liability claims against major asbestos manufacturers caused many of them to make and market asbestos substitutes.

By 2003, new environmental regulations and consumer demand helped push for full or partial bans on the use of asbestos in 17 countries: Argentina, Austria, Australia, Belgium, Chile, Denmark, Finland, France, Germany, Italy, Netherlands, Norway, Poland, Saudi Arabia, Sweden, Switzerland, and the United Kingdom.

In 2005, asbestos was banned throughout the European Union. In recent years, many of the world’s emerging economies have embraced the use of asbestos as eagerly as more developed nations did for much of the last century.

No Asbestos Ban in the US

Asbestos is still not banned in the United States. A 1989 ruling issued by the Environmental Protection Agency banning most asbestos-containing products was
overturned by the Fifth Circuit Court of Appeals in New Orleans in 1991 under pressure from the asbestos industry. Although it is still a legal commodity that appears in many building and common household products, asbestos use has declined considerably in the U.S.

The last U.S. asbestos mine closed in 2002, ending more than a century of the country's asbestos production. And although the United States has always been a major importer of asbestos, historically providing only a small percentage of the world's supply, it was always the world's largest consumer.
The Libby, Montana community and its residents are facing a critical environmental and public health crisis caused by slow motion technological disaster of asbestos exposure. In the fall of 1999, writer Andrew Schneider of the Seattle Post-Intelligencer broke the story (November 18, 1999 and November 19, 1999 issues) that revealed there had been hundreds of illnesses and deaths in the Libby community over the past 70 years resulting from occupational and non-occupational environmental exposures to asbestos associated with Libby’s vermiculite mining and milling operation.

Six miles north of Libby, vermiculite was mined by the Zonolite Corporation from 1919-1963 and then by W.R. Grace from 1963 until the mine closure in 1990. The vermiculite contained a naturally occurring amphibole asbestos mixture which is particularly toxic to human beings. Members of the Libby community were widely exposed to asbestos contaminated vermiculite ore through multiple pathways. The asbestos found in Libby appears to be unique in terms of its molecular composition and disease progression and is call Libby amphibole asbestos. The community wide asbestos exposure has been identified as the largest environmental and public health disaster in the nation. This has made Libby one of the highest priority superfund sites in the United States.

The asbestos exposure not only affected miners, mill-workers, and family members but also other local residents, including children, who were exposed through the ambient air. In addition, it was disclosed that not only was ambient air contaminated which exposed the entire community, but the vermiculite materials that were given away (free of
charge by W.R. Grace) were also dangerously contaminated. Disturbance of contaminated source materials through activities typically result in exposure to breathable asbestos fibers in the air. Thus it is recommended that people do not disturb the material or area if asbestos contamination is suspected. The Environmental Protection Agency (EPA) is leading the cleanup efforts in Libby and has a variety of information on their website.

For many decades, the asbestos contaminated vermiculite was utilized throughout the town in many public places such as school tracks, public parks, baseball fields, as insulation in public buildings and schools. The waste piles next to the little league ball fields were also a popular place for children to play as their friends and siblings played baseball. As of January 2005, the EPA stated that “Since November 1999, EPA has cleaned up the major source areas around town.” However, there are many private properties in the Libby area that are still in the midst of the community-wide cleanup process. Contamination of private properties includes the insulation in attics and walls of homes and businesses, and contaminated soil in gardens, yards, driveways, and sandboxes. Although W.R. Grace closed the mine in 1990 and cleanup efforts have been underway since 1999 in the Libby area, the past exposures have left a complex array of healthcare and associated problems. A comprehensive exposure questionnaire is utilized by CARD healthcare providers to assess an individual’s exposure pathways to identify the potential risk of developing Libby amphibole asbestos diseases.

Zonolite and Monokote are two trade names under which Libby vermiculite products were marketed. There are two overwhelming examples of the extent to which exposures can spread through commercial products. Vermiculite contaminated with Libby amphibole asbestos was used to create Zonolite attic insulation, which is estimated
to be in 30 million homes in America. The second is Monokote which was used to create a fire proofing material. It was used to coat all of the steel beams that were used in the construction of the World Trade Center towers in New York City. With the collapse of the twin towers on 11 September 2001 large amounts of Libby asbestos were released into lower Manhattan area. Some examples of other Grace products include Zonolite Finishing Cement, Zonolite Finish Coat Decorator’s White. A complete Grace Product List is available at the Grace Bankruptcy Claims Information Site.

The scope of the exposure associated with Libby amphibole asbestos contaminated vermiculite is far reaching and difficult to fully define. Many other corporations further processed Libby vermiculite incorporating it into hundreds of commercial products. Despite the difficulty in defining the scope of the problem, it becomes overwhelmingly clear that research on the unique features of Libby amphibole asbestos and the associated diseases is desperately needed. Further understanding of exposures and disease mechanism will allow for improved care and treatment for those impacted by Libby amphibole asbestos exposure and disease.

The EPA has spent around 400 million dollars for the cleanup efforts so far with another 6 million dollars from the Department of Health and Human Services to go to healthcare providers to screen, diagnose and treat asbestos-related illnesses. During the three-month trial, W.R. Grace did not deny that the asbestos came from its mine, but it said it acted responsibly to clean up the contamination. It also paid millions in medical bills for area residents, and agreed in 2008 to pay 250 million dollars to reimburse the EPA for the cleanup efforts.
Missouri Asbestos: What you need to know

Governing Law and Regulations

National emissions standards for hazardous air pollutants (NESHAP) for asbestos: 40 CFR 61.140 to 61.157

For a Limited Time receive a FREE EHS Report "Recordkeeping for EHS Managers." This special report contains a recordkeeping checklist to help you keep track of your records for major environmental laws and OSHA’s Hazard Communication Standard. Download Now

Asbestos abatement: 10 Code of State Regulations (CSR) 10-6.241 and 10 CSR 10-6.250

Registration requirements: 10 CSR 10-6.241(1)(B) and 10 CSR 10-6.241(3)(A)

Certification requirements: 10 CSR 10-6.241(3)(B)(1) and 10 CSR 10-6.250

Notification requirements: 10 CSR 10-6.241(3)(E), 10 CSR 10-6.241(4)(A), and 10 CSR 10-6.020(2)(A)

Emergency asbestos projects: 10 CSR 10-6.241(3)(E)(5)

Inspections: 10 CSR 10-6.241(3)(F)

Recordkeeping: 10 CSR 10-6.241(3)(B)(2) and 10 CSR 10-6.241(4)(B)

Training: 10 CSR 10-6.250

Regulatory Agency

Missouri Department of Natural Resources (DNR) Division of Environmental Quality Air Pollution Control Program

See ADDRESSES & CONTACTS for addresses and telephone numbers.

See national section for basic information and federal regulations.

Comparison: State vs. Federal

• Rules. Missouri’s asbestos practices generally follow the federal provisions, with some additional state requirements. The state adopted the asbestos NESHAP requirements. The state has additional rules governing asbestos abatement activities.

Missouri does not have a federally approved occupational safety and health program. Therefore, employers are governed by the federal Occupational Safety and Health Administration’s (OSHA) asbestos requirements.

See the national section ASBESTOS for further guidance.

• Administration and enforcement. The Air Pollution Control Program of DNR’s Division of Environmental Quality administers and enforces the state requirements associated with asbestos projects, certification, and training. Federal OSHA oversees occupational asbestos requirements.

State ...

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Related Topics

- Hazard Communication
- OSHA
- Toxic Substances Control Act
- Ventilation
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Missouri

- Richard Hall (NESHAP), 573-751-4817, richard.hall@dnr.mo.gov