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NYS/AHERA
ASBESTOS MANAGEMENT PLANNER
TRAINING MANUAL

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MODEL EPA CURRICULUM FOR TRAINING ASBESTOS MANAGEMENT PLANNERS

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SECTION A

Course Overview

OBJECTIVES:

1. To know the requirements to become an accredited Management Planner under AHERA.

2. To become familiar with the role of the Management Planner and where to find information regarding topics covered in this notebook.

NOTE: Words underlined in the text can be found in the Glossary at the end of this notebook.

QUALIFICATIONS AND ROLE OF THE MANAGEMENT PLANNER

The Asbestos Hazard Emergency Response Act (AHERA) Final Rule suggested certain minimum education prerequisites for Building Inspectors and Management Planners. However, states were free to adopt standards which were higher or lower than the federal suggestions:

Suggested Prerequisites (AHERA)

Inspectors	Management Planners
High School diploma	Registered architect, registered engineer, certified industrial hygienist, or related scientific professional

To become an accredited Building Inspector, persons are required to participate in an approved 3-day training course and obtain a minimum score of 70 percent on an examination. To become an accredited Management Planner, persons must take the Building Inspector's course plus an additional 2-day approved training course. Planners must pass the examination following the inspection course, as well as an examination at the conclusion of the Management Planner's course. To maintain their accreditation, Management Planners must attend a Building Inspector refresher course of one-half day in length, plus an additional half-day session on Management Planning for annual reaccreditation. Each state had the option of requiring persons to pass reaccreditation examinations at specific intervals.

Some states chose to implement more stringent requirements for certification in some or all of the AHERA disciplines. The Management Planner is advised to inquire into the state(s) requirements applicable to the buildings he/she is managing, to determine what additional requirements or prerequisites apply to asbestos management and/or remediation.

FUNCTIONS OF THE MANAGEMENT PLANNER

The Building Inspector is responsible for (1) determining whether ACBM is present in a building and (2) assessing physical characteristics of the ACBM and of the building. The Management Planner then uses this information to estimate the degree of current or potential hazard posed by the ACBM, and to develop a plan for managing the ACBM.

This includes the responsibility for designing an operations and maintenance (O&M) plan if the existence and location of asbestos-containing material (ACM) is confirmed. An O&M plan is to be implemented as soon as ACM is identified. The O&M program is to remain in effect until all ACM is removed from the facility.

A building inspection involves (1) an investigation of records for the specification of ACBM, (2) an inspection of the building for suspect materials, (3) sampling and analyzing suspect materials to test for asbestos, and (4) assessing the condition and location of the ACBM and other characteristics of the building. After reviewing the results of the inspection and physical assessment report covered in Section B of this notebook, the Management Planner employs a systematic approach to: (1) determine the hazard posed by the ACM, covered in Section C: Hazard Assessment; and (2) evaluate and select control response options, as discussed in Section E. Five major response actions are identified in AHERA. They include:

- Operations and Maintenance (O&M)
    - sometimes referred to as "preventative measures" in AHERA
- Repair
- Encapsulation
- Enclosure
- Removal

The selection of a response action should be based upon a number of evaluating factors, including (1) hazard assessment, (2) costs - initial and long-term, and (3) life of the facility. The Management Planner determines which response action is appropriate for all ACBM identified in the building. The single most important factor in determining a response action must be the health and safety of the building occupants. Once this factor has been gauged, all other factors should be incorporated into the final decision. In so doing, the Planner will find it advantageous to consult with other professionals, for example an architect (to address issues such as the life of the facility, building code upgrade requirements, etc). Section F provides guidance regarding the utilization of other professionals in developing a Management Plan.

If the recommended response action is O&M (any school building containing or assumed to contain friable ACBM must implement an O&M program as long as the ACM remains in the building), the Management Planner must develop and document the O&M program in the

Management Plan submitted to the local education agency (LEA). Developing an O&M program is covered in Section G of this Manual.

LEA's are required to conduct periodic reinspections of school buildings at least every 3 years. These inspections must be conducted by certified individuals. All inspection and assessment data compiled at the time of reinspection are to be appended to the existing Management Plan and acted upon in a timely manner.
Recordkeeping to document compliance with AHERA regulations and to update the condition of ACM IS covered in Section I of the Manual. Section J provides a detailed description of the elements of a Management Plan.

The Management Planner is expected to be knowledgeable regarding the costs of and options for financing response actions, including O&M programs. Section K provides financing and cost estimating guidance.

Section D of this Manual covers legal issues and Section H covers regulatory issues relevant to the Management Planner.

SECTION B

Evaluation and Interpretation of Survey Results

OBJECTIVES:

1. To Know the AHERA requirements for inspection reports and management plans.

2. To understand the need for a systematic approach to review survey data and produce a summary.

3. To be able to prepare and format survey data for use in hazard assessment.

4. To know the necessary records from the inspection report to include in the management plan.

NOTE: Words underlined in the text can be found in the Glossary at the end of this notebook.

INTRODUCTION

As specified in the AHERA Rule, the building inspection and management plans are designed to complement each other. Information on the presence or absence of ACBM, its condition, and its location in the building becomes the input data for the management plan. The Management Planner uses the inspection data to determine (1) the relative degree of hazard posed by the various ACBM in the building, (2) recommended response actions together with the timing of those actions, and (3) recommended management practices (the operations and maintenance program) for any ACBM in the building.

In preparing a management plan for buildings **other than schools**, the Management Planner should be aware that the inspection report may not conform to the AHERA requirements as taught in the Inspector's course. The Management Planner may find her/himself working from an Environmental Assessment report or other document not in the AHERA format. If the inspection report does not contain sufficient information on samples, definition of homogeneous sampling areas, categorization of damage and physical assessment, the Management Planner (or another accredited Inspector) may have to repeat part of the inspection and physical assessment in order to generate the information needed to prepare the hazard assessment for the management plan.

SUMMARY OF INSPECTION REPORT AND MANAGEMENT PLAN

The AHERA Rule requires that the following key items of information be included in the Inspection Report:

- A list of identified homogeneous sampling areas (referred to in AHERA as "homogeneous material") classified by type of material (surfacing material, thermal system insulation, or miscellaneous material).

- The location (through blueprint, diagram or written description) of homogeneous sampling areas and individual sampling locations, the location of friable suspect material assumed to be ACBM, and the location of non-friable suspected material assumed to be ACBM The dates of sampling should also be included.

- Approximate square or linear footage of any homogeneous sampling area where material was sampled for ACM.

- A copy of the laboratory analysis results of each bulk sample and designation of each homogeneous sampling area as ACM or non-ACM. The dates of sample analyses should also be included.

- The physical assessment of ACBM and suspect ACBM and placement into one of the following categories:

    1. Damaged or significantly damaged thermal system insulation 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 suspect ACBM

- The name and signature of each accredited inspector collecting samples, the state of accreditation and the accreditation number.

According to AHERA, the following key elements comprise the Management Plan:

- General building description and a summary of the Inspection Report.

- Descriptions of hazard assessments for all confirmed and assumed ACBM.

- Recommended preventative measures (operations and maintenance program) and/or response actions for any friable ACBM.

    - Location where preventative measures and response actions are to be implemented.

    - Reasons for selecting the measures and actions.

    - Schedule for implementation.

- Identification of ACBM which remains after response actions are taken.

- Plan for periodically re-inspecting ACBM.

- Program for informing workers and building occupants (sometimes called "Awareness Training").

- Evaluations of resources needed to implement the management plan.

REVIEW OF SURVEY DATA

The building inspection(s) will produce four types of survey data: (1) field data on building characteristics, homogeneous sampling areas, and areas where physical assessments were performed (functional spaces or areas), (2) results of laboratory analyses of bulk samples for asbestos content, (3) materials assumed to be ACM that were not sampled, and (4) physical assessment data on confirmed and assumed ACBM.

Exhibit B-1 contains a list and copies of all Building Inspector data forms that are discussed in the Building Inspector training course. Exhibit B-1c is a typical form used for summarizing field survey and physical assessment information in the inspection report. All ACBM listed on the form should be confirmed by sampling and analysis as ACM or non-ACM, unless it is listed on a form, such as Exhibit B-la, as assumed ACBM.

Field Data

The Management Planner should first review the Building Inspector's field data to (1) become familiar with the building and the assumed and confirmed ACBM, and (2) check for obvious errors in the characterization of the building and suspect ACBM All of the Inspector's data sheets (floor plans or sketches, maps or sketches of homogeneous sampling areas, assumed ACBM location forms) should be reviewed during a building walk-through. The Management Planner should also be certain the inspection was performed by an accredited inspector.

Laboratory Analyses

The Building Inspector's bulk sample data forms should be compared with the laboratory reports to verify which samples and which homogeneous areas contain asbestos. The Inspector's summary table (Exhibit B-1c) describing the type and location of ACBM, the type of asbestos, and the extent of each homogeneous sampling area should then be checked for accuracy during the building walk-through.

Physical Assessment Data

Finally, the Building Inspector's reports on the physical assessment of friable ACBM should be examined. Spot checks of friable ACBM should be made during the building walk-through to verify the assessments. Discrepancies between the Building Inspector's and the Management Planner's assessments should be noted. Any significant difference (i.e., a change in damage or potential for damage category) should trigger a complete reassessment of all functional areas by the Management Planner.

SUMMARIZING THE INSPECTION DATA

The Building Inspector's Summary Sheet (Exhibit B-lc) provides a useful starting point for the next step in the development of a management plan - the hazard assessment. If this sheet is not available from the Building Inspector, a summary should be prepared from the Building Inspector's data forms. (This is more likely to occur if, as noted earlier, the inspection was not done according to the AHERA format [e.g., it was not done for a school building]).

EXHIBIT B-1

BUILDING INSPECTOR'S DATA FORMS

- Assumed ACBM Location Form (Exhibit B-Ia)
- Recording Form for Physical Assessment Data (Exhibit B-Ib)
- Example Format for Summarizing Inspection and Assessment Results (Exhibit B-Ic)

EXHIBIT B-Ia

ASSUMED ACBM LOCATION FORM

Building: _____

LOCATIONS			**TYPE OF MATERIAL**			GENERAL CONDITION (Describe)
Functional Space No.	Floor	SM	TSI	Misc.	Describe	

Note: SM is surfacing material and TSI is thermal system insulation

Inspector: _____ Date: _____

EXHIBIT B-lb

RECORDING FORM FOR PHYSICAL ASSESSMENT DATA

Building: _____

Functional Space Number: _____ Type: _____ Location: _____

Type of Suspect Material: _____ Surfacing _____ TSI _____ Misc.
Description: _____
_____

Approximate Amount of Material (linear, square or cubic ft. _____

Condition:

Percent Damage _____ % _____ Localized _____ Distributed
Type of Damage _____ Deterioration _____ Water _____ Physical
Description: _____
_____

Overall Rating: _____ Good _____ Damaged _____ Sig. Damaged

Potential for Disturbance:

Frequency of Potential Contact: _____ High _____ Moderate _____ Low
Description: _____
_____

Influence of Vibration: _____ High _____ Moderate _____ Low
Description: _____
_____

Potential for Air Erosion _____ High _____ Moderate _____ Low
Description: _____
_____

Frequency of Potential Contact: _____ High _____ Moderate _____ Low
Description: _____
_____

Rate Potential for: _____ Damage _____ Sig. Damage _____ Minimal or No Damage

Comments: _____

Signed: _____ Date: _____

Inspector Accreditation Number _____

EXHIBIT B-lc

EXAMPLE FORMAT FOR SUMMARIZING SAMPLING AND ASSESSMENT RESULTS

ACBM Location		ACBM Characteristics				Assessment Results			
Homogeneous Sampling Area No.	Functional Space No.	Type	Friable / Non-Friable	% Asbestos	Amount of Material	Condition	Potential Disturbance	AHERA Category	Reason for Damage

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SECTION C

Hazard Assessment and Response Action Evaluation

OBJECTIVES:

1. To be able to distinguish between physical assessment and hazard assessment.

2. To recognize various approaches to hazard assessment.

3. To be able to employ the decision tree approach to hazard assessment.

4. To be able to define the seven hazard ranking classifications prescribed by AHERA and classify ACBM accordingly.

5. To understand the correlation between hazard assessment ranking and response action selection.

NOTE: Words underlined in the text can be found in the Glossary at the end of this notebook.

INTRODUCTION

Assessing the hazard potential of ACBM is one of the key activities of the Management Planner. Working with the results of the physical assessment of suspect material (condition and potential for disturbance) conducted by the Building Inspector, the Management Planner interprets and evaluates the data for the purpose of setting abatement priorities and ranking areas for response actions. The interpretation and evaluation process is described in the AHERA Rule as "hazard assessment."

This section builds on the general discussion of approaches to ACM assessment and the detailed description of one approach as it is presented in the Building Inspectors training course and repeated in Appendix C-1 at the end of this section. New material in the text focuses on selecting and timing response actions.

THE MANAGEMENT PLANNER'S HAZARD ASSESSMENT

Although all friable ACBM and all thermal system insulation will have been classified by the Building Inspector, considerable discretion in selecting response actions is still allowed under AHERA. To assist in selecting among the allowed ACBM control actions for each category, a hazard assessment should be conducted. The hazard assessment combines the level of potential disturbance with the current condition of the ACM to indicate overall hazard potential, as shown in decision tree form (Exhibit C-1) and tabular form (Exhibit C-2).

The first step in the hazard assessment procedure is to determine the current condition of the ACBM from the inspection report for each homogeneous sampling area. The ACBM will be classified as "significantly damaged," "damaged" or "good." The rankings of potential hazard range from 1 - most hazardous, to 7 - least hazardous. The highest rank is reserved for ACBM which is "significantly damaged." A review of the definitions of "significant damage" in Appendix C-1 (Exhibits C-1-1 and C-1-2) will reveal that the definitions are designed to identify ACBM which is so extensively damaged or deteriorated that it requires immediate corrective action. This is true without regard to the type of ACBM - surfacing material, thermal system insulation or miscellaneous material- all significantly damaged material is assigned to Hazard Rank #1.

Hazard rankings 2 - 4 reflect ACBM which is "damaged" as defined in AHERA, with rank 2 indicating a "potential for significant damage", and rank 3 indicating a "potential for damage." Hazard ranks 5-7 are reserved for ACBM currently in good condition, but with a range (moderate or low) in the likelihood for future disturbance. Should damage or significant damage occur, the ACBM will be appropriately reclassified on a subsequent inspection.

Note that this hazard ranking combines AHERA categories. For example, rank #2 is damaged ACBM with a potential for significant damage. By combining categories, a more complete evaluation of abatement priorities can be obtained.

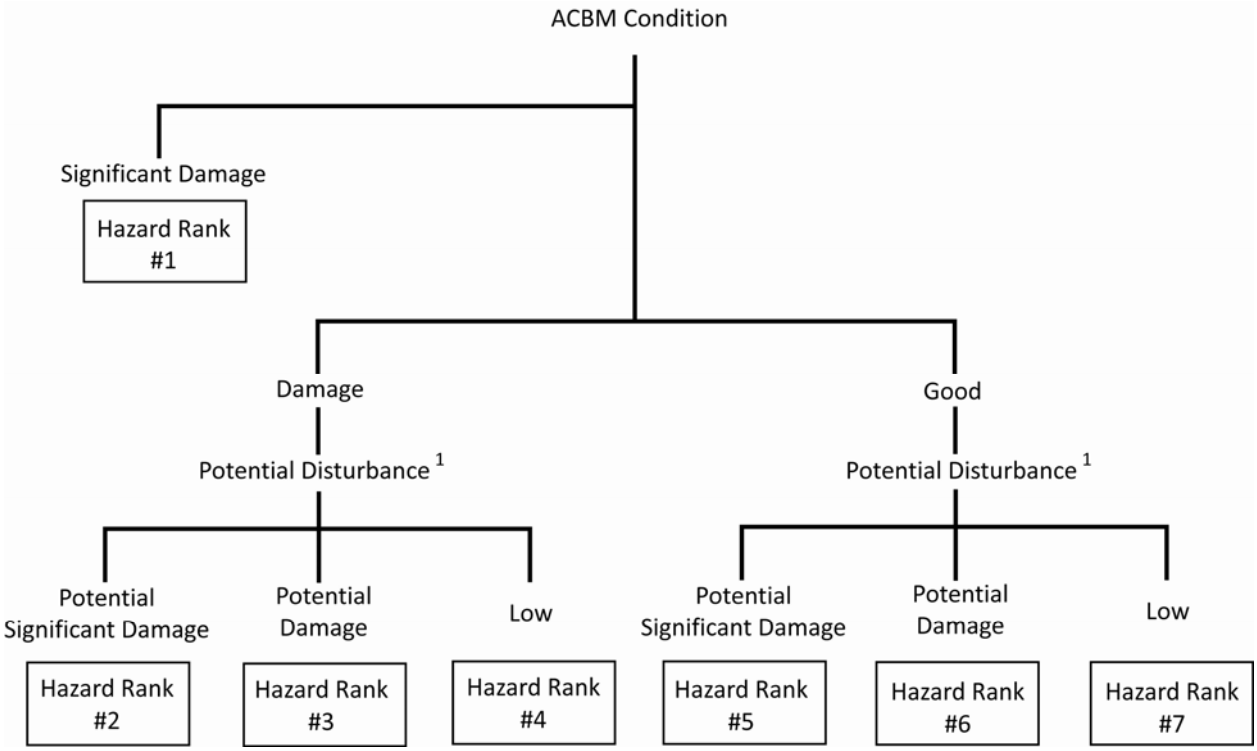
Note also that the hazard assessment produces seven hazard ranks. These seven ranks are different from and should not be confused with, the seven AHERA categories of damage and potential for damage. Review the AHERA categories and the hazard ranks to verify their differences.

EVALUATING RESPONSE ACTIONS

Exhibit C-3 outlines the basic response actions specified in the AHERA Rule which correspond to the hazard rankings in Exhibit C-2. Since the hazard ranks are combinations of AHERA categories, the indicated response actions are likewise combinations. As noted above, hazard rank number 1 indicates that immediate steps should be taken to evacuate people in the functional space or isolate the area with an airtight barrier. AHERA allows "repair" as an option for thermal insulation, but only if repair is technologically feasible and "human health and the environment" can be protected. This ranking receives the highest priority for abatement. Hazard ranks 2-7 are of lower immediate concern, but require specific response actions. The first action should be to institute a comprehensive operations and maintenance (O&M) program (see Section G). Other actions depend on individual circumstances. AHERA encourages Management Planners to broadly evaluate the costs and effectiveness of alternative response actions. A key phrase in the rule is that the most appropriate response action is "the least burdensome method which protects human health and the environment." Note that removal, enclosure, encapsulation, and repair are all potentially allowable actions for each of the hazard categories. The AHERA Rule also points out that nothing in the Rule should be interpreted as precluding removal of ACBM at any time. In the long run, all friable ACBM must be removed from each building prior to their disturbance by renovation, and all ACM (friable and nonfriable) must be removed prior to demolition according to the National Emission Standards for Hazardous Air Pollutants (NESHAP). However, the least burdensome strategy may well involve a combination of O&M, repair, enclosure, or encapsulation (if technically appropriate), and eventual removal, perhaps combined with building system renovation. Exhibit C-4 provides information that the Management Planner should use as a starting point in evaluating and selecting response actions. The AHERA requirements provide a framework and establish limits for analysis and decision-making. The abatement priority rank suggests the relative timing for ACBM abatement from a hazard perspective. The final decision will depend on a detailed analysis of effectiveness and costs as described in Sections E and K.

EXHIBIT C-I

CLASSIFICATIONS FOR HAZARD POTENTIAL
(DECISION TREE DISPLAY)



See Appendix C-I (EXHIBIT C-I-3) for classification scheme.

EXHIBIT C-2

CLASSIFICATIONS FOR HAZARD POTENTIAL
(TABULAR DISPLAY)

Hazard Rank	ACBM Condition	ACBM Disturbance Potential
1	Significantly Damaged	Any
2	Damaged	Potential for Significant Damage
3	Damaged	Potential for Damage
4	Damaged	Low
5	Good	Potential for Significant Damage
6	Good	Potential for Damage
7	Good	Low

EXHIBIT C-3

RESPONSE ACTIONS BASED ON HAZARD RANKING

Hazard Rank	Removal Priority	AHERA Categories	Response Action Required by AHERA
1	1	Significantly Damaged	Evacuate or isolate the area if needed. Remove the ACBM (or enclose or encapsulate if sufficient to contain fibers). Repair of thermal system insulation is allowed if feasible and safe. O&M required for all friable ACBM
2	2	Damaged + Potential for Significant Damage	Evacuate or isolate the area if needed. Potential for Remove, enclose, encapsulate, or repair to correct damage. Take steps to reduce potential for disturbance. O&M required for all friable ACBM
3	3	Damaged + Potential for Damage	Remove, enclose, encapsulate, or repair to correct damage. O&M required for all friable ACBM
4	4	Damaged	Same as hazard rank 3.
5	5	Potential for Significant Damage	Take steps to reduce potential for disturbance. O&M required for all friable ACBM and TSI.
6	6	Potential for Damage	O&M required for all friable ACBM and TSI.
7	7	All Remaining ACBM	O&M required for all friable ACBM, but measures need not be as extensive as above.

Note: AHERA does not account for combinations of current and potential damage (i.e., hazard ranks #2 and #3). The response actions shown are combinations of those required for each condition.

EXHIBIT C-4

CLASSIFICATIONS FOR THE LEVEL OF POTENTIAL DISTURBANCE

Level of Potential Disturbance	Frequency of Potential Contact	Influence of Vibration	Potential for Air Erosion
HIGH ("potential for significant damage" as defined in AHERA)	High	Any Value	Any Value
	Any Value	High	Any Value
	Any Value	Any Value	High
Moderate ("potential for damage" as defined in AHERA)	Moderate	Moderate or Low	Moderate or Low
	Moderate or Low	Moderate	Moderate or Low
	Moderate or Low	Moderate or Low	Moderate
LOW	Low	Low	Low

APPENDIX C-1
A METHOD FOR CONDUCTNG PHYSICAL ASSESSMENTS UNDER AHERA

A Decision Tree Approach to Physical Assessment

The approach described below extends the EPA assessment guidelines in the "Purple Book" to include hazard assessment requirements in the AHERA Rule. It is based on an approach described in the draft EPA document *Guidance for Assessing and Managing Exposure to Asbestos in Buildings,* D. Keyes, et al., EPA, November 1986. The fundamental principle of the assessment methodology described here is that the tendency for ACM to release fibers is directly related to the degree that the material has been disturbed or has deteriorated. One of the best measures of past and current disturbance and/or deterioration is the condition of the material. ACM in poor condition reflects past and perhaps ongoing disturbance/deterioration, and probably indicates past and ongoing release of fibers into the air. The likelihood of future disturbance can be gauged by the location of the material with respect to: (1) workers and other building occupants (the frequency of potential contact), (2) sources of vibration, and (3) sources of air erosion.

Assessing the Condition of the Suspect Material

Suspect material will be placed in one of three categories based on a visual inspection: good, damaged, or significantly damaged. Exhibits C-1-1 (surfacing material) and C-1-2 (thermal system insulation) provide descriptions of each category. Note that the description of "significantly damaged" is fairly restrictive. In the spirit of AHERA, it is designed to identify ACBM that needs to be isolated and removed (or repaired, if possible) as soon as is feasible. To aid in reliable and repeatable application of the definitions in Exhibits C-1-1 and C-1-2, a rough quantitative measure of damage is introduced - the extent of damage. As indicated, if the damage or deterioration covers roughly one-tenth (if evenly distributed) or one-quarter (if localized) of the surface, or more, the suspect material is rated as being significantly damaged. The presence or absence of other characteristics would also be sufficient for this classification. Of course, even the quantitative aspects of these assessments remain somewhat subjective. The aim is for the Building Inspector to gain a "feel" for the appropriate use of the definitions through repeatedly viewing a series of training pictures. Exhibits C-1-3 and C-1-4 are diagrams of 10% distributed and 25% localized damage, respectively. The distinction between localized and distributed damage reflects one of the purposes of assessment - developing recommendations for abatement. Localized damage or deterioration should be easier to repair.

Assessing the Potential for Disturbance

The likelihood that the suspect material could be disturbed in the future is related to (1) the frequency with which service workers need to work near the material, and the activities they conduct; or the frequency with which building occupants are in the vicinity of the material, (2) its location with respect to sources of vibration, and (3) the potential for air erosion. Exhibit C-1-5 defines each of these factors and provides guidance for evaluating them in the field. Note that the factors are evaluated differently depending on whether service workers or other building occupants are likely to contact/disturb the material.

The results of evaluating the factors in Exhibit C-1-5 are then used to classify the material with respect to its potential for disturbance. The categories are: potential for significant damage, potential for damage, and low potential. The classification scheme is illustrated in Exhibit C-1-6. As shown, if anyone of these three factors (frequency of potential contact, influence of vibration, or potential for air erosion) is determined to be high, then the level of potential disturbance is "potential for significant damage" as defined in AHERA, regardless of ratings for the other two criteria. Similarly, if none of the three criteria is assessed as high but at least one has a rating of "moderate" then the level of potential disturbance is designated "potential for damage" as defined in AHERA. If all three criteria are rated low, then the overall rating is "low potential." Note, that AHERA does not refer specifically to material in good condition or with a low potential for disturbance.

Other Data Important for Estimating Exposure Potential

Once asbestos fibers are released from ACBM, the degree to which they pose a danger to building workers and occupants depends on their concentration in the air at locations where people are present. Understanding the building's HVAC system is important to understanding the transport of released fibers. Any time fibers are released into the ventilation air stream they will be transported to occupied spaces. Thus, whether or not the ACBM is located in an air plenum should be noted. Location in a supply air plenum is more significant than in a return plenum since the distance of transport to the occupied space is shorter and dilution by makeup air is less significant. The total amount of suspect material in damaged or deteriorated condition may also affect the level of asbestos in the air. The amount of material can be calculated from the estimated percent of damage and the estimated amount of material present. Finally, additional information may be useful for other purposes. For example, the number of people in the building is needed to apply for EPA grants and loans for ACM abatement under the Asbestos in Schools Hazard Abatement Reauthorization Act.

Recording Assessment Data

All of the data discussed above should be collected in a systematic manner. Exhibit C-1-7 is a data form that could be used for this purpose. The form should be filled in as follows:

- Fill in the building name, functional space number and description of the location in the building. Note the type of area as well, including details such as whether it is a supply or return air plenum.

- Identify the type and amount of suspect material being assessed and describe it. Note: Where various types of material are present in a single functional space (e.g., fireproofing, acoustical plaster, and pipe wrap in a classroom), a separate form should be filled out for each material.

- Calculate the approximate amount of material by estimating the square feet of surfacing or miscellaneous material or the linear feet of pipe wrap, the number of pipe elbows, and the square feet of other types of thermal insulation.

- Estimate the extent and type of damage/deterioration and describe it.

- Using the rating scheme summarized in Exhibits C-1-1 and C-1-2, rate the overall condition of the material.

- Using the potential for disturbance rating scheme summarized in Exhibit C-1-5, rate the frequency of potential contact, the influence of vibration and the potential for air erosion. Describe the conditions observed in arriving at your rating.

- Using the classification in Exhibit C-1-6, rate the overall potential for disturbance.

- Add any additional comments that may be useful to the Management Planner in developing a plan to manage the ACBM.

EXHIBIT C-1-1

CLASSIFYING THE CONDITION OF SUSPECT MATERIAL
SURFACING AND MISCELLANEOUS MATERIAL

"Significantly Damaged"

Material with one or more of the following characteristics:

- The surface is crumbling or blistered over at least one-tenth of the surface if the damage is evenly distributed (one-quarter if the damage is localized).
- One-tenth (one-quarter, if localized) of material hanging from the surface, deteriorated, or showing adhesive failure.
- Water stains, gouges, or mars over at least one-tenth of the surface if the damage is evenly distributed (one-quarter if the damage is localized).

Accumulation of powder, dust, or debris similar in appearance to the suspect material on surfaces beneath the material can be used as confirmatory evidence.

"Damaged"

Material with the following characteristics:

- The surface is crumbling, blistered, water-stained, gouged, marred or otherwise abraded over less than one-tenth of the surface if the damage is evenly distributed (one-quarter if the damage is localized).

Accumulation of powder, dust, or debris similar in appearance to the suspect material on surfaces beneath the material can be used as confirmatory evidence.

Good Condition

Material with no visible damage or deterioration, or showing only very limited damage or deterioration.

AHERA Definition of Significantly Damaged Friable Surfacing and Miscellaneous ACM

"Friable surfacing and miscellaneous ACM in a functional space where damage is extensive and severe." Note, the Preamble to the AHERA rule makes reference to 10 and 25 percent damage as a means of distinguishing significantly damaged from damaged ACBM.

AHERA Definition of Damaged Friable Surfacing and Miscellaneous ACM

"Friable surfacing and 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 the 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 ACM surface; water damage; significant or repeated water stains, scrapes, gauges, mars or other signs of physical injury on the ACM. Asbestos debris originating from the ACBM in question may also indicate damage."

EXHIBIT C-1-2

**CLASSIFYING THE CONDITION OF SUSPECT MATERIAL-
THERMAL SYSTEM INSULATION**

"Significantly Damaged"

Material with one or more of the following characteristics:

- Missing jackets on at least one-tenth of the piping or equipment.
- Crushed or heavily gouged or punctured insulation on at least one-tenth of pipe runs/risers, boiler, tank, duct, etc., if the damage is evenly distributed (one-quarter if the damage is localized).

Accumulation of powder, dust, or debris similar in appearance to the suspect material on surfaces beneath the pipe/boiler/tank/duct, etc. can be used as confirmatory evidence.

"Damaged"

Material with one or more of the following characteristics:

- A few water stains or less than one-tenth of insulation with missing jackets.
- Crushed insulation or water stains, gouges, punctures, or mars on up to one-tenth of the insulation if the damage is evenly distributed (or up to one-quarter if the damaged is localized).

Accumulation of powder, dust, or debris similar in appearance to the suspect material on surfaces beneath the pipe/boiler/tank/duct, etc. can be used as confirmatory evidence.

Good Condition

Material with no visible damage or deterioration, or showing only very limited damage or deterioration.

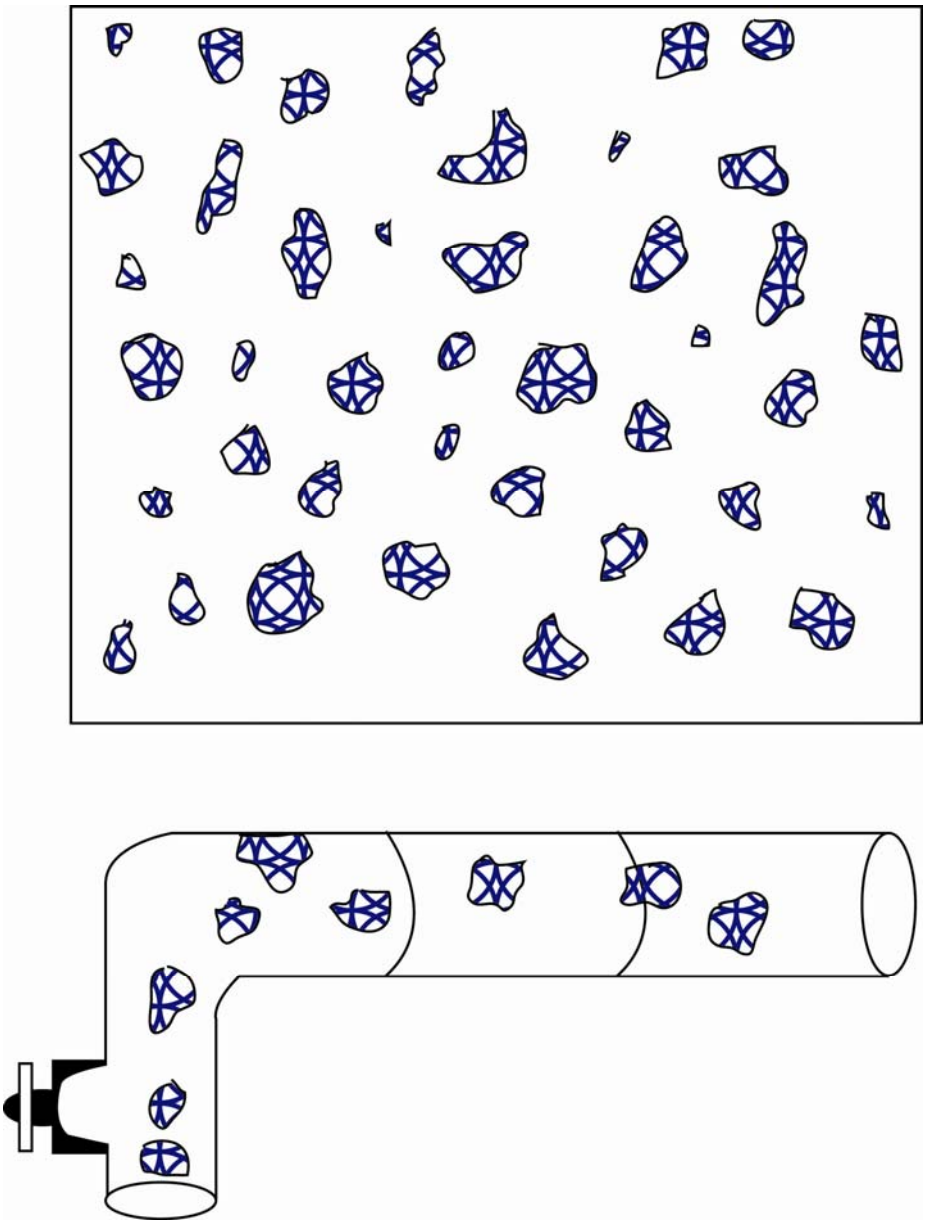
AHERA Definition of Damaged or Significantly Damaged Thermal System Insulation [1]

Thermal system insulation on pipes, boilers, tanks, ducts, and other thermal system insulation equipment which 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.

[1] NOTE: For TSI, the AHERA Rule has only one category of damage: ("damaged or significantly damaged").

EXHIBIT C-1-3

REPRESENTATION OF 10 PERCENT DISTRIBUTED DAMAGE



EXIHIBIT C-1-4

REPRESENTATION OF 25 PERCENT LOCALIZED DAMAGE

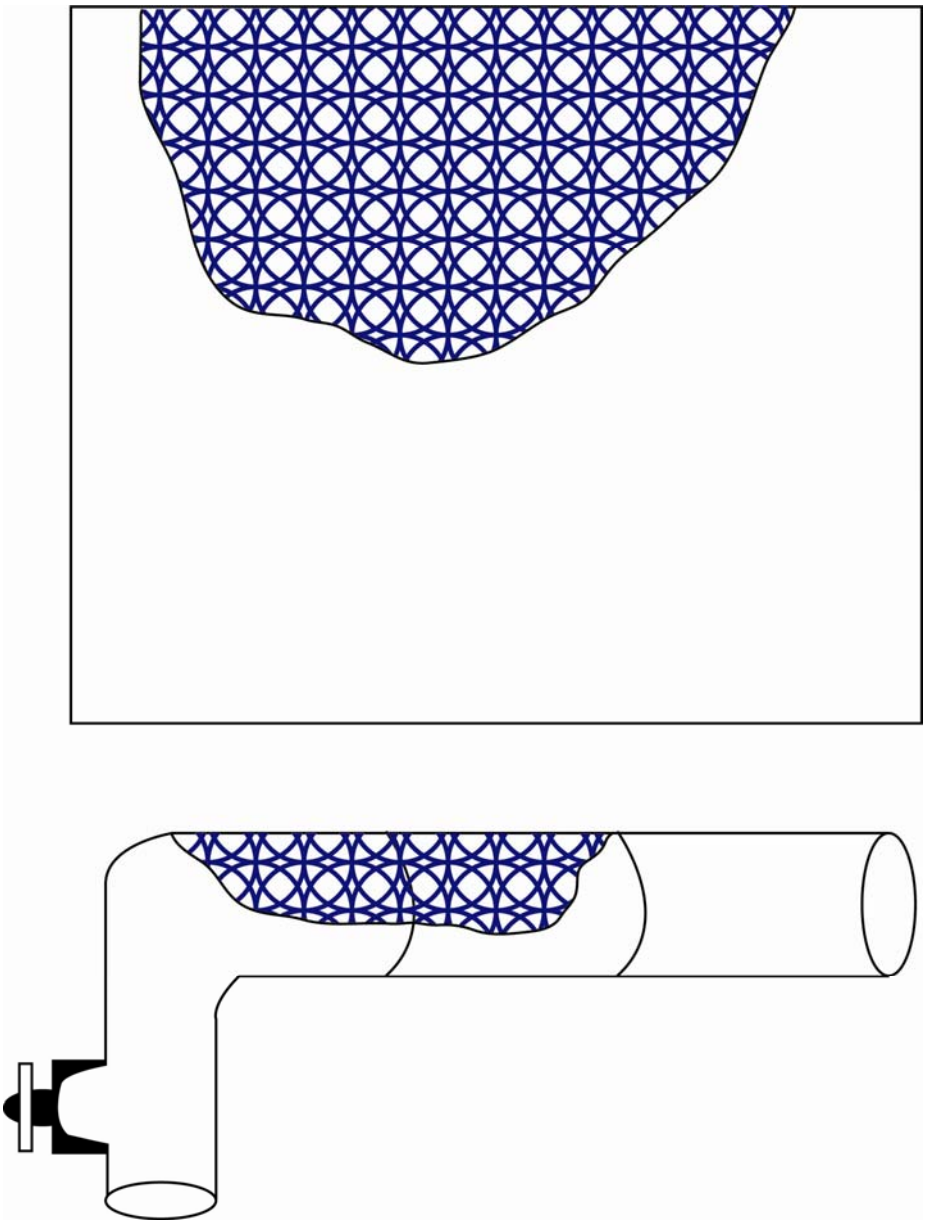


EXHIBIT C-1-5

FACTORS TO BE USED IN DETERMINING THE POTENTIAL FOR DISTURBANCE OF SUSPECT MATERIAL

Potential for Contact with the Material

High:
- Service workers work in the vicinity of the material more than once per week, or
- The material is in a public area (e.g., hallway, corridor, auditorium) and accessible to building occupants.

Moderate:
- Service workers work in the vicinity of the material once per month to once per week, or
- The material is in a room or office and accessible to the occupants.

Low:
- Service workers work in the vicinity of the material less than once per month, or
- The material is visible but not within reach of building occupants.

Influence of Vibration

High:
- Loud motors or engines present (e.g., some fan rooms), or
- Intrusive noises or easily sensed vibrations (e.g., major airports, a major highway).

Moderate:
- Motors or engines present but not obtrusive (e.g., ducts vibrating but no fan in the area), or
- Occasional loud sounds (e.g., a music room).

Low/None:
- None of the Above.

Potential for Air Erosion

High:
- High velocity air (e.g., elevator shaft, fan room).

Moderate:
- Noticeable movement of air (e.g., air shaft, ventilator air stream).

Low:
- None of the Above.

EXHIBIT C-1-6
CLASSIFICATION OF THE POTENTIAL FOR DISTURBANCE

Potential for Disturbance	Frequency of Potential Contact	Influence of Vibration	Potential for Air Erosion
"Potential for Significant Damage"	Any High Value		
"Potential for Damage"	Any Moderate Value		
Low Potential	Any Low Value		

AHERA Definitions

Potential Damage

(1) Friable ACBM in an area regularly used by building occupants, including maintenance personnel, during 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 O&M practices, changes in occupancy, or recurrent damage.

Potential for Significant Damage

Same as potential damage, plus:

(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.

EXHIBIT C-1-7
RECORDING FORM FOR PHYSICAL ASSESSMENT DATA

Building: _____

Functional Space Number: _____ Type: _____ Location: _____

Type of Suspect Material: _____ Surfacing _____ TSI _____ Misc.
Description: _____

_____

Approximate Amount of Material (linear, square or cubic ft. _____

Condition:

Percent Damage _____ % _____ Localized _____ Distributed
Type of Damage _____ Deterioration _____ Water _____ Physical
Description: _____

_____

Overall Rating: _____ Good _____ Damaged _____ Sig. Damaged

Potential for Disturbance:

Frequency of Potential Contact: _____ High _____ Moderate _____ Low
Description: _____

_____

Influence of Vibration: _____ High _____ Moderate _____ Low
Description: _____

_____

Potential for Air Erosion _____ High _____ Moderate _____ Low
Description: _____

_____

Frequency of Potential Contact: _____ High _____ Moderate _____ Low
Description: _____

_____

Rate Potential for: _____ Damage _____ Sig. Damage _____ Minimal or No Damage

Comments: _____

Signed: _____ Date: _____

Inspector Accreditation Number _____

APPENDIX C-2
ALTERNATIVE HAZARD ASSESSMENT METHODS

A wide variety of methods have been used to assess existing or potential hazards posed by asbestos-containing materials (ACM) and which identify the appropriate methods for corrective action. Three approaches, with examples (parentheses), are:

1) Table (EPA Purple Book)

2) Decision Trees (EPA Draft Assessment Guidance Document and the British Pink Book)

3) Matrix stratification (Sawyer and Morse)

A few common characteristics are worth noting:

- Condition of the material is a key criteria, if not the key criteria, in each method.
- Most methods differentiate between at least two levels of damage, occasionally three or four.
- A severe/major damage category is usually identified as "worse case," which requires removal.
- Accessibility is the second most prominent criteria.

Numerical scoring schemes (or “algorithms”) are not discussed, since EPA does not recommend their use.

EPA PURPLE BOOK (Table)

Comments:

- Provides separate analysis for three material types: surfacing material, pipe and boiler insulation (thermal system insulation) and other (miscellaneous) types of ACM
- Discusses need, timing and recommends methods of abatement for each type.
- Provides assessment tables for surfacing material and pipe and boiler insulation
- Classifies homogeneous sampling areas of either surfacing material or pipe and boiler insulation into six general categories given two key characteristics:
  - Current condition of ACM (good, minor damage, poor)
  - Potential for future damage, disturbance, or erosion (low, high)
- Provides comparative analysis of abatement methods.

Observations:

- Simple to use but highly qualitative.
- Allows flexibility in selecting response actions; identifies removal as having "the widest applicability" and as "the only truly permanent solution."
- Unit of analysis is homogeneous sampling area.
- Differentiates between surfacing material and thermal system insulation, in that former is less amenable to repair and less localized.
- Does not provide a manner for relative ranking of individual projects/hazards within categories.

Reference: *Guidance for Controlling Asbestos-Containing Materials in Buildings,* (EPA 560/5-85/024), June 1985, Chapter 4, pp. 4-1 to 4-12.

EPA DRAFT ASSESSMENT DOCUMENT (Decision Tree)
Seventh Draft Report (11/7/86)

Comments:

- Provides separate analyses for surfacing material and thermal system insulation.

- Offers detailed discussion of three key factors for assessing potential exposure to asbestos: the condition of the ACM, disturbance (existing and potential, which includes accessibility) and air flow.

- Classifies damage as:

  - Significant (10% scattered, 25% localized)
  - Moderate (up to 10% scattered, 25% localized)
  - Good condition ("no visible...or showing only very limited" damage)

- Results in 8 prioritized response action categories, ranging from removal ASAP (Response Action 1 - [RA1]) to continue O&M until NESHAP removal, by renovation or demolition, is required (RA8).

- Decision process flows as follows:

  - Friable? If so, assess condition. If not, O&M.
  - Condition? If significant damage isolate area and remove ASAP, if good, O&M, but assess potential for disturbance. If moderate damage, assess disturbance.
  - Disturbance level? If high, remove ASAP or reduce potential for disturbance.
  - If moderate or low, assess air flow.
  - Air flow? Four prioritized categories, depending upon disturbance level and presence of air flow.

Observations:

- Developed as guidance by EPA in response to requests from schools and other building owners for more specificity than provided in Purple Book.
- Modified by a panel of experts.
- Draft document which was never finalized.
- Fairly rigid structure.
- Provides priority listing by the 8 categories.
- Unit of analysis is homogeneous sampling area for surfacing material; separate analysis system for thermal system insulation - larger units than other schemes, intended to help owners recognize economies of scale and long-term considerations.
-

Reference: Keyes, D., B. Price, and J. Chesson, *Guidance for Assessing and Managing Exposure to Asbestos in Buildings,* Draft, November 7, 1986. Section 2 (pp. 5-22), Section 3 (pp. 24-40), and Trees, p. 26 and 39.

BRITISH PINK BOOK (Decision Tree)

Comments:

- Highly qualitative discussion of assessment, outlining the:
  - Potential for fiber release
  - Type of material (i.e., sprayed asbestos, etc.)
  - Integrity of the material (condition)
  - Position of the material (potential for disturbance)

- Proposes separate decision trees for each of three types of asbestos-containing material.
  - Sprayed asbestos (sprayed-on surfacing material) and lagging (thermal system insulation).
  - Asbestos insulating board
  - Asbestos cement products

- Decision process flows as follows:
  - Contains asbestos? If so, assess condition. If not, record as non-asbestos material.
  - Good condition? If so, management (O&M). If not identify material type.
  - Sprayed-on asbestos or lagging? If so, go to Chart 2. (If not, go to other appropriate charts)
  - Readily repairable? If so, repair. If not, assess accessibility.
  - Accessible? If so, assess extent of damage.
  - Damage extensive? If so, is there loose friable material? If not, seal or enclose.
  - Loose friable material? If so, is enclosure feasible? If not, seal or enclose?
  - Enclosure feasible? If so, enclose. If not, remove.
  - Management (O&M) is required for all material not removed.

Observations:

- Highly qualitative, but simple to use.
- Limits flexibility of response.
- Heavy reliance on proper management (O&M).
- Appears to reserve removal for only those cases where other methods (O&M, encapsulation, enclosure) are first ruled out as inappropriate.
- Licensed contractor performs abatement activity.

Reference: Department of the Environment, *Asbestos Materials in Buildings,* Her Majesty's Stationary Office (HMSO), Second Edition, 1986 (ISBN 0-11-751890-5). Chapter 4 (pp. 16-18), Annex 3 (pp. 38-45).

MATRIX STRATIFICATION (Matrix)

Comments:

- Proposes integrated survey of structure and suspect materials; inventory utilizing specific classifications of survey data; and a summary matrix of the inventory for assessment.

- Utilizes three basic inventory variables for matrix:
  - Accessibility, with 4 dimensions: Yes or no ill restricted area (boiler room) or non-restricted area (classroom or hallway).
  - Condition, with three or four dimensions (intact, minor damage, moderate damage, severe damage) depending on type of material and other factors.
  - Quantity of material (in precise linear, area or unit measurements).

- Places quantity of material as unit in cells.

- Matches response actions with conditions. For example, for thermal system insulation matrix:

  - Intact, monitor.
  - Minor damage, patch.
  - Moderate, cover (repair).
  - Severe, remove.

- Allows addition or deletion of cells, as appropriate. (Repair dimension would often be dropped for surfacing material.)

Observations:

- Provides some prioritization and overall picture.
- Dynamic. Facilitates cost analysis.
- Not project or area based (unit of analysis is smaller measure).
- Computer application appears more sophisticated than tables or trees.
- Heavy weight on accessibility factors.
- Reliance on engineering factors and definitions (i.e., does lack of "design failure" necessarily rule out health risk?).

Reference: Sawyer, RN. and RG. Morse. An Inventory Process for Determining Asbestos Control Needs and Costs. *Architecture,* December, 1986.

SECTION D

Legal Responsibilities of Management Planners

OBJECTIVES:

1. To understand the building owners/client's concerns and responsibilities when dealing with ACM.

2. To understand the liabilities incurred by a Management Planner.

3. To become aware of measures to reduce the Management Planners liability.

4. To appreciate the Planners responsibility for protecting building occupants, tenants, the public, and workers from exposure through the selection of appropriate asbestos control options.

5. To understand the purpose, types, and current problems in obtaining insurance for professionals engaged in asbestos-related work.

NOTE: Words underlined in the text can be found in the Glossary at the end of this notebook.

INTRODUCTION

This section discusses the liability that the Management Planner may shoulder as a result of conducting a hazard assessment and developing management plans. It begins with a discussion of broader issues, namely, the legal responsibilities of the Management Planner's client – the building owner's.

THE OWNER'S RESPONSIBILITY

Legally, a building owner has responsibility for any hazards within a structure. This includes hazards of which the owner is aware or reasonably should have been aware of in its building. Under general legal principles, a building owner who knows, or with reasonable due diligence should have known, that asbestos is present in a building, and that asbestos is likely to be hazardous, may be liable to occupants of the building. This theory is based on the fact that the building owner has a common law (and sometimes statutory) responsibility to "invitees" and "licensees," which are persons who have a right to use or be in the building. Further, once the owner suspects or has reason to suspect that asbestos hazards may be present on the property, any extended delay in confirming whether a hazard exists or in instituting a safe and effective asbestos management or abatement program, increases the owner's chances of being found negligent in a personal injury suit. In summary, an owner can be held liable if the owner knew, or reasonably should have known, that asbestos was present, and failed to take appropriate action or took improper or incomplete actions. Persons who may claim to be injured parties due to the building owner's negligence can include: employees of the owner, tenants (and their employees), outside maintenance personnel, outside contractors, persons who enter the property (business visitors, delivery persons), and the public.

Persons understand the principle of owner responsibility in connection with wet floors, snow removal, leaking roofs, etc. Just as these situations cause potentially dangerous conditions, so can the presence of asbestos-containing materials. And, just as owner's have their maintenance staff be vigilant regarding wet floors, so too must appropriate precautions and action be applied to the presence of asbestos-containing materials.

The building owner is generally held negligent for the actions of any employee performing his employment duties. Furthermore, because responsibility for an activity which is inherently dangerous cannot generally be delegated, a building owner retains responsibility for asbestos management or abatement programs if they are performed by the owner's employees, and, in some cases, by outside contractors. An owner will not necessarily be liable for the negligence of an independent contractor, although the owner would be liable for the same acts of negligence if committed by an employee.

Finally, a building owner is generally under an obligation to exercise reasonable care inspecting and maintaining a building. Therefore, in addition to developing and instituting an asbestos management or abatement program if hazards are found, the building owner may have a duty to warn persons who may be affected by the danger, and to take adequate measures to control the hazard. The extent of responsibility and liability will be determined by the state, county or municipal laws applicable in various jurisdictions.

In sum, the responsibility for potential asbestos exposure in a building rests with the building owner. An owner cannot discharge this responsibility by ignoring, delaying or delegating it. The Asbestos Hazard Emergency Response Act (AHERA) addresses asbestos-related actions in public and private schools. The building owner, generally a local education agency (LEA) is responsible for developing and submitting management plans, implementing response actions, providing protection for maintenance and custodial personnel and re-inspecting school buildings. The Asbestos School Hazard Abatement Reauthorization Act (ASHARA) addresses training and accreditation for asbestos inspectors, project designers, supervisors and workers engaged in asbestos-related activities in public and commercial buildings. More information on both of these Acts can be found in the *Regulatory Review* section (Section H).

LIABILITY OF THE MANAGEMENT PLANNER

While primary legal responsibility for damages suffered arising out of exposure to asbestos-containing materials rests with the building owner, consultants and contractors who become involved with inspecting and developing management plans may also incur liability. The responsibilities of persons acting in the capacity of a Management Planner fall into three areas: contractual liability, tort liability and regulatory liability.

Contractual Liability

A Management Planner who provides services under contract is liable for a breach of contract if the contract is not properly performed. Consequently, the terms of contracts between building owners and consultants are of extreme importance.

While all contracts are important legal documents, over the years there have evolved "form" contracts which consultants may find convenient to use or adopt. Inherent in the use of any form are the dangers of contract terms which are incomplete, inadequately understood or ambiguous. These potential dangers have often led to contractual disputes. In connection with asbestos-related work, contract documents should be designed for each project, to take account of particularities of project size, scheduling, professional interdisciplinary interaction, safety, liability insurance, and the like. It is advised that if form agreements are used, they be modified with the advice of legal counsel.

The following items should be considered in the drafting of a contract document.

- The scope of work should be carefully defined so that all parties understand what services and products are being contracted for. All parties ultimately benefit from a detailed description of the scope of work.

- Specification of cost, and the manner and schedule of payment for services.

- Schedule of delivery of services.

A professional consultant is liable for a breach of contract if the contract is not properly performed. Thus, all contracts must be reviewed to determine the obligations being undertaken and whether they can be performed.

Tort (Negligence) Liability

In addition to contract liability, in the event that Management Planners fail to perform their work in accordance with the standards of their business, they may be sued in "tort." A tort is a legal wrong, and breach of a legal duty is often termed "negligence." Negligence can arise from improper design or performance of:

- Building surveys

- Hazard assessment

- Development, implementation or oversight of response actions

- Development or implementation of operations and maintenance plans

It is therefore important that persons involved in these activities keep abreast of current technological advances, i.e. "state-of-the-art," in each of these areas.

Regulatory Liability

Failure to adhere to requirements imposed by law or regulation can also lead to liability imposed by governmental agencies. Various federal, state and local laws and regulations apply to the performance of activities involved in asbestos-related work. Violation of these requirements can lead to civil penalties (such as fines) and criminal penalties (which can include fines and/or imprisonment). It is, therefore, extremely important that all legal requirements be adhered to in order to avoid serious penalties.

Indemnification Clauses

A consultant should be concerned about protection from his own and others' negligence. The building owner or third parties may file suit if negligence is suspected. In addition, a plan which is not executed, or improperly executed, may result in a lawsuit against the building owner. Even if the management plan is well designed and implemented, a frivolous lawsuit may be filed. Any suit against the building owner is likely to name the Management Planner as a third party, or the building owner may file a second suit against the Management Planner. A hold harmless clause in the Planners contract may protect him or her from the building owner. In addition, an indemnification clause obligating the building owner to indemnify the Management Planner for legal fees and judgments, in case of a third party suit, would offer protection against negligence on the part of those responsible for implementing the management plan and against nuisance suits.

LEGAL CONSIDERATIONS OF ABATEMENT MEASURES

If asbestos discovered in a building is incompletely or improperly abated, the legal theories of liability are numerous, and the number of parties who may be liable is equally large. Owners and building managers must take action to determine the presence of any dangerous conditions. Plans must be developed to determine the hazards presented and appropriate response actions. Anyone who is or becomes involved from that point may be liable for any resulting consequences.

Many owners, both public and private, are concerned about recovering the expense of abatement or removal efforts from asbestos mining and product manufacturing firms, suppliers and distributors, and contractors involved in the original installation of the asbestos. The term "cost recovery" has become an important concept for owners, consultants and contractors.

Similarly, insurers are concerned over the liability of their insured (whether owners, professionals or contractors) for prior acts, as well as for the potential liability of those involved currently in asbestos-related activities. Developing and implementing a responsive and adequate management plan may be essential to the success of cost recovery litigation as well as the defense of insurers.

If ACM control measures are undertaken in a hurried, emotional atmosphere, the resulting situation may be even more hazardous than the situation which is supposedly being remedied. Each step in the planning process requires careful technical and legal consideration and coordination, as well as proper execution. Simply developing a well-conceived management plan is not sufficient. If it is improperly executed, the legal perils may be equal to or greater than having no plan at all. Failure to implement the plan through a coordinated team of competent technical and professional consultants can lead to the loss of the health protections

that are sought, as well as loss of legal protection. All abatement work must conform to the existing state-of-the-art practices.

LEGAL CONSIDERATIONS OF MANAGEMENT PLANS

Design and Implementation

Both the design and implementation of the management plan carry legal implications. Generally speaking, a management plan has two major goals:

- The minimization of exposure of employees, tenants and the public to asbestos; and
- The assurance that abatement activities are appropriate and conducted competently.

Each plan must be tailored to the unique characteristics of the individual building, including the structure itself, the use of the structure, the occupancy of various areas and the persons responsible for executing the plan. Off-the-shelf plans cannot adequately address the peculiarities of each building.

Owners and consultants must make certain that all affected parties involved in the management plan fully understand the severity of the risks involved in non-compliance with the plan and the need for strict adherence to all elements of the plan.

Use of In-House Staff versus Contracted Labor

In connection with establishing the Operations and Maintenance (O&M) program (and the management plan, of which the O&M program is a part), a building owner must consider whether the planning and response efforts will be done by in-house staff. O&M plan development and permanent corrective measures may entail a high degree of risk to workers and to persons occupying the building. All persons involved in planning response actions should be specially trained in this area, and, in the case of schools, they must be accredited.

The determination of whether to engage independent contractors involves legal issues, as well as economic ones. While a building owner can be held liable, under certain circumstances, for work conducted by consultants and independent contractors, the building owner will definitely be held liable for all work done by the owner's employees. A building owner can be held liable for retaining someone to do work whom the owner knew, or reasonably should have known, was not competent or qualified to perform the task. Under current regulations, a building owner may be held responsible for failing to notify EPA, the state and local agencies prior to undertaking asbestos work or for improper disposal of asbestos waste removed from the owner's building. Therefore, it is extremely important that a building owner make certain that any contractors and consultants who are hired are trained, qualified, experienced, and observe

all regulations. This implies that the building owner or the owner's representative be knowledgeable and competent as well.

USE OF PREVIOUS INSPECTIONS

Past inspections could have been performed in an inadequate manner, either because of a lack of knowledge or inattentiveness to requirements or detail. Thus, before a Management Planner can safely rely on a previously performed inspection, the following considerations must be addressed:

- The time at which the inspection was performed and the state of then-current knowledge;
- The person(s) performing the inspection, their training and expertise at that time;
- The information provided at that time to the Inspector by the owner;
- The procedure used to perform the inspection;
- The scope of the inspection;
- Restrictions placed on the inspector at that time; and
- Events that have transpired since the original inspection (such as renovation, remodeling, etc.).

A Management Planner may be liable if he or she relies on a prior inspection if the reliance was not reasonable and the inspection was not performed properly.

THE IMPORTANCE OF RECORDKEEPING

It is imperative that owners and Management Planners document all of their efforts and investigations regarding management planning and response actions for ACM. In addition to legal requirements regarding the compiling and maintenance of certain medical and exposure assessment information on workers exposed to asbestos, it is important that they set up recordkeeping systems as part of the entire asbestos management program.

From a legal perspective, all efforts to abate or manage ACM must be fully documented and the records retained. Even if the hazard assessment shows that no hazard exists, it may be necessary years later to show that the assessment was done properly and by competent professionals. If hazards are discovered and abated, it may be necessary to prove that· the abatement was done competently and in conformity with the then state-of-the-art work

practices. Similarly, records should be kept to show that the O&M programs were properly designed, implemented and periodically reassessed. Every aspect of the asbestos management program must be reviewed from a legal perspective to determine the types of records that are either required to be kept, or desirable to keep. Successful tort defense plans and cost recovery plans are heavily dependent on proper recordkeeping. Records should be maintained until the building is demolished.

Recordkeeping is discussed in detail in Section I of this Manual.

INSURANCE

The Role of Insurance

Insurance is intended to protect the insured against catastrophic financial loss. This "risk shifting" has been and continues to be sound business practice. However, in order to accomplish risk shifting successfully, an insured must be confident that (1) the anticipated risks will be covered by the policy; (2) the insurance carrier will respond to and adjust claims in a satisfactory manner and not deny coverage unjustifiably; (3) the insurance carrier has the financial ability to respond to claims; and (4) the insurer will continue its activity in the industry being insured, particularly where the type of policy written requires that the insured remain with the same carrier.

Insurance Problems in the Asbestos Industry

It is obvious that insurance adds to the consultant's cost of performance and thus is eventually paid by the owner, either on a pro-rata basis or dollar-for-dollar. Although available, the high cost of professional liability insurance may result in some building owners and Management Planners reducing or even dropping insurance requirements.

A number of reasons have been advanced by the insurance industry for the cancellation of policies and the relative high cost of insurance from major licensed carriers:

Indeterminate Risk - Insurance carriers rely on actuarial studies and data to set premiums and determine risk. The relative youth of asbestos-related work, combined with the long latency periods of asbestos-related diseases, have resulted in a limited amount of actuarial data on which to base premiums; since limited data exists, some carriers do not desire to write coverage.

Reinsurance Problems - Major insurance carriers themselves enter into reinsurance agreements or "treaties" with reinsurers in order to pass along a portion of the risk undertaken and increase the carriers' capacity. Reinsurers and carriers have suffered underwriting losses over the past several years due to selling insurance at low premium rates, and have been unable to make up

such losses through investment income as in the past, due to the lower interest rates that have prevailed.

Asbestos Liability - The massive litigation in which asbestos manufacturers are involved, and in which their insurance carriers have become involved, also has led to a "gun-shy" attitude on the part of carriers and reinsurers to insure those in the asbestos control industry, despite the differences in the employment and work practices from asbestos manufacturers.

For these reasons, the traditional role of insurance as a risk-shifting device has been distorted. The relative unavailability of insurance has forced contractors and professional consultants to purchase any insurance available, without paying adequate attention to whether risks are covered or to the strength or credibility of the carrier. Similarly, owners are accepting insurance certificates without analyzing the coverage being offered, or understanding changes in the type and scope of coverage offered by the insurance. Rather than risk shifting, insurance for some has become a "license to work" in the asbestos field. Others have attempted to negotiate an alternative with owners, under which the owner has provided insurance coverage, or waived insurance requirements.

Types of Insurance

Management Planners will normally look for "errors and omission" insurance to protect them against "mistakes" in the management plan. They should also purchase general liability insurance for events that may occur during building reinspection.

In the past, errors and omissions and liability insurance has been written on an "occurrence" basis. If an incident "occurs" while the policy is in force, coverage is afforded even if the actual claim is made some years later and even if the insured is no longer insured by the same carrier. As a result of the writing of this type of coverage, insurance carriers must defend claims brought years after companies are no longer insured by the carrier. Occurrence policies can result in great losses to carriers who have not received premiums over a period of time, especially given the long latency periods for asbestos-related diseases. As a result, the carriers have been adding exclusions to existing policies for asbestos-related, third-party claims and generally have changed the coverage from "occurrence" to "claims-made."

Under a "claims-made" policy, coverage exists if a claim is made while the policy is in force. In certain situations, a claim may be made during an extended ("tail") reporting period. The tail may require an additional premium. For many risks, the difference between occurrence and claims-made coverage is not significant since the liability causing event is obvious and claims are generally asserted shortly after the event occurs. However, the release of asbestos fibers caused by a planned response action may not be obvious and injury may not be detected for 20 to 40 years afterward. Claims-made coverage may not be of value in such cases if (1) the insured changes insurance carriers before a claim is made, or (2) the carrier withdraws from the

market before a claim is filed. Nevertheless, it is likely that claims-made coverage will be the type of insurance available in the future and an analysis must be made by the insured as to what coverage is actually being purchased. There is no single definition of what "claims-made" or "occurrence" means, thus it is mandatory that the insured read and understand the coverage afforded under the policy. All exclusions, conditions and definitions should be carefully analyzed.

There are several important considerations in making an analysis of available insurance coverage or in specifying same:

- True "occurrence" coverage is rare. The terms of the policy must be reviewed carefully. Some "occurrence" policies have conditions or exclusions that negate coverage. The name of the policy makes no difference. Claims-made policies may, in some situations, cover claims which arose in prior years, similar to "occurrence" policies.

- The insurance certificate itself provides little or no information regarding the specifics of coverage. The policy itself must be reviewed.

- The insurance carrier should be carefully evaluated. Does the carrier understand the industry, and is it committed to writing proper coverage? Again, the policy terms are important.

Problems that have arisen in this area can be illustrated by the following examples:

- A general liability insurance policy issued for asbestos work which excludes coverage for personal injury attributable to airborne mineral fibers. Of course, asbestos is a mineral fiber and is generally only dangerous when it is airborne and thereafter inhaled.

- An errors and omissions policy written for a consultant which includes a "pollution exclusion" excluding coverage for any personal injury or property damage caused by a broad list of substances, including asbestos. This policy provides no coverage for asbestos risks.

- A general liability "occurrence" policy which excludes "anticipatory damages," which is defined as damages that are claimed to have been caused by asbestos, but which cannot be proved due to the fact that the asbestos-related disease has not yet manifested itself. This situation is perhaps the type of claim which can most often be expected, but no coverage is provided in these circumstances.

Evaluating an Insurance Company

Assuming that the consultant, or building owner, realizes the pitfalls of making assumption regarding insurance coverage, and decides to make a knowledgeable choice regarding the type and quality of coverage to obtain, the next choice is the company from which to obtain coverage. There are several factors that must be considered in making this choice:

- The quality of the coverage that is being written (as discussed above);
- The management of the company;
- The financial stability of the company;
- The commitment of the company to the asbestos abatement industry; and
- Other features of the insurance company's program (such as work guidelines, loss control procedures, etc.)

Considerations for evaluating the type of coverage being written have been discussed above. Evaluating the financial stability of the insurance company can be difficult. For example, is an insurance company with $10 million of assets and having 100 insured (each of whom is covered by a policy providing $1 million of coverage) more financially stable than an insurance company with $5 million in assets that has 20 insured under the same circumstances? Also, what are the criteria that the insurance company uses to evaluate whether it will provide-insurance? If the insurance company has an inspection procedure which is designed to assure the competence of its insured, the financial stability of the insurance company in the long run may be enhanced.

With respect to the carrier's commitment to the asbestos industry, this consideration is important in connection with obtaining claims-made coverage. If the claims-made policy provides that coverage is no longer afforded after the termination of the policy, several events which may cause termination of coverage must be considered:

- The insured goes out of business or ceases doing business in asbestos-related work;
- The insurance company decides to stop writing coverage for asbestos-related work; and
- The insurance company goes out of business.

Unfortunately, you will not be able to obtain written guarantees from the insurance carrier that it will continue writing insurance for asbestos-related work. Similarly, the insurance company cannot obtain guarantees that the consultant will continue buying coverage from the same company. Even if such written assurances were obtained, either the consultant or the insurance company could go bankrupt and thereby legally avoid its obligations. However, a consultant or owner can investigate the insurance company to determine, as best as reasonably possible, whether the insurance company has a commitment to writing insurance for asbestos work in the future. This can only be done by talking directly to the company or its representatives. While this may appear troublesome, it would appear to be a prudent investment of time in view of the significant premiums that are being charged for asbestos coverage.

In addition, various types of coverage which may provide longer term protection should be investigated, including "extended reporting coverage" or "tail coverage." While these might involve additional premiums, the investment may again be worthwhile to consider depending on how long the tail is. For owners and consultants who are contemplating or are involved in significant amounts of work, the specific design of appropriate insurance coverage may be a worthwhile investment. Such requests should be broached to the insurance carriers in advance in order to determine whether specialty coverage can be written and, if so, at what cost. In this regard, coverage offered by specialty insurance carriers and insurance companies formed as risk retention should not be ignored. Many owners, upon analyzing such carriers, the coverage offered, and loss control policies, have determined that the insurance programs are equal to or more desirable than those offered by traditional carriers.

With respect to the review of other elements of an insurance program, the adoption of work procedures and loss control procedures should not be overlooked. The first line of defense with respect to claims is that the work is performed properly. If persons are not injured and property is not damaged in the first place, no claims should arise. Thus, the use of proper specifications for the performance of the work can help reduce claims, as can the monitoring of the work by professionals. Loss prevention programs established by an asbestos insurance carrier can be a significant additional service to an owner or consultant. Also, inspections of work being performed by the insured party by the insurance companies can help assure that proper work procedures are being observed.

For these reasons, the importance of considering all aspects of an insurance carrier's program cannot be overemphasized. The mere choice of a company based on anyone criteria may not be in the best interest of the management planner or building owner. Choices made on the basis of typical insurance industry evaluation standards (for example, whether the carrier is rated, or licensed in a particular state) may exclude carriers whose programs are specifically designed for the asbestos industry and whose coverage may be superior.

CONCLUSION

The legal considerations involved in management planning are many and complex. Each step in the asbestos control process must be properly planned and executed, not only to minimize the risk of exposure, but also to protect the persons and companies involved from significant legal exposure.

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SECTION E

Evaluation and Selection of Control Options

OBJECTIVES:

1. To be able to distinguish between the five main AHERA response actions.

2. To be able to recognize the advantages/disadvantages of alternative response actions.

3. To be able to select appropriate response actions for specific applications.

NOTE: Words underlined in the text can be found in the Glossary at the end of this notebook.

INTRODUCTION

This section provides information on technical and operational aspects of alternatives for controlling the release of fibers from ACBM. The information will assist Management Planners in recommending response actions from among those allowed by AHERA. (See Section C for a description of allowable response actions for ACM in various hazard categories.)

OVERVIEW

AHERA refers to actions taken by LEAs in building; with ACM as "response actions" or "control options." Response action alternatives, as defined by the AHERA Rule, fall into five main categories:

1. Operations and Maintenance Program - a program of training, cleaning, work practices, and periodic surveillance to maintain friable ACM in good condition, ensure cleanup of asbestos fibers previously released, and prevent further release by minimizing and controlling friable ACM disturbance.

2. Repair - returning damaged ACM to an undamaged condition or to an intact state through limited replacement and patching.

3. Encapsulation - treating ACM with a liquid that, after proper application, surrounds or embeds asbestos fibers in an adhesive matrix to prevent fiber release. The material may be a penetrant, which adds cohesion by penetrating the asbestos material, or a bridging encapsulant, which covers the surface of the material with a protective coating. Both are applied to the surface of the material using airless spray equipment at low pressure in order to reduce fiber release during applications. The specific language in AHERA is:

   "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)."

4. Enclosure - an air-tight (or as close to air-tight as is possible to construct) barrier installed between the friable asbestos and the building environment. They are typically constructed by mechanical attachment or spray application (the latter is sometimes referred to as "encasement"). 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 which cures into a hard shell. According to AHERA, "Enclosure means an air-tight, impermeable, permanent barrier around ACBM to prevent the release of asbestos fibers into the air."

5. Removal - stripping ACM from its substrate - asbestos material is separated from the underlying surface, collected, and placed in containers for burial in an approved disposal site; or removing entire components containing ACM - i.e., abandoned piping systems with ACM insulation wrapped in polyethylene, labeled before disposal.

Appropriate applications and advantages/disadvantages of each alternative are described below. Information on the cost of these alternatives and on conducting a cost- effectiveness evaluation is provided in Section K.

TECHNICAL DESCRIPTIONS

Operations and Maintenance (O&M) Program

As long as friable ACBM or nonfriable ACBM (see wording from AHERA below) remains in the school building, an O&M program is required by AHERA:

> "The local educational agency shall implement an operations, maintenance, and repair program ... 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….when the material is about to become friable as a result of activities performed in the building."

A more comprehensive approach will include all ACM in the O&M program, whether friable or not, and whether it is located inside or outside the building. The purpose of an O&M program is to prevent exposure to asbestos, wherever it may occur.

An O&M program includes protection of workers, worker training, scheduling of periodic surveillance, initial cleaning, and other necessary O&M activities. Proper maintenance, re-inspection, and periodic monitoring are often the most cost effective solutions for managing asbestos hazards. A detailed discussion of the elements of an effective O&M plan is presented in Section G.

An O&M program will probably have the lowest initial costs of the alternatives, although annual costs will continue until all the ACM is removed. On the other hand, a poorly enforced O&M program will increase the risk of asbestos exposure.

Encapsulation

Encapsulants are often viewed as a relatively inexpensive approach to ACM abatement. However, encapsulants are limited in their applicability and may make eventual removal of ACM more difficult and costly. They are best viewed as enhancing an O&M program when applied to appropriate ACM.

Since the act of applying encapsulants will dislodge fibers from the surface of the ACM, encapsulation should be considered equivalent to removal from a work practice perspective. All of the same protective measures should be taken. In addition, any encapsulant should be field tested before use to assure compatibility with the ACM.

Penetrating Encapsulants

Penetrating encapsulants are typically water-based compounds that are spray-applied over ACM and are designed to penetrate through the ACM matrix to the substrate. The objective is to coat the asbestos fibers in order to prevent fiber release. Following is a list of unsuitable applications of penetrating encapsulants:

- Not suitable over cementitious ACM since penetration is not possible.
- Not generally suitable over friable, fluffy or fibrous ACM since it is difficult to evenly and adequately distribute the encapsulant throughout the ACM.
- Not generally suitable over ACM greater than one inch thick since penetration greater than one inch is usually not achieved.
- Not generally suitable over ACM that is poorly adhered to the substrate or is delaminating since the extra weight of the encapsulant can cause further delamination.
- Not suitable over ACM that has been painted since the paint interferes with adequate penetration.
- Not suitable where ACM has significant water damage because the possibility of delamination is high.
- Not generally suitable where encapsulated ACM is subject to abrasion, impact or renovation activities since asbestos fibers can be released.
- May not be suitable over ACM used as fireproofing since density of fireproofing is increased, resulting in reduced fire ratings.

Because of these numerous limitations, penetrating encapsulants are generally not suitable for most applications of ACM.

Bridging Encapsulants

Bridging encapsulants are typically water-based compounds that are spray-applied on the surface of ACM and are designed to put a homogeneous coating over the ACM. The objective is to provide a void-free surface over the ACM to prevent fiber release.

Following is a list of suitable and unsuitable applications:

- Generally suitable over cementitious forms of ACM.
- Generally suitable over painted ACM.
- Generally, suitability of application is not directly a function of ACM thickness.
- Not generally suitable over ACM that is poorly adhered to the substrate or is delaminating, since the extra weight can cause further delamination.
- Not generally suitable over friable, fluffy or fibrous ACM since it is difficult to get a homogeneous, void-free surface.
- Not suitable where ACM is subject to water damage since water can pool behind the encapsulant and ACM can partially or completely delaminate.
- Often not suitable where encapsulated ACM is subject to abrasion or direct impact since asbestos fibers can be released. Some products have significantly better performance in this regard than others.
- Some materials have flame spread ratings. Effects on fireproofing have not been documented.

Enclosures

Enclosures are of two types:

1. Mechanical systems (e.g., metal, gypsum board, plywood, plastic), materials which are mechanically fastened to the building structure or substrate between the ACM and the building's ambient air space.

2. Spray-applied enclosures which are also called encasement systems.

Mechanical Systems

These enclosure systems have been used primarily to enclose cementitious ACM on ceilings and to protect fireproofing applied to structural steel columns. Gypsum board is used to assure the fire resistance of the fireproofing is not reduced. Plastic, steel, and aluminum are used to enclose pipe insulation. To be effective, all seams and joints must be sealed.

Construction of enclosures can disturb the ACM and should be considered the same as a removal project. Full protection should be provided for abatement workers and for the building outside the work area.

Following is a list of suitable and unsuitable applications:

- Generally suitable with all forms and thicknesses of ACM

- Generally suitable for ACM with some damage since materials are mechanically fastened into the building structure or substrate and do not place weight on the ACM

- Not suitable over ACM in locations expected to receive significant water damage since water could collect behind the enclosure unless suitable venting is provided.

- Generally suitable where ACM is subject to impact and abrasion, depending on the thickness and durability of enclosure materials.

- May not be suitable where future renovation is planned since asbestos fibers will be released when boards or sheets are removed. However, the enclosure may provide interim protection.

- Generally not suitable when demolition is planned in the near future since enclosure materials will need to be removed first in most cases.

- Generally suitable over ACM fireproofing if gypsum wallboard is used since additional fire resistance is added.

Spray-Applied Enclosures

Spray-applied enclosures are often called encasement systems since the ACM is encased behind a hard surface. The material is applied by airless spray equipment and cures rapidly. The sealant can be applied in a range of thicknesses, usually one-eighth to four inches. At present, there are at least two encasement systems on the market. These enclosures consist of a structural shell which is sprayed over the ACM in one or two layers. The systems are mechanically fastened in a manner similar to mechanical enclosures to assure they stay in place. Structural strength of the encasement system is high, although it must be applied by trained applicators and according to the manufacturer's specifications. A field test should be conducted to assure suitability and proper application.

Following is a list of suitable and unsuitable applications:

- Generally suitable for all forms and thicknesses of ACM.

- May be suitable for ACM with some damage since materials are mechanically fastened into the building structure or substrate and do not place weight on the ACM.

- Not suitable over ACM in locations expected to receive significant water damage since water could collect behind the enclosure unless suitable venting is provided.

- Generally suitable where ACM is subject to impact and abrasion, depending on thickness and durability of enclosure materials.

- May be suitable for some situations where future renovation is planned since system designs can include mechanical fasteners and hangers to accommodate installation of items such as piping, electrical conduit and partition headers.

- Generally suitable over ACM fireproofing since one of the present spray-applied enclosure systems has fire resistance comparable to gypsum wallboard and, therefore, is not detrimental to the fire rating of the fireproofing.

Repair

Repair of ACBM is discussed in the AHERA Rule, both as a separate response action, and as part of an ongoing O&M program. Repair can be accomplished with a variety of materials and procedures. Small areas of surfacing ACM could be patched with asbestos-free spackling compound, caulk, or plaster. However, any loose material must be dislodged prior to patching.

In addition, the cause of the damage must be identified and eliminated. Thermal system insulation can be repaired with caulk, asbestos substitutes such as fibrous glass, Styrofoam, rubber, or new jackets. (New jackets may be considered a form of enclosure.)

Removal

Removal is often described as the only permanent solution to ACM problems since all friable ACM must be removed before a building is renovated or demolished, as per NESHAP regulations. (Exceptions are buildings with only small quantities of ACM or containing only non-friable ACM in good condition. See Section H for details.) However, poorly performed removal operations may actually raise fiber levels in a building after the project is completed. In addition, removal and replacement of ACM frequently has the highest initial cost of the alternatives. The timing of removal is thus crucial to optimizing cost-effectiveness.

Removal of ACM requires complete isolation of the work site from the rest of the building. Ideally, removal would only be undertaken in unoccupied buildings. This is frequently possible for school buildings by scheduling removal during school vacations, but very difficult for other types of buildings. In addition to work-site isolation, measures are taken to reduce fiber levels during the removal operation. These include wetting the ACM with amended water (water and a surfactant) and filtering the air with high efficiency particulate air (HEPA) filters. Abatement workers must wear appropriate protective clothing and respirators and must pass through decontamination chambers upon entering or exiting the work-site. Details on protective measures and work practices for removal projects can be found in Chapter 5 of EPA's "Purple Book."

The actual removal of ACM is usually accomplished by scraping it off of the substrate. Vacuum systems have occasionally been used both alone and in conjunction with manual methods. High pressure water also has been employed to blast ACM off the substrate; results have been mixed. Water under high pressure (at least several hundred pounds per square inch) can be effective in removing ACM from rough or uneven surfaces. However, it can also be dangerous for workers who are struck by the water stream, and large amounts of water in the work-site are difficult to contain.

Special techniques are often needed to remove amosite-containing material. Amosite is difficult to wet, even with amended water. (Some commercial surfactants are more effective than others.) The resulting high levels of airborne fibers should be addressed with airline respirators and a greater number of air exchanges in the work area.

Work-site cleanup is accomplished by either wet wiping or vacuuming all surfaces, including the plastic barriers. (The cleaned substrate is sometimes first sprayed with encapsulant to bind any residual fibers.) The air is then sampled for fibers and the work-site is re-cleaned until a specified clearance level is met. See Chapter 6 of EPA's "Purple Book."

Removal operations are often specific to the type of application:

1. Asbestos in a final plaster coat on a browncoat is the most common asbestos ceiling construction arrangement found in schools and many other buildings. (A three-coat plaster system is very common: a final coat on top of a browncoat on top of a scratch coat, which is applied to metal.) The least complex and inexpensive removal effort involves ceilings with smooth browncoat and soft asbestos. The asbestos is easily "skinned" from the browncoat after wetting with amended water. If the browncoat surface is heavily abraded, the asbestos covering must be removed and the browncoat surface thoroughly nylon-brushed to remove additional material within the abrasions. If the browncoat itself contains asbestos, this material will require removal or the application of encapsulants before reapplication of the final coat. Note: If the browncoat ACM is encapsulated rather than removed, the ACM may be nonfriable but still present.

2. ACM directly sprayed on wire laths presents an expensive, time-consuming, and tedious removal task. The ceiling must be removed and the entire space above the ceiling will require decontamination.

3. Some buildings have concrete slabs sprayed with ACM for noise abatement. Because of the porous nature of the concrete, it is very difficult to remove all of the ACM. Similarly, removal of materials from concrete and cinderblock foundations is also difficult. These surfaces will probably require encapsulation after removal is complete to bind residual fibers.

4. Corrugated steel decking sprayed with ACM is sometimes found in modern buildings. The ACM is especially difficult to remove. Meticulous hand cleaning with scrapers and brushes is required for these situations, and special care must be given to the seams.

5. Structural steel beams sprayed with asbestos fireproofing may be found in larger facilities. The ACM may have been on such structures either before or after the utilities were installed. In either case, the removal will be complex and the cost higher than usual.

6. Asbestos-containing boiler and pipe insulation, and insulating material on pipe elbows, flanges, valves, and other fittings can be removed with the glovebag technique. The bag assembly is placed over a pipe section and the pipe insulation is then cut into manageable lengths using an appropriate cutting instrument. See the EPA publication: *Asbestos-in-Buildings Technical Bulletin: Abatement of Asbestos-Containing Pipe Insulation,* 1986-2. Asbestos may also be found in valve packing and gaskets, and in rope

used to close gaps, in pipe sleeves and other openings. These materials may be friable; if so, glovebags should be used.

7. Removal of ACM from or near electrical equipment or from live steam pipes may require dry techniques. EPA permission is required when conducting dry ACM removal. Special efforts will be needed to maintain airborne fibers at acceptably low levels, (e.g., by increased air exchange rates).

SUMMARY OF ADVANTAGES, DISADVANTAGES, AND APPROPRIATE UTILIZATION OF RESPONSE ACTIONS

Exhibit E-1 presents a general comparison of alternative response actions. The Management Planner must select appropriate actions based on:

1. AHERA requirements for response actions for each category of friable ACBM (i.e., the seven categories of current condition and potential for disturbance-see Section C, pages 18 and 19).
2. The hazard ranking system described in Section C (see Exhibits C-5 through C-7).
3. The technical suitability of the various alternatives (this section).
4. The costs of the alternatives (see Section K).

The information presented in this section can be used to evaluate the technical suitability of the alternative response actions. It should be used together with information on control costs to evaluate the cost-effectiveness of alternatives, as discussed in Section K.

The response actions described here are seldom used alone, but are part of a combination of corrective actions recommended for each area of ACM. For example, even if removal is urgently needed, it normally will take some time to obtain the services of a contractor. During this time, the area must be isolated from the public. This isolation, together with subsequent removal, would constitute a response action. Similarly, enclosure and encapsulation may reduce the potential for ACM disturbance in certain areas and thus are an important part of an O&M program.

STAGING AND PRIORITY OF WORK

- Once the most appropriate response action for each area of ACM has been identified, priorities for abatement and a schedule of projects must be developed. This then becomes the Management Planner's recommendations to the LEA/building owner and constitutes the major input to the management plan.

- Exhibit C-7 in Section C provides information on judging areas for removal priority. In addition, occupants' activity patterns and plans for building maintenance and renovation should be taken into account.

- The proximity of areas needing immediate removal to lower priority areas should be addressed.

For example, if immediate removal of surfacing ACM is required in a wing of a building, and the wing also contains piping with damaged insulation, consideration should be given to removing the ACM from the pipes at the same time. The additional cost of removing pipe insulation may be quite low compared to calling in a contractor next year just to work on the pipes. Given the fixed costs involved in ACM removal, substantial economies of scale may be realized by combining the work. See Section K for more information on costs.

- The occupancy patterns of the building.

No matter how carefully an abatement job is carried out, there is still a potential for exposure of building occupants to airborne asbestos. In the case of schools, the best time of year for removal operations is summer. If removal cannot be postponed until summer vacation, the staging plan may require evacuation and isolation of the areas prior to starting the work. Isolation of the area means not only closing the area to students, teachers, the general public, and general custodial staff, but also assuring that the HVAC systems in the area are isolated from the building's general system.

Abatement projects in occupied buildings are usually more difficult and risky. To reduce the risks of accidental contamination of occupied spaces, additional barriers and protective systems should be engineered. For example, double barriers and additional air samples should be considered. This will raise the cost of the project. In staging work, the Management Planner should take into account the disruption of normal building activity caused by isolating the work area Isolating one or two classrooms for a few weeks may have a far different impact than closing down an entire floor for a semester.

The scheduling of work by wing and floor will aid in minimizing disruption. Scheduling work in areas that can be easily isolated in terms of HVAC systems should also be considered.

- Remaining life of the building.

Buildings with relatively short remaining life may not be candidates for large-scale removal before demolition. It may be less expensive to establish a comprehensive O&M and postpone major abatement actions as part of later demolition or a major renovation of the building.

- Planned renovation and maintenance

Economies may be achieved by combining renovation activities with abatement activities. For example, installation of a sprinkler system or removal of a suspended ceiling during remodeling in an area with fireproofing ACM sprayed on structural beams will disturb the ACM. By combining abatement with renovation, the cost of many common activities can be shared.

SECTION F

Role of Other Professionals in the Management Planning Process

OBJECTIVES:

1. To understand the need to involve other professionals in the development of an asbestos management and control program.

2. To recognize the specific contributions other professionals can make in developing a management plan

NOTE: Words underlined in the text can be found in the Glossary at the end of this notebook.

INTRODUCTION

The Management Planner must confer with and obtain assistance from a number of other professionals during the course of the development of a report. The Management Planner has to consider health, economic, engineering, and Administrative factors in developing recommendations for asbestos management and control. In order to accomplish this task, the Planner may need to confer with at least four types of other professionals while preparing a report: project monitors, architects, maintenance engineers, and school business officials.

RELEVANT PROFESSIONALS

Industrial Hygienist

The industrial hygienist plays a critical role in many phases of asbestos assessment and control activities. With respect to the Management Planners, consulting hygienists could provide assistance with the hazard assessment and the prioritization of response actions. The hazard assessment requires the Planner to make judgments regarding fiber release potential under a variety of use, accessibility, and ventilation situations. The assessment of future fiber release may consequently involve technical questions regarding re-entrainment of fibers, dispersion of fibers under specific air flow conditions, damage potential of asbestos covering under heat, or water-related stress. In addition, if the building owner wishes to undertake air monitoring (not recommended by EPA for assessment, but might be used as a surveillance tool for an O&M program), an industrial hygienist could conduct and interpret the air sampling. Hygienists can provide valuable technical assistance on these issues.

A second area in which the industrial hygienist can aid the Planner is in prioritizing response options. From the hazard assessment the hygienist can offer guidance in ranking areas and drawing up a suggested time frame for implementing response actions.

A third form of interaction between the Management Planner and industrial hygienist might involve the hygienist as the LEA's or building owner's representative. In such a role, the hygienist will be interested in teaming with the Planner to ensure that he performs competently and in the best interests of the building owner.

Architect/Engineer

The development of response action options may require the Management Planner to consult with architects or architectural engineers. Although the management report is not meant to contain detailed specifications for proposed response actions, the feasibility of those responses, the sequencing of response actions, and approximate costs of some proposed actions may require the services of a consulting architect/engineer. Certain planned actions may require

unique architectural solutions for purposes of removal or access, the design of special containment structures, mechanical system alteration, or more funding than for a response under conventional conditions. Depending on local building codes, an architectural review may be needed on aspects of a management plan. This review may be required under the following circumstances:

1. Prior to submission of renovation or demolition plans to the local review and permitting agency.
2. By an architect doing subsequent renovation work at the building.
3. By the staff architect/facilities manager representing the building owner.

Building Engineer

The building engineer (custodial/maintenance personnel) can provide the Management Planner with valuable information concerning building use (and abuse) patterns, history of damage and repair, and frequency of activities which may potentially result in fiber release episodes. These types of information will aid the Management Planner with the hazard assessment. In addition, it will be useful in the determination of response action priorities.

The Management Planner will develop an O&M program to optimize protection of building occupants from future fiber release from asbestos remaining in the building. In order to develop a feasible program, the Management Planner needs to know how operations and maintenance activities are presently carried out. Such items as the processing of work orders for repair jobs, work practices, and the use of contract services should be explored. In order to understand the present system and develop feasible approaches to changing the system, the Planner will need information and advice from custodial/maintenance personnel.

Abatement Contractor

Another useful participant in the "team" when planning response actions is an abatement contractor. Contractors are an excellent source for preliminary budget information regarding costs of specific response actions. Contacting several local contractors and providing them with some basic information about the planned response action(s) can assist the Management Planner in generating realistic cost estimates for the management plan.

Analytical Laboratory

A building owner will most likely have to conduct personal air sampling to meet the requirements of the OSHA asbestos construction standard (1926.1101). This sampling is required during any activity which may expose employees to asbestos. Sampling is termed "initial sampling" and is conducted to determine the exposures experienced by employees during any and all activities which might expose them to elevated levels of asbestos. Although

many O&M activities may not expose employees to elevated levels of airborne asbestos, the only way to know for sure is to do initial sampling. In most cases, this sampling will be conducted by a consultant (environmental or industrial hygiene); however the building owner may have trained in-house staff to conduct the sampling. In either case, an analytical laboratory will be needed to analyze these samples. The laboratory can also assist with other asbestos sampling the building owner may need related to O&M (i.e., settled dust sampling). A relationship with a reliable and accredited laboratory is very important in achieving appropriate employee protection and regulatory compliance.

School Administration

In developing a realistic response plan, the financial situation at the school and the LEA's preference for use of in-house custodial staff and/or contract workers should be taken into consideration. Creation of a plan without information on these factors may lead to confrontations and the submission of a plan that cannot be implemented. In developing the management plan, it is essential that the Planner confer with the relevant school officials to assess these factors and adapt the plan to suit conditions at the school.

SECTION G

Developing and Implementing an Operations and Maintenance Program

OBJECTIVES:

1. To understand the purpose of an operations and maintenance program.

2. To be aware of pertinent regulations which apply to operations and maintenance activities and incorporate these into the program.

3. To recognize the elements of an operations and maintenance program.

4. To be able to develop an operations and maintenance plan.

NOTE: Words underlined in the text can be found in the Glossary at the end of this notebook.

INTRODUCTION

The process of identifying ACM within a facility is the first step in controlling building occupant exposure to asbestos fibers. The next step is to develop a written operations and maintenance (O&M) program to minimize the potential hazard posed by the ACM.

The O&M program is a set of specific procedures and practices applied to building cleaning, maintenance, renovation and general operation to maintain the building as free of asbestos contamination as possible. The O&M program draws heavily on information' generated during the building survey and becomes a key component of the management plan. The O&M program should remain in effect until all ACM is removed from the facility.

OBJECTIVES OF AN OPERATIONS AND MAINTENANCE PROGRAM

There are three primary objectives of the O&M program: (1) clean up existing contamination, (2) minimize future fiber release by controlling access to ACM, and (3) maintain ACM until it is eventually removed. Properly prepared and implemented, this plan will document the building owner's prudence in dealing with asbestos in the building.

Since by law all but small quantities of friable ACM, and some non-friable ACM, must be removed from buildings before demolition or renovation, the O&M program is not a permanent solution. It is implemented as part of an overall asbestos management plan that has as its goal the elimination of asbestos exposure within the facility. The O&M program likewise is not a means by which full-scale asbestos abatement is accomplished. Rather, intentional disruption of ACM should be limited to repair or removal of small areas of significantly damaged ACM, or small areas where removal is necessary to facilitate maintenance/renovation activities. Large abatement projects that require extensive planning and technical expertise are beyond the scope of most O&M programs. On the other hand, limited encapsulation and enclosure could be used to enhance an O&M program, e.g., by reducing the likelihood for contact with this ACM.

ELEMENTS OF THE O&M PROGRAM

Specific features of an operations and maintenance program should be individually designed. However, each O&M program should include the following elements:

- Notification and labeling;
- A visual record of the type and location of known or assumed ACM within the building or facility;
- Training (on several levels);
- Employee protection and medical surveillance programs;

- Specialized cleaning procedures;
- Maintenance/Renovation work permit system;
- Special work practices for maintenance activities;
- Special work practices for renovation;
- Emergency response procedures;
- Periodic ACM surveillance; and
- Recordkeeping.

Each of these elements will be discussed in the following sections. Additional information on managing asbestos in buildings can be found in the EPA publication *Managing Asbestos in Place: A Building Owners Guide to Operations and Maintenance Programs for Asbestos containing Materials,* 20T-2003, July 1990. This publication contains expanded coverage on many of the O&M elements found in this chapter and is primarily directed to owners and managers of nonschool buildings. Managers of industrial plants and other types of structures may need to supplement the information in this chapter and the referenced publications with additional specialized guidance.

Notification and Labeling

Once the presence of asbestos-containing materials has been established in a facility, notification and warning program should be initiated. The notification and warning program serves two purposes: (1) it alerts affected parties to a potential hazard in the building; and (2) it provides basic information on avoiding the hazard. Building occupants, employees and others who are aware of the presence of ACM are less likely to disturb the material and cause accidental fiber release.

Notification

Notification of building occupants and other affected individuals can be accomplished several ways. Two common techniques are:

- Distributing notices; and
- Holding awareness or informational seminars.

The distribution of notices is an effective means of alerting building occupants about the presence of asbestos. Memos or letters can be tailored to specific parties, and verification that notification was received is easily accomplished. For example, in a large multi-tenant facility, the building owner can send detailed reports to the management of individual companies, while distributing similar informational memos to building occupants.

Awareness or informational seminars can be designed to follow written notification. They serve to expand on relevant information while allowing attendees to raise questions. These seminars

can be developed at the same time as other training programs, and typically last no more than several hours.

Regardless of the notification format chosen, building occupants should be provided with the following information, at a minimum:

- What asbestos is and how it is typically used;
- Health effects associated with exposure;
- What type(s) of ACM are present in the facility;
- The exact location(s) of these materials;
- How individuals can avoid disturbing ACM;
- How to recognize and report damage;
- How custodial and maintenance personnel are dealing with these materials to prevent fiber release;
- What will be done periodically and over the long run to protect the health and safety of building occupants;
- Name and telephone number of the person responsible for asbestos-related activities in the facility; and
- The availability of the management plan (required for schools).

Labeling and Signs

Under AHERA, the posting of warning signs is mandatory on or adjacent to any friable or non-friable ACBM and assumed ACBM in routine maintenance areas (such as boiler rooms) at each school building. Labeling, as opposed to notification, is not intended as general information. It serves as a final line of defense to prevent unprotected individuals from disturbing ACM, or entering areas where repair or renovation activities involving ACM are underway. Labeling is usually in the form of posted signs or notices, which are often found either directly attached to ACM or at entrances to areas where ACM is present (e.g., boiler rooms). Warning signs used in conjunction with small renovations or repairs that involves the disruption of ACM should be posted at entrances and around the perimeter of the project and in accordance with the OSHA Asbestos Standards (1926.1101 or 1910.1001, whichever is applicable).

Specific warning sign language (in areas where no regulatory requirement prevails) is a matter of extreme importance. A warning that is vaguely worded may not effectively express the potential danger involved. Warning or danger signs that come across too alarmist may create undue concern among building occupants. Consideration should also be given to level of comfort the employees/occupants have when reading and comprehending English-only, signs. Also, the manner in which a warning sign is worded can affect the owner's liability. It is best to consult an attorney and seek advice from a communications and/or public relations expert prior to developing and posting non-mandatory ACM warning signs.

Training

Training of service (custodial and maintenance) workers is one of the most important aspects of an effective operations and maintenance program. Training serves to establish proper awareness and understanding of work practices that are vital to the success of the program. In those schools that contain friable ACM, training must be adequately developed and offered on at least two levels (per AHERA). Similar training is also appropriate in nonschool facilities.

1. General Awareness

All service personnel who work in a school building that contains friable ACM must receive two hours of awareness training. This training Session should include, at a minimum, all the information outlined in the section on notification. OSHA requires that maintenance and custodial work during which employees will contact but not disturb asbestos (Class IV work) be performed by persons with 2 hour training.

2. Cleaning and Custodial Work

Custodial/service personnel who conduct any activities that will result in the disturbance of ACM must receive the two hours of general awareness training and 14 hours of additional instruction (per AHERA). Information to be presented in this training session should include proper cleaning techniques, appropriate practices for handling ACM, and proper use of respirators and other protective equipment, including hands-on training. One of the main objectives of the O&M program is to clean the facility of existing asbestos contamination. This training program instructs participants in proper cleaning techniques that involve the use of wet methods, HEPA vacuuming, protective equipment, and proper waste disposal methods. Elements of specialized cleaning and re-cleaning are discussed later in this chapter.

3. Maintenance Work

Maintenance workers are often required to use specialized asbestos control procedures when working around ACM. Most maintenance work is conducted entirely by in-house staff, entirely by outside contracted help, or a combination of these two options. If routine or even infrequent maintenance involves the possibility of significant disturbance of ACM, workers should be involved in a more extensive training program (16 hours total). Depending on the type of material involved, maintenance workers will need to be trained in local isolation of the heating ventilation, and air conditioning (HVAC) system, isolation of the work area from non-work areas (through the use of barriers and warning signs, etc.), vacuuming, the use of methods to reduce fiber release, HEPA and glove-bag techniques for working around pipe insulation, clean-up and

decontamination procedures, and ACM disposal procedures. In addition, maintenance workers in this category will need to be involved in respiratory protection and medical surveillance programs. The OSHA regulations governing the construction industry also require 16 hours of training for Class III activities (maintenance and repair activities where asbestos is likely to be disturbed. This training must also include hands-on instruction.

With respect to outside contractors (e.g., electrical, plumbing, and construction contractors), building owners should require evidence that the contractor is familiar with the O&M program, has experience and/or training in working around ACM, and has adequately trained work crews. It is often preferable to have one member of the in-house staff trained to oversee all maintenance performed by outside contractors.

Medical Surveillance and Employee Protection Programs

According to the OSHA Asbestos Standard for the Construction Industry (29 CFR 1926.1101), the OSHA Asbestos Standard for General Industry (29 CFR 1910.1101) and the U.S. EPA Worker Protection Rule (40 CFR 763.120), any employee who is exposed to at least 0.1 f/cc of asbestos (8-hour time-weighted average, as measured with phase contrast microscopy) or 1.0 f/cc (30-minute sampling period) for 30 or more days per year (Construction Industry) or 1 or more days per year (General Industry) must be involved in a medical surveillance program. Likewise, any employee who wears a tight fitting respirator as part of his/her job must be included in a respiratory protection program. In the O&M program, the use of tight fitting respirators will dictate involvement in the medical surveillance program for most custodial and maintenance workers. When an employer provides an employee with a respirator, the implementation of a respiratory protection program is required by the OSHA Respiratory Protection Standard for General Industry (29 CFR 1910.134). It is the responsibility of the employer to provide these programs at no cost to employees.

The purpose of the medical surveillance program is to establish an employee's fitness to wear a respirator, and to detect any changes in the gastrointestinal and cardiopulmonary systems as a result of working in asbestos-contaminated areas. Such changes may indicate the onset of an asbestos-related disease.

The main requirements of the medical surveillance program are initial and periodic examinations. The initial examination can be omitted if the employee had an equivalent exam within the last twelve months. Periodic examinations are required at least annually, and must be performed before the employee is issued a negative pressure respirator.

Each examination must include, at a minimum:

- Completion of the mandatory medical questionnaires. There is one each for the initial and periodic examinations. These questionnaires also include sections on work history. Copies of both the initial and periodic questionnaires are included at the end of this section;
- A physical examination, with emphasis on the cardiovascular and gastrointestinal systems; and
- A pulmonary function test, which includes the forced vital capacity (FVC) and the forced expiratory volume in one second (FEV_1).

The examining physician may also require other tests as part of the medical examination. A chest x-ray is optional and is administered at the discretion of the physician for employees covered under the Asbestos Construction Industry Standard. However, it is required for employees covered under the Asbestos General Industry Standard. It is recommended that an initial chest x-ray be used in order to establish baseline conditions for the employee. Exit (termination) exams are only required for those employees covered under the General Industry Standard.

Following the examination, the physician must provide the employer with the following:

- A written opinion as to whether the employee has any detected medical conditions that would place the employee at increased risk of health impairment from exposure to asbestos;
- Any recommended limitations on the employee or on the use of personal protective equipment, such as respirators; and
- A statement that the employee has been informed by the physician of the results of the medical examination, the hazards of smoking combined with exposure to airborne asbestos, and of any medical conditions that may result from asbestos exposure.

The physician is not to reveal in the written opinion given to the employer any specific findings unrelated to asbestos exposure. Also, the employer must provide a copy of the physician's written statement to the employee within 30 days of receipt.

The employer must provide the examining physician with the following:

- A copy of the OSHA Asbestos Standard;
- A description of the employers duties as they relate to asbestos;
- The employee's actual or anticipated level of exposure;
- A description of any personal protective and respiratory equipment used or to be used; and

- Information from previous medical examinations of the employee that is not otherwise available to the examining physician.

Finally, the employer must maintain medical records for at least 30 years following termination of employment. If the employer goes out of business without a successor, OSHA must be notified at least 90 days prior to termination of business and provide for transfer of records to the Secretary of OSHA, if requested.

With respect to a respiratory protection program, the elements of a comprehensive program are included as Appendix G-l.

Specialized Cleaning Procedures

Cleaning up existing asbestos contamination within a facility is one of the primary objectives of the O&M program. Dry brooms, mops, dust cloths, and standard vacuum cleaners simply re-suspend asbestos fibers into the air increasing the risk of employee exposure and distributed contamination. Therefore, it is essential that specialized cleaning procedures be implemented.

Specially trained and properly equipped custodial workers should· conduct a thorough initial cleaning in the building as soon as the O&M program is in place and before the initiation of any response action. These workers should be equipped with high efficiency air purifying respirators, at a minimum. A combination of wet mopping/wiping and vacuuming should be used to clean all surfaces within the building. Irregular or porous surfaces, such as curtains, books, furniture, and carpeting should be cleaned using HEPA-equipped vacuum cleaners. Many manufacturers offer several "nozzles" to make HEPA vacuuming of these surfaces less difficult. Carpeting may also be cleaned using steam cleaners. A preliminary study carried out by EPA in 1989 showed that hot water vacuums were more effective in carpet cleaning than HEPA vacuums, under the test conditions. Further field studies are planned to confirm these findings. However, while it is likely that wet cleaning of carpets and other textiles will reduce asbestos levels within the fabrics, complete decontamination is unlikely. Removal and replacement of contaminated carpeting or other woven textiles may be recommended as a more reliable alternative. Care should be taken to ensure that the liquid waste generated during steam cleaning is disposed of as asbestos-contaminated waste (discussed later in this section) or filtered properly before disposal. (The treatment of asbestos-contaminated waste water will vary state-by-state or city-by-city. The sentiment expressed herein constitutes good practice.)

Other surfaces, such as walls, non-carpeted floors, light fixtures, equipment housings, the exterior of air handling ducts, and file cabinets should be cleaned using mops and/or dust cloths and rags that are wetted with amended water. Amended water is a mixture of water and a non-sudsing surfactant. A dust suppressant could also be used on mops. Periodic or routine cleaning is less rigorous than the initial cleaning and is implemented, when needed, on a regular

schedule depending on the extent of the ACM within the facility and the level of contamination. Surfaces should be wet wiped and/or HEPA vacuumed. Respiratory protection may not be required for the custodial crew performing periodic cleaning. However, areas where ACM is frequently disturbed may warrant continued use of respiratory protection.

Under AHERA the accredited Management Planner should determine whether routine cleaning is needed. This determination should be based on the rate of dust buildup.

Maintenance/Renovation Work Permit System

Minimizing inadvertent disruption of ACM during maintenance and renovation operations is often one of the most difficult tasks faced by the asbestos program manager. Initiating a work permit system, where all work orders or requests are funneled through the asbestos program manager ("designated person" as per AHERA), is a simple yet effective way of controlling disruption of ACM during these activities.

In the permit system, all requests for maintenance/renovation activities are given to the asbestos program manager prior to the issuance of a work order to proceed. (Exhibits G-1 and G-2 are example permit request forms.) The program manager then checks the building's asbestos records (files, computerized database, etc.) for information about the presence of ACM where work is to be performed. The manager should also physically inspect the area in question to ensure records reflect actual conditions. If no asbestos is present, the work order is issued and the planned actions can proceed. If ACM is found to be present in the area, the program manager will sign the permit application and either equip properly trained maintenance/renovation workers to deal with the ACM during the operation or dispatch an "emergency response" team to remove the ACM In worst-case situations (e.g., large amounts of ACM), non-critical maintenance/renovation work should be deferred until the ACM in the area can be abated by an accredited abatement contractor.

Special Work Practices For Maintenance Activities

Normal maintenance activities can disturb ACM and raise levels of airborne asbestos. Maintenance workers should be cautioned against conducting any maintenance work in a manner that may disturb ACM. The O&M program should include provisions for each type of ACM that is present in the building.

The nature and extent of special work practices should be tailored to reflect the likelihood that the ACM will be disturbed and that fibers will be released. Four categories of potential disturbance are defined: (1) contact with the ACM is very unlikely; (2) accidental disturbance is possible; (3) a small amount of ACM (less than three square feet or three linear feet) will be disturbed; and (4) a large amount of ACM (three or more square feet or linear feet) will be disturbed. The following sections on surfacing materials, thermal system insulation, and other

types of ACM describe the work practices in detail. A document developed by the National Institute of Building Sciences (NIBS) in 1992 entitled *Guidance Manual: Asbestos Operations & Maintenance Work Practices* may prove very useful in providing guidance to the asbestos program manager on specific step-by-step work practices appropriate to the type of ACM and activity being undertaken. This document may be purchased from NIBS. For more information contact:

The National Institute of Building Sciences
Publications Department
1201 L Street, NW, Suite 400
Washington, OC 20005-4014 (2021289-7800)

The AHERA Rule refers to small-scale, short-duration projects, but does not use linear or square feet to distinguish small/short from large/long. Instead, the examples cited of small-scale, short duration projects are broadly consistent with categories (2) and (3) above.

Surfacing Materials

Contact with ACM Unlikely

In some buildings with ACM, many routine maintenance activities can be conducted without contacting the ACM. For example, changing light bulbs in a fixture on a ceiling with asbestos-containing acoustical plaster can usually be performed without jarring the fixture or otherwise disturbing the ACM. (The top of the fixture should have been wet-cleaned previously to remove settled fibers.) In these situations, few precautions other than normal care are needed. The only precaution is to assure the availability of respirators and a HEPA vacuum if needed. These do not have to be taken to the site, but should be available at a known location in the building. Where maintenance is performed in parts of the building which are free of ACM, no special precautions are usually necessary. An exception would be work causing vibrations at a distant location where ACM may be present.

Accidental Disturbance of ACM Possible

Routine maintenance and repair includes work on light fixtures, plumbing fixtures and pipes, air registers, HVAC ducts, and other accessible parts of building utility systems. Where these fixtures or system parts are near friable ACM, maintenance work may unintentionally disturb the ACM and release asbestos fibers.

For example, maintenance work on ventilation ducts in an air-handling room where asbestos fireproofing is present only on structural beams could probably be conducted without contacting the ACM. However, the fireproofing could be disturbed accidentally during the course of the work.

The following precautions and procedures should be used if accidental disturbance of ACM (or dust and debris containing asbestos fibers) is possible:

- Approval and guidance should be obtained from the asbestos program manager before beginning work. The asbestos program manager or supervisor should make an initial visit to the work site.
- The work should be scheduled after normal working hours (nights or weekends), if possible, or access to the work area should be controlled: doors should be locked from the inside and signs posted to prevent unauthorized persons from entering the work area (e.g., "MAINTENANCE WORK IN PROGRESS, DO NOT ENTER", or, if asbestos levels are, or are anticipated to be high enough to trigger the OSHA Rule (the PEL or higher), "DANGER-ASBESTOS: CANCER AND LUNG DISEASE HAZARD: AUTHORIZED PERSONNEL ONLY: RESPIRATORS AND PROTECTIVE CL0THING ARE REQUIRED IN THIS AREA"). **Note: Emergency exits must remain in operation.**
- The air-handling system should be shut off or temporarily modified to prevent the distribution of any released fibers to areas outside the work site.
- A 6-mil fire retardant polyethylene plastic drop cloth should be placed underneath the location of the maintenance work, extending at least 10 feet beyond all sides of the work site. Alternatively, a rectangular enclosure constructed of 6-mil plastic on a frame can be positioned underneath the maintenance area to inhibit the spread of fibers from fallen ACM (Mobile enclosures of this type are available commercially.)
- Workers should wear at least a half-face negative pressure air-purifying respirator with HEPA filters and protective clothing including a body suit and hood.
- The ACM in the vicinity of the maintenance work should be misted lightly with amended water. Use a mister that produces a very fine spray. Be sure that the electrical system is shut off before spraying around any electrical conduits or fixtures.
- After the maintenance work is completed, the fixture, register, or other component, and all tools, ladders and other equipment should be HEPA-vacuumed or wiped with a damp cloth.
- If any debris is apparent on the drop cloth, floor or elsewhere, it should be HEPA-vacuumed.
- The plastic drop cloth (or enclosure) should be wiped with a damp cloth, carefully folded, and discarded as asbestos waste.
- All clothes, vacuum bags/filters, and other disposable materials should be discarded in sealed and labeled plastic bags as asbestos waste.
- Workers should HEPA-vacuum respirators and protective clothing at the work site. The clothing should be turned inside-out as it is removed and then discarded as asbestos waste. If the ACM was disturbed during the course of the work, the workers should leave their respirators on, proceed to a shower room, shower with respirators on, and clean their respirators while in the shower.

Disturbance of ACM Intended or Likely

Some maintenance and repair activities will unavoidably disturb the ACM. For example, installing new sprinkler or piping systems will necessitate hanging pipes from structural members or the ceiling. If the beams or ceilings are insulated with ACM, the ACM will be scraped away to install hangers. Likewise, pulling cables or wires through spaces with ACM or ACM debris is likely to dislodge pieces of the ACM or disturb ACM debris and dust. Furthermore, anytime tiles are moved to enter the space above a suspended ceiling, settled dust on top of the tiles will be re-suspended. If the beams or decking above the ceiling are covered with ACM, the dust is likely to contain asbestos fibers. All of these examples involve disturbance of ACM or asbestos dust and debris, and will likely result in elevated levels of airborne asbestos.

Small Disturbances

The following procedures are appropriate for maintenance activities which involve small-scale (less than 3 square feet) removal of surfacing ACM or when disturbance of ACM dust and debris or unintentional contact with the ACM is likely.

- Approval should be obtained from the asbestos program manager before beginning work, and the work should be supervised.
- The work should be scheduled after normal working hours (nights or weekends), if possible, or access to the work area should be controlled: doors should be locked from the inside and signs posted to prevent unauthorized persons from entering the work area (e.g., "MAINTENANCE WORK IN PROGRESS, DO NOT ENTER", or, if the asbestos levels are high enough to trigger the OSHA Rule (the PEL or higher), "DANGER-ASBESTOS: CANCER AND LUNG DISEASE HAZARD: AUTHORIZED PERSONNEL ONLY: RESPIRATORS AND PROTECTIVE CLOTHING ARE REQUIRED IN THIS AREA"). **Note: Emergency exits must remain in operation.**
- The air handling system should be shut off or temporarily modified to prevent the distribution of fibers from the work site to other areas in the building.
- Workers should wear, at minimum, full-face negative-pressure air-purifying respirators with HEPA filters or powered air-purifying respirators with HEPA filters and protective clothing, including a body suit, hood, boots, and gloves.
- A 6-mil fire retardant polyethylene plastic drop cloth should be placed beneath the location of the maintenance work, extending at least 10 feet beyond all sides of the work site. (In the case of entry into the space above a suspended ceiling, the work site would be the area of the tiles removed to gain access.) Alternatively, a rectangular enclosure constructed of 6-mil plastic on a frame can be positioned underneath the maintenance area to inhibit the spread of fibers from fallen ACM. (Mobile enclosures of this type are available commercially.)

- If entry to the space above a suspended ceiling is necessary, the entry tile(s) should be removed carefully with as little jarring as possible. The air above the opening, the top of the removed tile, all tiles surrounding the opening, and the ACM likely to be disturbed should be misted with amended water. Use a mister with a very fine spray. A thorough misting in the air helps fibers to settle more quickly. Cleaning ceiling tiles with a HEPA vacuum cleaner (prior to wetting) is also effective as long as care is taken not to vibrate tiles and disturb the ACM.
- Selected workers must wear personal air monitoring pumps as required by OSHA unless previous experience with the same ACM and similar operations indicates that fiber levels are likely to be less than the PEL.
- During the course of the work, any ACM which is removed should be collected by the HEPA-vacuum. This is best accomplished by placing the vacuum hose just below the ACM being removed.
- Upon completion of the work, any visible debris on the top of the suspended ceiling, on the drop cloth, on the floor, or anywhere else should be collected by cleaning with a HEPA vacuum.
- All equipment and tools should be wiped with damp cloths or HEPA-vacuumed.
- The plastic sheet should be wiped with a damp cloth, folded, and discarded as asbestos waste.
- All debris, cloths, and vacuum bags/filters should be discarded in sealed and labeled plastic bags as asbestos waste.
- Workers should vacuum their disposable suits before leaving the work site (or remove and discard them as asbestos waste and put on a clean disposable suit), proceed to a shower room, shower with their respirators on, and clean their respirators while in the shower.

Large Disturbances

Any maintenance work which involves removal of 3 or more square feet of surfacing material (or 3 linear feet of thermal system insulation) should be considered a large-scale disturbance of ACM. Moreover, if the maintenance work is part of general building renovation, NESHAP requires prior removal of ACM if more than about 160 square feet of friable surfacing ACM (or 260 linear feet or 35 cubic feet of thermal system insulation) would be broken up or made inaccessible for subsequent removal. Even if NESHAP does not strictly apply, building owners should consider removing all friable ACM and all non-friable ACM, which is in poor condition, from that part of the building where this type of maintenance work is planned. In a school, the response to large disturbances (> 3 square or linear feet of ACM) must be designed and conducted by accredited persons. Typically, an outside abatement contractor would be hired for the removal project before the maintenance work would begin. If this approach is not deemed necessary or desirable, the maintenance workers should be fully trained and accredited in asbestos removal and the work should proceed as follows:

- All of the procedures for asbestos removal should be followed - construction of containment barriers and decontamination facilities; use of a negative pressure ventilation system; use of protective clothing and "type C" respirators by workers; proper disposal of asbestos debris; and proper cleanup of the work site followed by air testing. Most of these procedures except the use of "type C" respirators are required by OSHA (See Chapters 5 and 6 of the Purple Book and the OSHA rule for the construction industry for a detailed discussion of these steps.) Personal air monitoring is also required by OSHA unless self-contained breathing apparatus SCBA or "type C" respirators are used. (An "Asbestos Work Order- Daily Activity Report" [Exhibit G-3] may be helpful in documenting the daily activities within an asbestos abatement project.)
- Once the work site has been adequately isolated and all precautionary measures have been taken, the maintenance work should begin. If the work involves cutting, drilling, grinding, or sanding the ACM, special tools equipped with HEPA vacuum attachments must be used (OSHA requirement). Where the ACM is simply scraped off the substrate, the hose from a HEPA vacuum cleaner should be placed just below the removal site to catch the ACM. Upon completion of the work, the vacuum bags and filters should be discarded as asbestos waste.
- Where the ACM was disturbed as part of the maintenance activity, it should be repaired with non-asbestos plaster or spackling compound or sprayed/painted with an encapsulant or latex paint (see section 5.1.3. of the EPA Purple Book for specifications). This should be done before final cleanup of the work site.

Thermal System Insulation

Maintenance activities affecting asbestos-containing thermal system insulation generally involve plumbing-type repairs, or repairs to the heating, ventilation and air conditioning (HVAC) system. Frequently, the ACM must be removed to provide access to the valve, flange, duct, or related system part needing maintenance.

Contact with ACM Unlikely

Maintenance activities or repairs which can be performed without contacting or disturbing the ACM require little more than normal care and good workmanship. (Respirators and a HEPA vacuum cleaner should be available if needed.) For example, valves which are either uncovered or covered with non-asbestos insulation can be repacked or repaired without disturbing asbestos insulation on nearby pipes. As with surfacing ACM, the only precautions necessary are to make sure that a HEPA vacuum cleaner and air-purifying respirators are available if needed.

Accidental Disturbance of ACM Possible

Even maintenance tasks that involve no direct contact with ACM may cause accidental disturbance. For example, vibrations created by maintenance activities in one part of the piping network will be transmitted to other parts. Vibrations could then cause fibers to be released from insulation which is exposed (not covered with a protective jacket) or not in good condition. If in doubt about the possibility of fiber release, thoroughly inspect the thermal system insulation before undertaking the maintenance or repair work. Then, either correct the problem before starting, or assume that the maintenance work may cause accidental disturbance and fiber release. In this case, the following procedures should be used:

- Work approval and site preparation procedures as described under **Surfacing Material** should be followed.
- Plastic sheets (6-mil fire retardant polyethylene) should be cut and taped around any insulation which might be accidentally disturbed. The plastic should be misted with amended water before taping it shut. If the locations where insulation could be disturbed are too numerous for isolation with plastic, workers should perform the maintenance work wearing air-purifying respirators, at a minimum, and protective clothing, including disposable suits and hoods.
- Cleanup procedures, as described under **Surfacing Material,** should be followed. Special care should be taken when removing the plastic from the insulation to minimize disturbance of any ACM dust or debris that may have fallen from the insulation.

Disturbance of ACM Intended or Likely

Where asbestos-containing insulation must be removed to maintain or repair the thermal system, the ACM will obviously be disturbed. As with surfacing ACM, the amount to be removed or manipulated will determine the procedures to be used.

Small Disturbances

Work approval and site preparation procedures as described for surfacing ACM, should be followed.

- Maintenance workers should wear at least air-purifying negative pressure respirators with HEPA filters and protective clothing (suit, hood, and boots) in case of a fiber release accident.
- The asbestos-containing insulation should be removed as necessary for the repairs, and the repairs made using standard glove-bag techniques, where possible, (see the EPA publication: *Asbestos-in-Buildings Technical Bulletin: Abatement of Asbestos-Containing Pipe Insulation,* 1986-2 and the OSHA construction industry rule). Glove-bags are fastened around the part to be repaired, the insulation is removed with knives and saws

to make the part accessible, and the repairs are made using tools contained in the glove-bag tool pouch. The open faces of the remaining asbestos-containing insulation are then sealed with an encapsulant or latex paint, all surfaces are wet-wiped or HEPA vacuumed, and all debris is sealed in the glove-bag and removed, together with the bag.

- If a bag is ruptured during the course of repairs, work should stop, the area should be sealed off; and all procedures recommended for large-scale asbestos removal should be followed. Thorough clean-up of the work site, followed by air testing, is especially important to assure that fibers which may have escaped are removed. Sealing tape applied quickly to a small puncture could prevent significant release of fibers to the room, provided the ACM inside the bag was thoroughly wet. In this case, sealing off the area followed by cleaning and air testing is probably not necessary.
- At the conclusion of the work, maintenance workers should clean their clothing as above (if fibers escaped from the glove-bag), shower with their respirators on, and clean their respirators while in the shower.
- All glove-bags and any other used materials (including disposable clothing) should be discarded as asbestos waste.
- Non-asbestos insulating material can be installed, as necessary, to replace insulation which was removed.

Note: Procedures for the response to disturbances and emergencies are described in Title 12 NYCRR Part 56 and NYC Title 15, Chapter 1.

Large Disturbances

In a school, maintenance activities which involve removal of 3 linear feet or more of asbestos-containing insulation (e.g., several valves need attention in a utility room or block insulation needs to be removed for boiler repair) should be considered large-scale disturbances. In some situations, glove-bag techniques may be appropriate and the procedures described above under "small disturbances" should be followed. When glove-bags are not feasible, the maintenance activities should be conducted using all the procedures recommended for large-scale asbestos removal. ACM removal is typically conducted by abatement contractors. If maintenance personnel are to conduct the removal, they must be thoroughly trained in removal techniques (OSHA and EPA requirement). Successful completion of an approved AHERA Worker Training Course will meet the training requirements of both agencies. In addition, many states require all workers and supervisors involved in asbestos abatement projects be licensed by the state:

If the maintenance activities are likely to cause disturbance of ACM on pipes, boilers, or ducts at sites other than just those undergoing repair (due to vibration, for example), then the entire room or area should be isolated and large-scale asbestos removal procedures employed. NESHAP regulations require that asbestos-containing thermal system insulation be removed prior to building renovation if 260 linear feet, 35 cubic feet or more of ACM would be broken up or made inaccessible for subsequent removal prior to demolition.

Other ACM

Other types of ACM should also be addressed in the special O&M program. They include vinyl asbestos floor tiles, asbestos ceiling tiles, asbestos-cement wall board and counter tops, asbestos roof tiles, and various textile products such as stage curtains. (ACBM as per the AHERA Rule does not include fabrics [unless associated with a heating/ventilating or air-conditioning (HVAC) system, such as vibration dampening cloth] or exterior products.) Disturbance of these materials should be avoided. Where this is not possible, procedures should be used as described above for large-scale removal of ACM Cutting, drilling, grinding, or sanding of ACM must be performed with tools equipped with HEPA-filtered vacuum systems (OSHA requirement).

Other Measures

Whenever friable ACM is present in a building, special procedures should be followed when changing filters in the HVAC system. The filters should be misted with amended water as they are removed, placed in plastic bags, sealed, and discarded as asbestos waste. Workers should wear at least an air-purifying respirator.

Special Work Practices for Renovation and Remodeling

Renovation

Building renovation or building system replacement can cause major disturbances of ACM. Moving walls, adding wings, and replacing heating or air conditioning systems involve breaking, cutting, or otherwise disturbing ACM that may be present. Prior removal of ACM is highly recommended in these situations, and is required by NESHAP if the amount of friable ACM likely to be disturbed is greater than the threshold amounts (160 square feet, 260 linear feet or 35 cubic feet of ACM). If prior removal is not undertaken, the renovation project should be considered equivalent to an asbestos removal project. All the procedures and precautions for asbestos removal recommended/required by EPA and required by OSHA as previously discussed should be employed. A key step in considering a renovation project is checking on the location and type of ACM that may be affected. Clearance should be obtained from the asbestos program manager before serious project planning is begun.

Remodeling

Remodeling or redecorating implies less dramatic structural alteration. However, disturbances of ACM or materials contaminated with asbestos fibers are still possible. Where the remodeling involves direct contact with ACM (e.g., painting or wallpapering over ACM), all of the procedures and precautions recommended by EPA and required by OSHA for asbestos removal should be followed.

If "other" types of ACM have to be removed as part of the renovation project, the removal should be done with care to avoid breaking the material. For example, small sections of asbestos-containing floor tiles can be removed by applying dry ice or heat from a portable heater to the tops of the tiles and then prying them up. Glued carpet may require a mechanical chipper to separate the carpet from the floor. Before a chipper is employed, test the carpet adhesive for asbestos. If it contains asbestos, all workers should wear appropriate respirators and the project should be treated as an asbestos removal project.

Emergency Response Procedures

As long as ACM remains in the building, a fiber release episode could occur. Custodial and maintenance workers should report to the asbestos program manager the presence of debris on the floor, water or physical damage to the ACM, or any other evidence of possible fiber release. Fiber release episodes can also occur during maintenance or renovation projects. The asbestos program manager should call an abatement contractor or assign a suitably trained in-house team to clean up debris and make repairs as soon as possible. If an outside contractor is to be used, a company should be selected and retained by contract for quick response action as needed.

Minor Fiber Release Episodes

Minor fiber release episodes, such as a small section of insulation (3 linear feet or less) falling from a pipe or a careless worker bumping into a beam and dislodging a small amount of fireproofing ACM (3 square feet or less) are defined as such in the AHERA Rule,. They can be treated with standard wet cleaning and HEPA-vacuum techniques:

- Workers should wear air-purifying respirators with HEPA filters, at a minimum.
- Workers should thoroughly saturate the debris with amended water using a misting bottle with a very fine spray. The debris should then be placed in a labeled, 6-mil plastic bag for disposal and the floor should be cleaned with damp cloths or a mop. Alternatively, the debris can be collected with a HEPA vacuum cleaner, followed by wet cleaning of the vacuumed surfaces.
- All debris and materials used in the cleanup should be discarded as asbestos contaminated waste.
- Workers should vacuum their disposable suits before leaving the work site (or remove them, discard them as asbestos waste, and put on clean, disposable suits), proceed to a shower room, shower with their respirators on, and clean their respirators while in the shower.
- The damaged ACM should be repaired with asbestos-free spackling, plaster, cement, or insulation, or sealed with latex paint or an encapsulant.

Major Fiber Release Episodes

Major fiber release episodes are very serious events. Large amounts of ACM falling from heights of several feet may contaminate an entire building with asbestos fibers. If more than 3 square feet of surfacing ACM or more than 3 linear feet of thermal system insulation delaminate or is unintentionally dislodged from its substrate, the episode should be considered major. A large breach in a containment barrier for a maintenance or abatement project should also be considered a major episode. AHERA requires that the response action for any major fiber release episode be designed by accredited Project Designers and conducted by accredited Contractors/Supervisors. However, the following response procedures should form the basis for response actions and the first two action items implemented immediately upon discovery of a major fiber release episode.

- The area should be isolated as soon as possible after the ACM debris is discovered. Where the area can be sealed by doors, they should be locked from the inside (escape corridors must remain in operation) and signs posted to prevent unauthorized personnel from entering the work area ("DANGER-ASBESTOS; CANCER AND LUNG DISEASE HAZARD; AUTHORIZED PERSONNEL ONLY; RESPIRATORS AND PROTECTIVE CLOTHING ARE REQUIRED IN THIS AREA").
- The air-handling system should be shut off or temporarily modified to prevent the distribution of fibers from the work site to other areas of the building. If possible, doors, windows, and air registers should be sealed with 6-mil plastic sheets and tape.
- All the procedures recommended by EPA and required by OSHA for large-scale removal of ACM should then be used. These include containment barriers, negative pressure ventilation, personal respiratory protection and protective clothing, decontamination facilities, and air testing.
- Workers should wear appropriate respirators (see discussion in the Asbestos Inspector Manual) and protective clothing, including a body suit, hood, boots and gloves. Personal air monitoring may be conducted on representative workers, but is not required by OSHA when SCBA or "type C" respirators are used.
- Fallen debris should be sprayed with amended water and placed in plastic bags for disposal. Shovels are useful for collecting the debris. The floor should be thoroughly cleaned with a HEPA vacuum cleaner.
- Walls, ceilings, pipes, boilers, or other surfaces where ACM was damaged or delaminated should be repaired temporarily. This might involve re-plastering with asbestos-free material, spraying with an encapsulant, or taping with duct tape. In some cases, ACM beyond the immediate area of damage may need to be removed to prevent additional episodes.
- The air should be tested for asbestos fibers before the plastic barriers are removed and the area reoccupied. Testing should follow guidelines in Chapter 6 of the Purple Book, Chapter 4 of the Silver Book *Measuring Airborne Asbestos Following an Abatement Action,* or the protocol detailed in the EPA guidance document *Guidelines for*

Conducting the AHERA TEM Clearance Test to Determine Completion of a Response Action. That is, air should be sampled at the specified number of locations and analyzed by either phase contrast microscopy or transmission electron microscopy. See Title 12 NYCRR Part 56 and NYC Title 15, Chapter 1.

- After the barriers have been taken down, a decontamination of the entire building or a portion of it should be considered. The need for this will depend on how rapidly the response team reacted to the episode and, in particular, how quickly the HVAC system was turned off. A thorough decontamination includes HEPA-vacuuming and/or wet wiping all carpets, furniture, and other surfaces. Decontamination of the HVAC system would involve disassembling and cleaning (HEPA-vacuuming or wet wiping) ducts, ventilators, registers, and other system parts. System filters should also be removed and replaced.
- All equipment used in the cleanup operation should be washed or wiped with damp cloths. All disposable materials (e.g., cloths, mop heads, filters, coveralls) should be discarded as asbestos wastes.
- Each fiber release episode should be documented. A report format is suggested in Exhibit G-4. These procedures should be employed whether the building owner uses in-house staff or an outside asbestos abatement contractor. If an outside contractor is used, the procedures should be thoroughly discussed and proper training and accreditation of the contractor's crew assured before signing the contract.

Under the AHERA Rule, this part of the O&M program should be developed by an accredited Project Designer. At a minimum, the Management Planner should have a Project Designer review and approve this part of the O&M plan.

Periodic ACM Surveillance

Periodic review of the O&M program is essential to insure that the program objectives are being met. A key feature of the review is re-inspection of all ACM in the building. Combined with ongoing reports of changes in the condition of the ACM made by services workers, the re-inspection will insure that any damage or deterioration of the ACM will be detected and corrective action taken. Re-inspections should be conducted at least annually; more frequently if necessary. AHERA requires periodic surveillance every six months by the LEA, and re-inspection every three years by an accredited Building Inspector.

The assessment factors described in Section C should be used to evaluate each homogeneous area of surfacing ACM and thermal system insulation. The assessment factors are: ACM condition (deterioration, physical damage, and water damage), and potential for disturbance (frequency of potential contact, sources of vibration near the ACM, and potential for air erosion). Either the asbestos program manager or someone trained or experienced in ACM assessment, should conduct the 6 month periodic surveillance inspections. The results should be documented (see Exhibit G-5) and placed in the permanent asbestos file.

Air monitoring could supplement the physical inspection. If air monitoring is conducted, transmission electron microscopy (TEM), not phase contrast microscopy (PCM), should be used to count and identify the airborne fibers. Only TEM can detect the small asbestos fibers typically found in buildings with ACM. (Large-scale disturbance of ACM will release both small and large fibers.) Since analysis by TEM is more expensive than PCM, air monitoring which employs TEM is typically used on a one-time basis and provides a "snap-shot" view of building conditions. Such a one-time view can be very misleading because airborne asbestos levels vary from day to day and from room to room. Low readings are, therefore, possible even when the ACM is in poor condition. For this reason, EPA does not recommend air monitoring for the initial assessment of exposure potential (see Chapter 4 of the EPA Purple Book and Section C of this Student Manual). However, if the ACM is currently in good condition, increases in airborne asbestos levels may provide an early warning of deterioration or disturbance of the ACM. **Never perform aggressive air sampling to determine ambient levels!**

To use air monitoring in an "early warning" context, a baseline asbestos level should be established soon after the O&M program is initiated. Periodic air monitoring (perhaps conducted simultaneously with the periodic surveillance) would then be used to determine if asbestos levels have changed relative to the baseline. Although this use of air monitoring is appropriate and useful in concept, it will still be expensive.

If the air monitoring is used in the ACM surveillance component of the O&M program, the air sampling and sample analysis procedures described in EPA's Silver Book (Measuring Airborne Asbestos Following an Abatement Action, EPA 560) should be employed. At least five samples should be collected to establish a baseline, followed by at least five additional samples during each semi-annual re-inspection of the ACM Sequential sets of five samples can be averaged and the averages compared statistically (as described in Chapters 3 and 4 of the Silver Book for clearance monitoring) to determine whether asbestos concentrations are increasing. Note that aggressive sampling should NOT be used in any area where ACM is present. Special training or expert advice is needed to design and operate an air-monitoring program.

Measuring dust accumulation for asbestos is another way to supplement physical re-inspection. A trend of increasing asbestos content in dust samples would be evidence for release of asbestos fibers in the building. Although dust measurement is becoming more popular, no standardized collection and analysis procedures are available. Some asbestos consultants use an air sampling pump to "vacuum" fibers from surfaces; others favor some sort of "wipe sample" method. EPA is currently evaluating several collection and analysis protocols for asbestos dust. Until this study is concluded, EPA does not recommend dust measurement as part of ACM surveillance in an O&M program.

Recordkeeping

All written records discussed in this section should be maintained as part of a thorough recordkeeping process. To review, these include, (but may not be limited to):

- The written O&M plan itself, including work practices;
- Building plans and drawings;
- Survey data;
- A visual record of the type and location of known or assumed ACM within the building or facility;
- Copies of notification and warning programs;
- Descriptions, times, dates, and attendants of training programs;
- Written respiratory protection program; and
- Medical surveillance records.
- Copies of all permits and documentation of custodial, maintenance, renovation, and emergency response actions performed
- Periodic ACM surveillance records.

OSHA requires that each employee's record of exposure and medical surveillance be made available to the employee. EPA recommends that all written elements of the O&M program similarly be made available for inspection.

A detailed description of recordkeeping requirements under AHERA is found in Section I of this Student Manual.

CASE STUDY

The Setting

East Lake is a high school in mid-America. The school consists of a central three-story, steel frame domed structure housing the mechanical plant, laboratories, lecture halls, a planetarium, and various special-purpose rooms. Classrooms are located in single story wings which surround the central structure in a *U-shape.* The gymnasium and associated athletic facilities are located m a separate structure.

ACBM consists of fireproofing sprayed on structural beams and columns in the central structure. The structural steel is located above the Suspended ceilings, which form return air plenum on all floors. Fireproofing is also found on structural steel supporting the dome (above false ceilings in the lecture halls) and above the planetarium (it had been encapsulated in the planetarium area). Some debris and dust is found on ceiling tiles, with large amounts of dust present in the utility space just below the dome. This space connects directly to janitor closets on the third floor of the central structure.

Asbestos-containing thermal system insulation is found in the central boiler room and in two fan rooms in the central structure. Most of the material is in good condition, with the exception of the fan rooms where accumulating dust and debris suggests deterioration of pipe insulation (and of fireproofing on exposed beams).

Vinyl asbestos floor tile has been installed in the single-story wings. Cement-asbestos wallboard was used in the boiler room.

Discovery of the Problem

Spurred by suspicions of some faculty and students (and the results of "secret testing"), the school administration hired a consultant to conduct a comprehensive building survey for ACM. The consultant recommended the following actions for the most hazardous areas:

- Access to the utility space just below the dome (and above the lecture halls) should be locked to control access until the fireproofing could be removed.
- Likewise, access to the janitors' closets which connect to this space should be locked.
- Two small equipment rooms in the athletic complex should also be locked since the fireproofing had been damaged and had fallen to the floor.

During the course of the investigation, the consultant spoke with representatives of the teacher's union. He discovered a general attitude of distrust toward the school administration ("they're covering up the problem") and several specific problems associated with school operating practices.

Specifically,

- Maintenance personnel were entering the air plenum on each floor without taking precautions.
- The track team was practicing in a 2nd floor corridor causing significant structural vibrations.
- Although most occupied areas were well-maintained, cleaning was conducted using dry techniques.

Recommendations Regarding O&M

An O&M program was a feasible response option for all areas of the school except those with the highest hazard rating. The consultant prepared a detailed O&M plan similar in structure to the generic plan discussed above. That is, it was based on a work permit system, and specified appropriate work practices for cleaning, maintenance and repair, renovation and remodeling, and emergency response. It also described medical surveillance and respiratory protection programs and training programs for (1) service workers and (2) student teachers and administrative staff. Finally, a schedule of initial cleaning of the entire building was developed. In terms of program implementation, an administrative structure was outlined. It focused on an appointed asbestos program manager, and included representatives from the supervisor's office, the facilities management department, and the faculty union. Union participation was critical, both to improve the school board's credibility, and to provide critical input from people knowledgeable about the building operation.

The LEA's Response

The LEA was sensitized to the need for prompt and responsive action. A schedule to remove fireproofing from the most hazardous areas was quickly developed. A bond election date was then set to raise money to pay for removal. The LEA also recognized that a strict O&M program was necessary (1) to minimize the risks to students and school personnel from ACM remaining in place, and (2) to assure parents and voters that the school board was taking the matter seriously.

The structure of the O&M team proved to be workable and effective. By including the teachers' union, a more effective program tailored to conditions of East Lake was developed. In addition, the teachers developed a deeper commitment to the program than otherwise might have been the case, and most helped enforce the program once it was established.

The LEA, on the other hand, quickly came to see O&M as a short-term solution at best. The extensive training, respiratory protection, and medical surveillance requirements were seen as onerous. Moreover, rearranging school activities (e.g., the track team was forced to find an alternative wintertime practice facility) and controlling student behavior was difficult. Preventing students from "popping" ceiling tiles was particularly problematic. As a result, the LEA proceeded to remove all of the fireproofing over a two year period. TSI was repaired in the short-term and removed in the final stage of the asbestos control program.

Lessons

The East Lake experience illustrates several important aspects of an O&M program:

1. Participation in designing the program by all affected parties is crucial. (Even student participation can be useful.)
2. A comprehensive and effective program can convince the community that the problem is significant and that the LEA/building owner is serious.
3. A comprehensive O&M program may be burdensome to some LEAs/building owners, and may drive them toward other response actions.
4. The weak part of any O&M program in a school is the need to control student behavior, especially in poorly supervised areas.

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EXHIBIT G-I

PERMIT APPLICATION FOR PERFORMING MAINTENANCE/RENOVATION WORK

1. Exact location of area involved (including building number, room, location within room, etc.) _____

2. Description of work involved: _____

3. Starting Date: _____ Anticipated Completion Date: _____

4. *Approximate amount of Asbestos present (linear feet, square feet, size of tank, etc.)

5. *Asbestos control method to be used (ie. glovebag, HEPA vacuum, wet method, etc.)

6. *Protective equipment to be used (ie. respirators, coveralls, etc.) _____

7. Name and telephone/extension of supervisor _____

*Note: These items may have to be filled out by the Asbestos Program Manager.

Please return this form to:

Name
Address or Mail Stop
Telephone or Extension

TO BE FILLED OUT BY ASBESTOS PROGRAM MANAGER

Permit _____ Accepted _____ Rejected _____

Signed _____ Printed _____

Permit Number _____

Emergency Contact _____ Telephone _____

EXHIBIT G-2

ASBESTOS WORK ORDER

Asbestos Work Order Number

Building Name

Date

Building Location

Describe the Work to be Performed

Describe the Room(s) and/or Area(s) involved in this Work

Work to be Performed by
(Identify Contractor or, if Building Owner's Employees are to Perform the Work, then the Individual's Names & Employee Identification #'s)

Contractor Identification (Name, Address, Phone, Certification # and State)

CONDITIONS OF WORK PERFORMANCE

It is an explicit condition of this Work Order that all work will be performed in strict accordance with all applicable health and safety standards, and "State of the Art" work practices.
If the Building Owner's employees are involved in the work in any phase, the project supervisor is required to maintain accurate and complete Daily Activity Reports for each day of work.
Multiple work shifts on the same day will require a Daily Activity Report for each shift.

The Daily Activity Report is part of the total Asbestos Work Order record.

The Work to be Performed, And Any Applicable Terms and Conditions Thereof Are More Fully Described On Page 2 of this Form, and Said Page is Hereby Made a Part Hereof.

Asbestos Work Order Number

General Work Conditions

Type of Material		Type of General Protection	
Surfacing		General Occupant and Public	
Floor		Poly on Floor	
Wall		Mini-Enclosure	
Ceiling		Glove Bag	
Visible		Negative Air Enclosure	
Hidden		HEPA Vacuum	
Miscellaneous		HVAC Shutdown	
Describe		Power Shutdown	
		Wet Cleaning	
		Other (Describe)	
Thermal Systems			
Pipe Lagging		General Worker Protection	
Boiler Cover		Decon/Shower Unit	
Ducting		Negative Pressure Air	
Intake		Purifying Respirators	
Exhaust		Powered Air Purifying	
Breeching		Respirators	
Fittings, Valves		Supplied Air Purifying	
Etc.		Respirators	
		Full Body Suits	
		Other	

Estimated Quantity of Material

Square Feet	Linear Feet	# of Pieces

If Removal is involved, then the "Asbestos Containing Materials Disposal Documents" are made a part hereof.

Other special conditions necessary to complete this work order should be detailed on back side of this page.

Work Order Approved by:

Signature **Date**
Asbestos Program Coordinator

Page 2 of 2

EXHIBIT G-3

ASBESTOS WORK ORDER DAILY ACTIVITY REPORT

Date _____

Asbestos Work Order _____

Work Supervisor _____

Shift Starting Time _____ Shift Ending Time _____

Lab On-Site _____ Yes _____ No Name of Lab _____

Lab Tech's Name _____

Air Samples: Quantity & Type Personal _____

Environmental _____

Final Clearance _____

O = Acceptable X = Not Acceptable N/A - Not Applicable

Item		Comments			
_____	Negative Air Maintained				
_____	Work Area Isolation				
_____	Containment Type	Full	_____	Critical Barriers Only	_____
_____	Glove Bag				
_____	Personnel Decon Unit				
_____	Waste Load Out Decon Unit				
_____	Air Sampling Records - Personal				
_____	Air Sampling Records - Environmental				
_____	Planview / Sampling Locations				

Quantity of Waste Generated _____ Barrels _____ Cu. Yards _____ Bags _____

Daily Progress _____

Incidents _____

Supervisor's Signature _____ Date _____

Print Name _____

EXHIBIT G-4

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)

EXHIBIT G-5

REASSESSMENT OF ASBESTOS-CONTAINING MATERIALS

Location of asbestos-containing material(s) (address, building, room(s), or general description)

_____

_____

_____

_____

_____

_____

Type of asbestos-containing material(s):

1 Sprayed- or troweled-on ceilings or walls
2 Sprayed- or troweled-on structural members
3 Insulation on pipes, tanks or boilers
4 Other (describe): _____

_____

_____

Abatement Status

1 The material has been encapsulated _____ enclosed _____ neither _____

Assessment

1 Evidence of physical damage _____

_____

2 Evidence of water damage _____

_____

3 Evidence of delamination or other deterioration _____

_____

4 Degree of accessibiity of the material _____

_____

5 Degree of activity near the material _____

_____

6 Location in an air plenum, air shaft or air stream _____

_____

7 Other observations (including the condition of the encapsulant or enclosure, if any)

_____

_____

_____

_____

Signed: _____ Date: _____
(Evaluator)

OSHA CONSTRUCTI0N INDUSTRY STANDARD

MEDICAL QUESTIONNAIRES

PARTS 1 AND 2

The following medical questionnaires are taken from Appendix D to 29 CFR 1926.1101 and are a mandatory part of the medical-surveillance program.

These questionnaires must be administered to all employees who are exposed to asbestos at or above the action level or excursion level, or those employees assigned a negative-pressure respirator and who will be included in their employer's medical-surveillance program.

Part I contains the Initial Medical Questionnaire which must be obtained for all new hires who will be covered by the medical surveillance requirements. Part 2 includes the abbreviated Periodical Medical Questionnaire which must be administered to all employees who are provided periodic medical examinations under the medical surveillance provisions of the Construction Industry Standard (1926.1101).

From *Federal Register/Vol.* 51, No. 119/Friday, June 20, 1986/Rules and Regulations

Part 1

INITIAL MEDICAL QUESTIONNAIRE

1. NAME _____

2. SOCIAL SECURITY NUMBER # _____

3. CLOCK NUMBER _____

4. PRESENT OCCUPATION _____

5. PLANT _____

6. ADDRESS _____

7. _____
(Zip Code)

8. TELEPHONE NUMBER _____

9. INTERVIEWER _____

10. DATE _____

11. Date of Birth _____
Month Day Year

12. Place of Birth _____

13. Sex
1. Male ___
2. Female ___

14. What is your marital status?
1. Single ___
2. Married ___
3. Widowed ___
4. Separated/ Divorced ___

15. Race
1. White ___
2. Black ___
3. Asian ___
4. Hispanic ___
5. Indian ___
6. Other ___

16. What is the highest grade completed in school? _____
(For example 12 years is completion of high school)

OCCUPATIONAL HISTORY

17A. Have you ever worked full time (30 hours per week or more) for 6 months or more?
1. Yes ___ 2. No ___

IF YES TO 17A:

B. Have you ever worked for a year or more in any dusty job?
1. Yes ___ 2. No ___ 3. Does Not Apply ___

Specify job/industry _____ Total Years Worked _____

Was dust exposure:
1. Mild ____ 2. Moderate ____ 3. Severe ____

C. Have you ever been exposed to gas or chemical fumes in your work?
1. Yes ___ 2. No ___

Specify job/industry _____ Total Years Worked ___

Was exposure :
1. Mild ____ 2. Moderate ____ 3. Severe ____

D. What has been your usual occupation or job -- the one you have worked at the longest?

1. Job occupation _____

2. Number of years employed in this occupation _____

3. Position/job title _____

4. Business, field or industry _____

(Record on lines the years in which you have worked in any of these industries, e.g. 1960-1969)

Have you ever worked:	YES	NO
E. In a mine?	_____	_____
F. In a quarry?	_____	_____
G. In a foundry?	_____	_____
H. In a pottery?	_____	_____
I. In a cotton, flax or hemp mill?	_____	_____
J. With asbestos?	_____	_____

18. PAST MEDICAL HISTORY

	YES	NO
A. Do you consider yourself to be in good health?	_____	_____

If "NO" state reason _____

B. Have you any defect of vision? ..... _____ _____

If "YES" state nature of defect _____

C. Have you any hearing defect? ..... _____ _____

If "YES" state nature of defect _____

D. Are you suffering from or have you ever suffered from:

	YES	NO
a. Epilepsy (or fits, seizures, convulsions)?	_____	_____
b. Rheumatic fever?	_____	_____
c. Kidney disease?	_____	_____
d. Bladder disease?	_____	_____
e. Diabetes?	_____	_____
f. Jaundice?	_____	_____

19. CHEST COLDS AND CHEST ILLNESSES

19A. If you get a cold, does it "usually" go to your chest? (Usually means more than 1/2 the time)
1. Yes ___ 2. No ___ 3. Don't get colds ___

20A. During the past 3 years, have you had any chest illnesses that have kept you off work, indoors at home, or in bed?
1. Yes ___ 2. No ___

IF YES TO 20A:

B. Did you produce phlegm with any of these chest illnesses?
1. Yes ___ 2. No ___ 3. Does Not Apply ___

C. In the last 3 years, how many such illnesses with (increased) phlegm did you have which lasted a week or more?
Number of illnesses ___ No such illnesses ___

21. Did you have any lung trouble before the age of 16?
1. Yes ___ 2. No ___

22. Have you ever had any of the following?

1A. Attacks of bronchitis? 1. Yes ___ 2. No ___

IF YES TO 1A:

B. Was it confirmed by a doctor? 1. Yes ___ 2. No ___ 3. Does Not Apply ___

C. At what age was your first attack? Age in Years ___ Does Not Apply ___

2A. Pneumonia (include bronchopneumonia)? 1. Yes ___ 2. No ___

IF YES TO 2A:
B. Was it confirmed by a doctor? 1. Yes ___ 2. No ___ 3. Does Not Apply ___

C. At what age did you first have it? Age in Years ___ Does Not Apply ___

3A. Hay Fever? 1. Yes ___ 2. No ___

IF YES TO 3A:
B. Was it confirmed by a doctor? 1. Yes ___ 2. No ___ 3. Does Not Apply ___

C. At what age did it start? Age in Years ___ Does Not Apply ___

23A. Have you ever had chronic bronchitis? 1. Yes ___ 2. No ___

IF YES TO 23A:
B. Do you still have it? 1. Yes ___ 2. No ___ 3. Does Not Apply ___

C. Was it confirmed by a doctor? 1. Yes ___ 2. No ___ 3. Does Not Apply ___

D. At what age did it start? Age in Years ___ Does Not Apply ___

24A. Have you ever had emphysema? 1. Yes ___ 2. No ___

IF YES TO 24A:
B. Do you still have it? 1. Yes ___ 2. No ___ 3. Does Not Apply ___

C. Was it confirmed by a doctor? 1. Yes ___ 2. No ___ 3. Does Not Apply ___

D. At what age did it start? Age in Years ___ Does Not Apply ___

25A. Have you ever had asthma? 1. Yes ___ 2. No ___

IF YES TO 25A:
B. Do you still have it? 1. Yes ___ 2. No ___ Does Not Apply ___

C. Was it confirmed by a doctor? 1. Yes ___ 2. No ___3. Does Not Apply ___

D. At what age did it start? Age in Years ___Does Not Apply ___

E. If you no longer have it, at what age did it stop?
Age stopped ___Does Not Apply ___

26. Have you ever had:

A. Any other chest illness? 1. Yes ___ 2. No ___

If yes, please specify _____

B. Any chest operations? 1. Yes ___ 2. No ___

If yes, please specify _____

C. Any chest injuries? 1. Yes ___ 2. No ___

If yes, please specify _____

27A. Has a doctor ever told you that you had heart trouble?
1. Yes ___ 2. No ___

IF YES TO 27A:
B. Have you ever had treatment for heart trouble in the past 10 years?
1. Yes ___ 2. No ___ 3. Does Not Apply ___

28A. Has a doctor told you that you had high blood pressure?
1. Yes ___ 2. No ___

IF YES TO 28A:
B. Have you had any treatment for high blood pressure (hypertension) in the past 10 years?
1. Yes ___ 2. No ___ 3. Does Not Apply ___

29. When did you last have your chest X-rayed? Year) ___ ___ ___ ___

30. Where did you last have your chest X-rayed (if known)?
_____

What was the outcome? _____

FAMILY HISTORY

31. Were either of your natural parents ever told by a doctor that they had a chronic lung condition such as:

	FATHER 1. Yes 2. No 3. Don't know	MOTHER 1. Yes 2. No 3. Don't know
A. Chronic Bronchitis?	___ ___ ___	___ ___ ___
B. Emphysema?	___ ___ ___	___ ___ ___
C. Asthma?	___ ___ ___	___ ___ ___
D. Lung cancer?	___ ___ ___	___ ___ ___
E. Other chest conditions?	___ ___ ___	___ ___ ___
F. Is parent currently alive?	___ ___ ___	___ ___ ___
G. Please Specify	___ Age if Living ___ Age at Death ___ Don't Know	___ Age if Living ___ Age at Death ___ Don't Know
H. Please specify cause of death	_____	_____

COUGH

32A. Do you usually have a cough? (Count a cough with first smoke or on first going out of doors. Exclude clearing of throat.)
(If no, skip to question 32C.)

1. Yes ___ 2. No ___

B. Do you usually cough as much as 4 to 6 times a day 4 or more days out of the week?

1. Yes ___ 2. No ___

C. Do you usually cough at all on getting up or first thing in the morning?

1. Yes ___ 2. No ___

D. Do you usually cough at all during the rest of the day or at night?

1. Yes ___ 2. No ___

IF YES TO ANY OF ABOVE (32A, B, C, OR D,), ANSWER THE FOLLOWING.
IF NO TO ALL, CHECK "DOES NOT APPLY" AND SKIP TO NEXT PAGE

E. Do you usually cough like this on most days for 3 consecutive months or more during the year?

1. Yes ___ 2. No ___3. Does not apply ___

F. For how many years have you had the cough?

Number of years ___Does not apply ___

33A. Do you usually bring up phlegm from your chest?
(Count phlegm with the first smoke or on first going out of doors.
Exclude phlegm from the nose. Count swallowed phlegm.)
(If no, skip to 33C)

1. Yes ___ 2. No ___

B. Do you usually bring up phlegm like this as much as twice a day 4 or more days out of the week?

1. Yes ___ 2. No ___

C. Do you usually bring up phlegm at all on getting up or first thing in the morning?

1. Yes ___ 2. No ___

D. Do you usually bring up phlegm at all on during the rest of the day or at night?

1. Yes ___ 2. No ___

IF YES TO ANY OF THE ABOVE (33A, B, C, OR D), ANSWER THE FOLLOWING:

IF NO TO ALL, CHECK "DOES NOT APPLY" AND SKIP TO 34A

E. Do you bring up phlegm like this on most days for 3 consecutive months or more during the year?

1. Yes ___ 2. No ___3. Does not apply ___

F. For how many years have you had trouble with phlegm?

Number of years ___Does not apply ___

EPISODES OF COUGH AND PHLEGM

34A. Have you had periods or episodes of (increased*) cough and phlegm lasting for 3 weeks or more each year?
* (For persons who usually have cough and/or phlegm)
1. Yes ___ 2. No ___

IF YES TO 34A
B. For how long have you had at least 1 such episode per year?
Number of years ___Does not apply ___

WHEEZING

35A. Does your chest ever sound wheezy or whistling

1. When you have a cold? 1. Yes ___ 2. No ___

2. Occasionally apart from colds? 1. Yes ___ 2. No ___

3. Most days or nights? 1. Yes ___ 2. No ___

IF YES TO 1, 2, or 3 in 35A
B. For how many years has this been present?
Number of years ___Does not apply ___

36A. Have you ever had an attack of wheezing that has made you feel short of breath?
1. Yes ___ 2. No ___

IF YES TO 36A
B. How old were you when you had your first such attack?
Age in years ___Does not apply ___

C. Have you had 2 or more such episodes?
1. Yes ___ 2. No ___3. Does not apply ___

D. Have you ever required medicine or treatment for the(se) attack(s)?
1. Yes ___ 2. No ___3. Does not apply ___

BREATHLESSNESS

37. If disabled from walking by any condition other than heart or lung disease, please describe and proceed to question 39A.

Nature of condition(s) _____
_____

38A. Are you troubled by shortness of breath when hurrying on the level or walking up a slight hill?
1. Yes ___ 2. No ___

IF YES TO 38A

B. Do you have to walk slower than people of your age on the level because of breathlessness?
1. Yes ___ 2. No ___3. Does not apply ___

C. Do you ever have to stop for breath when walking at your own pace on the level?
1. Yes ___ 2. No ___. Does not apply ___

D. Do you ever have to stop for breath after walking about 100 yards (or after a few minutes) on the level?
1. Yes ___ 2. No ___3. Does not apply ___

E. Are you too breathless to leave the house or breathless on dressing or climbing one flight of stairs?
1. Yes ___ 2. No ___3. Does not apply ___

TOBACCO SMOKING

39A. Have you ever smoked cigarettes? (No means less than 20 packs of cigarettes or 12 oz. of tobacco in a lifetime or less than 1 cigarette a day for 1 year.)
1. Yes ___ 2. No ___

IF YES TO 39A

B. Do you now smoke cigarettes (as of one month ago)
1. Yes ___ 2. No ___. Does not apply ___

C. How old were you when you first started regular cigarette smoking?
Age in years ___Does not apply ___

D. If you have stopped smoking cigarettes completely, how old were you when you stopped?
Age stopped ___Check if still smoking ___
Does not apply ___

E. How many cigarettes do you smoke per day now?
Cigarettes per day ___Does not apply ___

F. On the average of the entire time you smoked, how many cigarettes did you smoke per day?
Cigarettes per day ___Does not apply ___

G. Do or did you inhale the cigarette smoke?
1. Does not apply ___
2. Not at all ___
3. Slightly ___
4. Moderately ___
5. Deeply ___

40A. Have you ever smoked a pipe regularly? (Yes means more than 12 oz. of tobacco in a lifetime.)
1. Yes ___ 2. No ___

IF YES TO 40A:
FOR PERSONS WHO HAVE EVER SMOKED A PIPE

B. 1. How old were you when you started to smoke a pipe regularly?
Age ___

2. If you have stopped smoking a pipe completely, how old were you when you stopped?
Age stopped ___ Check if still smoking pipe ___
Does not apply ___

C. On the average over the entire time you smoked a pipe, how much pipe tobacco did you smoke per week?
(a standard pouch of tobacco contains 1 1/2 oz.) ___ oz. per week ___ Does not apply

D. How much pipe tobacco are you smoking now?
oz. per week ___
Not currently smoking a pipe ___

E. Do you or did you inhale the pipe smoke?
1. Never smoked ___
2. Not at all ___
3. Slightly ___
4. Moderately ___
5. Deeply ___

41A. Have you ever smoked cigars regularly? (Yes means more than 1 cigar a week for a year)
1. Yes ___ 2. No ___

IF YES TO 41A
FOR PERSONS WHO HAVE EVER SMOKED A CIGARS

B. 1. How old were you when you started smoking cigars regularly?
Age ___

2. If you have stopped smoking cigars completely, how old were you when you stopped .
Age stopped ___Check if still smoking cigars ___
Does not apply ___

C. On the average over the entire time you smoked cigars, how many cigars did you smoke per week?
Cigars per week ___ Does not apply ___

D. How many cigars are you smoking per week now?
Cigars per week ___
Check if not currently smoking cigars ___

E. Do or did you inhale the cigar smoke?
1. Never smoked ___
2. Not at all ___
3. Slightly ___
4. Moderately ___
5. Deeply ___

Signature _____ Date _____

Part 2

PERIODIC MEDICAL QUESTIONNAIRE

1. NAME _____

2. SOCIAL SECURITY # ___ ___ ___ ___ ___ ___ ___ ___ ___

3. CLOCK NUMBER ___ ___ ___ ___ ___ ___ ___

4. PRESENT OCCUPATION_____

5. PLANT _____

6. ADDRESS _____

7. _____
(Zip Code)

8. TELEPHONE NUMBER _____

9. INTERVIEWER _____

10. DATE _____ ___ ___ ___ ___ ___ ___

11. What is your marital status? 1. Single ___ 4. Separated/.
2. Married ___ Divorced ___
3. Widowed ___

12. OCCUPATIONAL HISTORY

12A. In the past year, did you work full time (30 hours per week or more) for 6 months or more?
1. Yes ___ 2. No ___

IF YES TO 12A:

12B. In the past year, did you work in a dusty job? 1. Yes ___ 2. No ___ 3.. Does not Apply ___

12C. Was dust exposure: 1. Mild ___ 2. Moderate ___ 3. Severe ___

12D. In the past year, were you exposed to gas or chemical fumes in your work?
1. Yes ___ 2. No ___

12E. Was exposure: 1. Mild ___ 2. Moderate ___ 3. Severe ___

12F. In the past year, what was your:

1. Job/occupation? _____
2. Position/job title? _____

13. RECENT MEDICAL HISTORY

13A. Do you consider yourself to be in good health? Yes ___ No ___

If NO, state reason _____

13B. In the past year, have you developed:

	Yes	No
Epilepsy?	___	___
Rheumatic fever?	___	___
Kidney disease?	___	___
Bladder disease?	___	___
Diabetes?	___	___
Jaundice?	___	___
Cancer?	___	___

14. CHEST COLDS AND CHEST ILLNESSES

14A. If you get a cold, does it "usually" go to your chest? (usually means more than 1/2 the time)
1. Yes ___ 2. No ___3. Don't get colds ___

15A. During the past year, have you had any chest illnesses that have kept you off work, indoors at home, or in bed?
1. Yes ___ 2. No ___3. Does Not Apply ___

IF YES TO 15A:

15B. Did you produce phlegm with any of these chest illnesses?
1. Yes ___ 2. No ___3. Does Not Apply ___

15C. In the past year, how many such illnesses with (increased) phlegm did you have which lasted a week or more?
Number of illnesses ___ such illnesses ___

16. RESPIRATORY SYSTEM

In the past year have you had:

	Yes or No	Further Comment on Positive Answers
Asthma	_____	
Bronchitis	_____	
Hay Fever	_____	
Other Allergies	_____	
Pneumonia	_____	
Tuberculosis	_____	
Chest Surgery	_____	
Other Lung Problems	_____	
Heart Disease	_____	

Do you have:

	Yes or No	Further Comment on Positive Answers
Frequent colds	_____	
Chronic cough	_____	
Shortness of breath when walking or climbing one flight of stairs	_____	

Do you:

Wheeze	_____	
Cough up phlegm	_____	
Smoke cigarettes	_____	

Packs per day ____ How many years ___

Date _____ Signature _____

ELEMENTS OF A COMPREHENSIVE RESPIRATORY PROTECTION PROGRAM

An effective respirator program as adapted from A Guide to Respirator)' Protection for the Asbestos Abatement Industry. (U.S.EPA/NIOSH publication, EPA-56-OPTS-86-001 September 1986) 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. Written standard operating procedures governing the selection and use of respirators.

3. Respirator selection (from NIOSH/MSHA-approved and -certified models) on the basis of hazards to which the worker is exposed.

4. Medical examinations of workers to determine whether or not they may be assigned an activity where negative pressure respiratory protection is required.

5. Employee training in the proper use and limitations of respirators (as well as 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.

10. Surveillance of work area conditions and degree of employee exposure (e.g., through air monitoring).

11. Regular inspection and evaluation of the continued effectiveness of the program.

All of the above items are required by OSHA if employees wear respirators during work.

SECTION H

Regulatory Review

OBJECTIVES:

1. To understand the various regulations which may have an effect on Management Planners.

2. To become aware of the requirements of the U.S. EPA Worker Protection Rule, and gain an understanding of who it applies to.

3. To understand the requirements of the OSHA Asbestos Standard for the Construction Industry and the OSHA Respirator Standard through an explanation of their applicability to specific job duties (i.e. operations and maintenance or repair of ACM) may result in exposure to airborne asbestos.

4. To understand the regulations put forth by the Asbestos Hazard Emergency Response Act of 1986 and the Asbestos Schools Hazard Abatement Reauthorization Act (ASHARA) of 1992 including how they are to be interpreted and what they require when managing asbestos in buildings.

5. To understand any applicable state or local asbestos regulations concerning Management Planners.

NOTE: Words underlined in the text can be found in the Glossary at the end of this notebook.

INTRODUCTION

To date, two federal agencies have been principally responsible for generating regulations for asbestos control. These two agencies are the U.S. Environmental Protection Agency (EPA) and the U.S. Occupational Safety and Health Administration (OSHA).

Other federal agencies with jurisdiction over asbestos detection and control include the Department of Transportation (DOT with regulations regarding the transport of asbestos, the National Institute of Standards and Technology (NIST) which has established standards and protocols for laboratory accreditation, and the Consumer Product Safety Commission (CPSC) which has been responsible for banning asbestos in some consumer products: Exhibit H-l presents a chronology of major federal initiatives regarding asbestos. These initiatives span the period of the early 1970's through the present.

A summary of EPA and OSHA regulations follows. Specifically, the EPA Asbestos Hazard Emergency Response Act (AHERA), the EPA Asbestos School Hazard Abatement Reauthorization Act (ASHARA), the EPA National Emission Standards for Hazardous Air Pollutants (NESHAP), the EPA Asbestos Ban and Phase-Out Rule, the EPA Worker Protection Rule, and the OSHA Asbestos Standards are covered.

U.S. EPA ASBESTOS REGULATIONS

ASBESTOS HAZARD EMERGENCY RESPONSE ACT

In October 1986 the Asbestos Hazard Emergency Response Act (AHERA) was signed into law. Included in this Act are provisions directing the EPA to establish rules and regulations addressing asbestos-containing materials in schools. Specifically, EPA was directed to address the issues of: (1) identifying, (2) evaluating, and (3) controlling ACM in schools.

Under a six-month deadline set by Congress, EPA convened a panel of representatives from various associations and interest groups which would be affected by the regulation. The panel members negotiated on many issues, and the results were published during April of 1987 in the form of a proposed rule. The final AHERA regulations (rules) became effective December 14, 1987. They are found in 40 CFR 763 Subpart E §763.80 - §763.99 and have authority under the Toxic Substances Control Act (TSCA).

To whom do the AHERA regulations apply?

- All public and private elementary and secondary schools, in the U.S. and its territories; and
- American schools on military bases in foreign countries.

What are the schools' responsibilities under the rule? [§763.80 and .84]

- To designate a person to ensure that AHERA requirements are properly implemented; To inspect and identify friable and non-friable ACM;
- To monitor and periodically re-inspect ACM;
- To develop and update management plans;
- To determine and implement response actions;
- To develop and implement operations and maintenance programs;
- To notify parents, building occupants and outside contractors of ACM identified in the school, and
- To ensure that accredited persons perform these required activities under AHERA.

What is the timeframe for conducting school inspections under AHERA?

- Schools had to be inspected prior to October 12, 1988. [§763.85]
- Re-inspections must be conducted by accredited inspectors at least every 3 years, with periodic surveillance conducted by maintenance/custodial staff every 6 months, [§763.85 and .92]

What requirements regarding bulk sampling are specified in AHERA? [§763.86)

- Schools could have elected to assume that any or all materials contained asbestos. If they chose to make this assumption, no sampling was necessary.
- To demonstrate that suspect material does not contain ACM, bulk sampling must be conducted in the manner specified.

Where and how are bulk samples to be analyzed?

- Bulk samples are to be analyzed for asbestos by laboratories accredited by the National Institute of Standards and Technology (NIST) through the National Voluntary Laboratory Accreditation Program (NVLAP). [§763.87]
- Analysis shall be by polarized light microscopy (PLM), using the prescribed method (see guidance from EPA regarding point counting of bulk samples; Exhibit H-2).

What assessment data must be compiled by the schools? [§763.88]

- All friable ACBM, thermal system insulation (TSI) and friable assumed ACBM must be located and categorized as to present condition, potential for damage, and type of material.

- Non-friable ACBM and assumed ACBM must be identified and documented but not assessed.

What options does the school have to manage and control ACM?

- Consideration may be given to the following response actions [§763.90]:
  - encapsulation;
  - enclosure;
  - operations and maintenance;
  - repair; and
  - removal

- Particular conditions require specified response actions. [§763.90]

When must a school implement an operations and maintenance (O & M) program? [§763.91]

- Any school building where friable ACBM is present or assumed to be present must develop and implement an O&M program. Non-friable ACBM is regulated under this program when it is about to be made friable due to maintenance work.
- OSHA's Asbestos Standards (29 CFR 1926.1101 and 1910.1001) and/or EPA's Worker Protection Rule (40 CFR 763.121) cover workers performing O&M and repair activities.
- The O&M program must provide for surveillance of ACM at least every 6 months.
- Additional requirements and directions for responding to fiber release episodes are specified in the regulations.

What does AHERA require of schools to substantiate that they are taking responsible action to manage and control asbestos in school buildings? [§763.93]

- On or before October 12, 1988, schools must have prepared and submitted, to an Agency designated by the Governor, an asbestos management plan for each building.
- The plan must be kept up-to-date. The plan is required to contain information specified in AHERA.
- Schools must have begun implementation of the management plan by July 9, 1989.
- A management plan must be prepared and submitted for any building to come into service after October 12, 1988 prior to its use as a school.

What recordkeeping responsibilities does the LEA have? [§763.94]

- A detailed written description of any preventative or response action taken for ACBM must be appended to the management plan.

- Records of air monitoring, training, surveillance, cleaning, O&M, fiber release episodes, and re-inspections must be maintained and added to the management plan.

Does the school have to warn persons of the presence of ACBM? [§763.95]

- Warnings must be posted adjacent to any ACBM located in maintenance areas of a building.
- Warning labels must read:

CAUTION: ASBESTOS. HAZAROOUS
DO NOT DISTURB WITHOUT
PROPER TRAINING AND EQUIPMENT

Are there are penalties for not complying with AHERA? [§763.97]

- Failure to comply can result in fines ranging from $5,000 to $25,000 per day in violation.
- Criminal penalties can be invoked.

Can a LEA be excluded from any part of this rule? [§763.99]

- An inspection is not necessary if an accredited inspector determines:
  - that a previous inspection identified friable and non-friable ACBM (however, while sampling is not necessary in this case, the friable ACBM must be assessed as under §763.88 and the non-friable ACBM must be assessed to determine whether it has become friable);
  - that prior sampling showing no ACBM was conducted in substantial compliance with AHERA;
  - that all ACM was removed; or
  - that the school was built after October 12, 1988 and a registered architect project engineer or accredited inspector verifies that no ACBM was used as a building material in the building.

Who must be accredited under AHERA?

- Building Inspectors - persons who survey buildings for the presence of ACM.
- Management Planners - persons who conduct hazard assessments and who advise school administrators on management options.
- Project Designers - persons who design' abatement projects and write contract specifications for abatement work.
- Abatement Supervisors - persons who supervise abatement projects.
- Abatement Workers - persons who conduct abatement projects.

Who else needs training under AHERA?

- O & M Workers - persons involved in operations and maintenance or custodial activities within a school containing ACBM.
- Designated Person- person designated to ensure that the LEA responsibilities are properly implemented.

How much training is needed and how often?

- Building Inspector - 3 day course with mock building inspection and exam; half day annual refresher training.
- Management Planner - 3 day building *inspector's* course plus 2 additional days and exam; 1 day annual refresher training (includes 4 – hour Inspector Refresher).
- Project Designer - 3 day course with workshops, field trip and exam; 1day annual Project Designer refresher training.
- Abatement Supervisor - 5 day course with hands-on training and exam; 1day annual refresher training.
- Abatement Worker - 4 day course with hands-on training and exam; 1day annual refresher training.
- O & M Workers* - 2 hour awareness* for those who work in a building which contains asbestos; 14 additional hours for any who may disturb ACBM through their work.
- Designated Person* - training adequate to perform duties as required under 763.84.

* This training does not require the use of an accredited course or provide. (The other courses listed must be offered by an accredited training provider.)

What responsibilities does a state have under AHERA?

- Each is to adopt an accreditation plan at least as stringent as the EPA model.
- An agency of the state was to be named to receive and review LEA's management plan.

ASBESTOS SCHOOL HAZARD ABATEMENT REAUTHORIZATION ACT

Section 206 of the Toxic Substances Control Act (TSCA) mandated that EPA develop an asbestos Model Accreditation Plan (MAP). The original MAP was promulgated in 1987 and became codified as 40 CFR Part 763; Appendix C to Subpart E, Section 206 of TSCA. It was later amended by the Asbestos School Hazard Abatement Reauthorization Act (ASHARA). ASHARA mandated that the MAP be revised to:

- provide for the extension of accreditation requirements to public and commercial buildings for persons who inspect for asbestos-containing material, design response actions, supervise, and/or carry out response actions; and
- to increase the minimum number of training hours, including additional hands-on training, required for accreditation of workers and supervisors performing work in schools and/or public and commercial buildings.

ASHARA does not require persons who prepare management plans in public or commercial buildings to obtain accreditation. The accreditation requirement of the ASHARA statute went into effect on 28 November 1992. The revised MAP, which provides more information on the meaning of the new statutory requirements, and expands the length of training and topics addressed in the training courses, was published as an interim final rule in the *Federal Register* on 3 February 1994, and took effect on 4 April 1994.

NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS

EPA's rules concerning the application, removal and disposal of asbestos-containing materials were issued under NESHAP. Also included in NESHAP are rules concerning manufacturing, spraying, and fabricating of asbestos-containing material. NESHAP was revised 20 November 1990 to clarify requirements regarding removal and disposal of asbestos-containing materials.

NESHAP Definitions (selected):

Category I non friable ACM:	Asbestos-containing packings, gaskets, resilient floor covering and asphalt roofing products containing more than 1% asbestos. (Category I non friable ACM has been interpreted to include pliable asbestos-containing sealants and mastics since they exhibit many of the same characteristics as Category I non friable asbestos-containing materials[1])
Category II non friable ACM:	any material, excluding Category I non friable ACM, containing more than 1%asbestos that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure. (Example: asbestos-cement products).

[1] Interpretive letter dated 31 July 1992 from the U.S. EPA Stationary Source Compliance Division.

Friable asbestos material:	any material containing more than 1% asbestos that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure.
Regulated asbestos containing material (RACM):	a) friable asbestos material, b) Category I non friable ACM that has become friable, c) Category I non friable ACM that will be or has been subjected to sanding, grinding, cutting or abrading ,or d) Category II non friable ACM that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder by the forces expected to act on the material in the course of demolition or renovation operations regulated by subpart §61.141 of 40 CFR Part 61 (NESHAP Revision; Final Rule).
Waste Generator:	Any owner or operator of a source whose act or process produces asbestos-containing waste material.

What analytical method(s) are required to determine asbestos content of a material?

- The analytical method specified in Appendix A, subpart F, 40 CFR Part 763 Section 1, is polarized light microscopy (PLM). This method was published as an appendix to the *Friable Asbestos-containing Material in Schools, Identification and Notification* rule ("Interim Method"). (NOTE: EPA recently published *Method for the Determination of Asbestos in Bulk Building Materials,* EP*A/600/R*-93/116, July 1993. While the "Interim Method" continues to be the EPA compliance monitoring method and must be used for AHERA and NESHAP monitoring, the agency is considering replacing the Interim Method with this newer, improved procedure. Any change in the status of either method will be published in the *Federal Register.)*
- If the asbestos content is less than 10% as determined by a method other than point counting by PLM, verify the asbestos content by point counting using PLM. (See interpretive memo issued by EPA regarding point counting of samples › Exhibit H-2.)

What does NESHAP require regarding the removal of ACM, if more than 260 linear feet, 160 square feet or 35 cubic feet are present?

- Removal of all RACM from a facility being demolished or renovated before any activity begins that would break up, dislodge, or similarly disturb the material or preclude access to the material for subsequent removal. EPA has determined that "any demolition operation (i.e., use of a wrecking ball; implosion, use of a bulldozer, backhoe or other heavy machinery to knock the building over) will extensively damage Category II ACM such that it is crumbled, pulverized or reduced to powder[2]. Consequently Category II ACM must be removed prior to demolition.
- Friable asbestos must be removed using wet removal techniques.

[2] Interpretive letter dated 21 December 1992 from the U.S.EPA Stationary Source Compliance Division.

- With special approval from EPA, dry removal is allowed under certain circumstances (i.e., abatement in close proximity to energized electrical panels which cannot be de-energized). Each request for an exemption from the use wet methods is evaluated on a case-by-case by EPA. (Approval from NYSDOL is also required).
- No visible emissions to the outside air are permitted during removal or renovation.

What notification requirements are specified under NESHAP?

- At least 10 working days' advance written notice must be filed before demolition of a building. Notification is also required prior to any renovation activity which may disturb asbestos. This includes asbestos stripping or removal work or any other activity (such as site preparation) that would break up, dislodge or similarly disturb asbestos material.
- At least 10 working days before the end of the calendar year, notification is required for planned renovation operations involving individual nonscheduled operations. To determine if notification is required, predict the combined additive amount of RACM to be removed or stripped during the upcoming calendar year of January 1 through December 31.
- Update notice, as necessary, including changes in start/completion dates, and/or when the amount of asbestos affected changes by at least 20%. The written notification must be delivered by U.S. Postal Service, commercial delivery service or hand delivery.
- Some states have notification requirements for removal of RACM in amounts less than federal NESHAP. Check with the state agency responsible for NESHAP notification before any project begins.
- The following information is required on the notice:
  - An indication of whether the notice is the original or a revised notification;
  - Name, address and phone number of both the facility owner and operator and the asbestos removal contractor owner or operator;
  - Type of operation: demolition or renovation;
  - Description of the facility or affected part of the facility including the size (square feet and number of floors), age and present and prior use of the facility;
  - Procedures, including analytical methods, employed to detect the presence of RACM and Category I and Category II non friable ACM;
  - Estimate of the approximate amount of RACM to be removed from the facility; also estimate the approximate amount of Category I and Category II non friable ACM in the affected part of the facility that will not be removed before demolition;
  - Location and street address (including building number or name and floor or room numbers, if appropriate), city, county and state of the facility being demolished or renovated;

- Scheduled starting and completion dates for asbestos removal work (or any other activity, such as site preparation that would break up, dislodge, or similarly disturb asbestos material) in a demolition or renovation; planned renovation operations involving individual nonscheduled operations shall only include the beginning and ending dates of the report period;
- Scheduled starting and completion dates of demolition or renovation;
- Description of planned demolition and renovation work to be performed and methods;
- Description of work practices and engineering controls to be used to comply with the requirements of NESHAP, including asbestos removal and waste-handling emission control procedures.
- Name and location of the waste disposal site where the asbestos containing waste material will be deposited.
- A certification that at least one trained management level person will supervise the stripping and removal described by this notification. (See interpretive memorandum on NESHAP training requirements-Exhibit H-3.)
- If demolition is under order from a State or local agency, the name, title and authority of the State or local government representative who ordered the demolition, the date that the order was issued, and the date on which the demolition was ordered to begin. A copy of the order shall be attached to the notification.
- For emergency renovations, the date and hour that the emergency occurred, a description of the sudden, unexpected event, and an explanation of how the event caused an unsafe condition, or would cause equipment damage or an unreasonable financial burden.
- Description of procedures to be followed in the event that unexpected RACM is found or Category II non friable ACM becomes crumbed, pulverized or reduced to powder.
- Name, address and telephone number of the waste transporter.

- In a facility being demolished, if the combined amount of RACM is less than 260 If, 160 sf or 35 cf, only simple notification requirements apply. This simple notification must include the items in bold typeface above, with the 10 day notification requirement also applying.

When is removal not required under NESHAP?

- If it is Category I non friable ACM that is not in poor condition and is not friable.
- If it is on a facility component that is encased in concrete or other similarly hard material and is adequately wet whenever exposed during demolition.

- If it was not accessible for testing and was, therefore, not discovered until after demolition began and as a result of the demolition, the material cannot be safely removed. If not removed for safety reasons, the exposed RACM and any asbestos containing debris must be treated as asbestos-containing waste material and adequately wet at all times until disposed of.
- Category II non friable ACM with a low probability that the material will become crumbled, pulverized, or reduced to powder during demolition.

What disposal requirements are specified under NESHAP?

- No visible emissions to the outside air are allowed during collection, packaging, transportation, or deposition of ACM waste.
- Wet ACM must be sealed in a leak-tight container.
- Containers must be labeled with OSHA danger labels.
- Label containers or wrapped materials with the name of the waste generator and the location at which the waste was generated.
- Mark vehicles used to transport asbestos-containing waste material during the loading and unloading of waste so that the signs are visible.
- Maintain waste shipment records according to NESHAP regulations.
- Report in writing to the local, State or EPA Regional office responsible for administering the asbestos NESHAP program for the waste generator if a copy of the waste shipment record is not received by the waste generator within 45 days.

Since NESHAP mandates the removal of friable ACM before a building is demolished or renovated, if the renovation will disturb the ACM, the plan for managing ACM should take into account the costs of eventual removal. The same is true for future renovation work covered by NESHAP. The asbestos program manager should also keep in mind that certain abatement methods such as encapsulation and enclosure may make eventual removal more difficult.

ASBESTOS: MANUFACTURE, IMPORTATION, PROCESSING AND DISTRIBUTION IN COMMERCE PROHIBITIONS; FINAL RULE (BAN AND PHASE-OUT RULE)

On July 7, 1989 EPA announced the promulgation of its long-awaited asbestos ban and phase-out rule. This rule, which was to be phased in over a seven year period beginning in 1990, prohibited the manufacture, importation, processing and distribution of certain commercially available asbestos-containing products. This rule would have effectively banned the use of nearly 95% of all asbestos products used in the United States, with the exception of products for which no acceptable substitute has been found, and certain products for military use.

EPA had adopted separate dates for the banning of the manufacture, importation, and processing of asbestos-containing products and for the distribution of asbestos-containing products in commerce. However, this regulation was vacated by the Fifth Circuit Court of

Appeals in October 1991. EPA appealed the court's decision and the appeal was rejected on 27 November 1991.

The court did allow EPA to ban new uses of certain asbestos-containing products and those products that were not being manufactured, imported or processed on the date the final rule was issued (12 July 1989). EPA issued a notice in the *Federal Register* that requested information on the status of 14 product categories included in the rule that were not being manufactured, processed or imported when the final rule was published. Based on the research conducted EPA, and information provided by commenters on this Federal Register notice, EPA concluded that the following six products are still subject to the Ban and Phase-out Rule:

- corrugated paper
- roll board
- commercial paper
- specialty paper
- flooring felt, and
- New uses of asbestos.

EPA WORKER PROTECTION RULE

This regulation extends the OSHA standards to state and local employees who perform asbestos work, and who are not covered by the OSHA Asbestos Standards, or by a state OSHA plan. The work, and who are not covered by the OSHA Asbestos Standards, or by a state OSHA plan. The Rule currently parallels 1986 OSHA requirements and covers medical examinations, air monitoring and reporting, protective equipment, work practices, and recordkeeping. This regulation is in the process of being revised to include the amendments made to the OSHA asbestos standards since 1986.

OSHA ASBESTOS STANDARDS

The Occupational Health and Safety Administration has established four sets of regulations which address asbestos exposure:

29 CFR 1910.1001 - General Industry
29 CFR 1926.1101 - Construction Industry
29 CFR 1915.1001 - Shipyard Industry
29 CFR 1910.134 - Use of Respirators (General)

The construction industry standard covers employees engaged in demolition and construction, and the following related activities likely to involve asbestos exposure: removal, encapsulation, alteration, repair, maintenance, insulation, spill/emergency clean-up, transportation, disposal and storage of ACM. The general industry standard covers all other operations where exposure to asbestos is possible, including exposure to occupants of buildings which contain ACM. In most cases, however, levels of airborne asbestos are not expected to reach the exposure standards in these buildings.

In general, OSHA coverage extends to all private sector employers and employees in the 50 states and all territories under federal jurisdiction. Those not covered under the standard include: self-employed persons, certain state and local government employees, and federal employees covered under other federal statutes. Persons engaged in inspection, management planning, and other asbestos-related work fall under OSHA's construction industry standard.

To enforce its standards, OSHA is authorized to conduct workplace inspections. In addition, employees have the right to file an OSHA complaint without fear of punishment from the employer. In turn, employees have the responsibility to follow all safety and health rules. OSHA may not conduct a warrantless inspection without the employer's consent. Citations are issued by OSHA during an inspection if the compliance officer finds a standard being violated. The citation informs the employer and employees of the regulations or standards alleged to have been violated and of the proposed length of time for correction. Monetary penalties may also be imposed.

What is OSHA's definition of asbestos-containing material?

- Any material containing more than 1% asbestos.

How does OSHA define Presumed Asbestos-Containing Material (PACM)?

- PACM is thermal system insulation and surfacing material found in buildings built no later than 1980.

What are OSHA's classifications of work activities?

- Class I asbestos work includes the removal of thermal system insulation and surfacing ACM and PACM surfacing ACM and PACM.

- Class II asbestos work includes the removal of ACM which is not thermal system insulation or surfacing material. This includes floor tile, roofing products, insulation or surfacing material. This includes floor tile, roofing products, construction mastics, etc.

- Class III asbestos work means repair and maintenance operations where ACM is asbestos work means repair and maintenance operations where ACM is likely to be disturbed.

- Class IV asbestos work includes maintenance and custodial work during which employees contact ACM and PACM but do not disturb it, and activities to clean up waste and debris generated by Class I, II, or III activities.

What are the OSHA asbestos exposure limits?

- The permissible exposure limit, (PEL), is 0.1 fibers per cubic centimeter, (f/cc), time weighted average, (TWA). TWA means exposure concentration averaged over an 8 hour period.

- An excursion limit (EL) of 1.0 f/cc over a 30 minute TWA

When are employees required to wear respirators?

- During all Class I asbestos work.
- During all Class II work where the ACM is not removed in a substantially intact manner.
- During all Class II and Class III work which is not performed using wet methods.
- During all Class II and Class III work where an employer has not conducted a negative exposure assessment.
- During all Class III jobs where TSI or surfacing ACM or PACM is being disturbed.
- During all Class IV work done within a regulated area where other workers are required to wear a respirator.
- During all work when an employee is exposed above the PEL or EL.
- In emergencies.

What is a negative initial exposure assessment?

- A demonstration by an employer which indicates employee exposure during an operation is expected to be below the PEL or EL.

What steps must be taken by an employer if an employee is required to wear a tight fitting respirator?

- Establish a medical surveillance program.
- Institute an employee training program.
- Establish a respiratory protection program.

What steps must be taken by an employer if employees are exposed to airborne asbestos at or above the PEL?

- Establish a respiratory protection program.
- Daily personal air sampling to record employee exposure to asbestos must be undertaken. (If air-supplied respirators operated in a positive pressure mode are being worn this sampling is not required.)
- Employees must be notified as soon as possible, in writing, of the results of air sampling.
- The employer must establish a regulated area where concentrations of airborne asbestos exceed the PEL.
- Access to the regulated area is to be limited.
- A negative-pressure enclosure must be established around the area.
- Eating, smoking, drinking, and gum chewing are prohibited in the regulated area.
- A designated competent employee must monitor the integrity of the area and enforce the above requirements.

What steps must be taken by an employer if employees are exposed to airborne asbestos at or above the EL?

- The same requirements which are triggered by the PEL.

What is the definition of "competent person"?

- An individual capable of identifying asbestos hazards and selecting the appropriate control strategy for asbestos exposure; and
- one who has authority to take corrective action to eliminate the hazards.

What are the responsibilities of the "competent person"?

- Set up the regulated area
- Determine the need for the negative-pressure enclosure and ensure its integrity.
- Control entry to and exit from the enclosure and/or regulated area
- Supervise employee exposure monitoring as required by OSHA
- Ensure that all employees working within a restricted area wear the appropriate personal protective equipment.
- Ensure that engineering controls in use are functioning properly.

What engineering and/or housekeeping controls are encouraged to achieve compliance with exposure standards?

- HEPA filter ventilation systems and vacuum cleaners;
- Wet methods (wetting agents, cleaning processes);
- Proper work practices; and
- Appropriate respirator and protective clothing.

What hazard communication measures are required?

- Before any work which is regulated by OSHA can be conducted, the building or facility owner must identify the presence, location, and quantity of ACM and/or PACM.
- Warning signs to identify a regulated area must be posted. Warning signs must contain the following words:

DANGER
ASBESTOS
CANCER AND LUNG DISEASE HAZARD
AUTORIZED PERSONNEL ONLY

- Where respirators and protective clothing are required in a regulated area, the sign displayed above must also include the words:

RESPIRATORS AND PROTECTIVE CLOTHING
ARE REQUIRED IN THIS AREA

- The employer shall ensure that employees working in and contiguous to regulated areas comprehend these warning signs. This may be accomplished through the use of foreign language wording, pictographs and graphics.

- Labels are to be attached to any product containing asbestos and to all waste containers. These labels must be Black, White and Red in color and read:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG
DISEASE HAZARD

What training is required under the OSHA standard?

- OSHA bases its training requirements on the class of activity an individual will perform:
  - Class I activities must be conducted by persons accredited as asbestos abatement workers under EPA's Model Accreditation Plan;
  - Class II activities involving asbestos-containing roofing, flooring, siding, ceiling tiles, or cement panels require a minimum of 8 hour. Other Class II activities requires training covering topics outlined by OSHA, but of no specific length;
  - Class III activities must be performed by persons with 16-hour O&M training as outlined under AHERA;
  - Class IV activities must be performed by personnel who receive 2 hour awareness training as presented by AHERA;
  - Competent Persons must be trained as Contractors/Supervisors under EPA's Model Accreditation Plan for Class I and Class II activities;
  - Class I activities must be conducted by persons accredited as asbestos abatement workers under EPA's Model Accreditation Plan;

- Training will include the following topics:
  - methods of recognizing asbestos;
  - the health effects associated with asbestos exposure;
  - the nature of operations that could disturb asbestos and protective controls to minimize exposure;
  - purpose, proper use, fitting, and limitations of respirators;
  - the appropriate work practices for performing asbestos jobs;
  - medical surveillance and employee rights;
  - the contents of the OSHA standard;
  - the availability of self-help smoking cessation program material; and
  - the requirements for posting signs and affixing labels and the meaning of the required legends for such signs and labels.

Who is to be covered by a medical surveillance program?

- All employees who are engaged in Class I, II, or III activities for 30 or more days per year.
- All employees exposed to fiber levels at or above the PEL (0.1 f/cc TWA) or excursion limit (1.0 f/cc) for 30 days or more per year.
- All employees who are required to wear tight fitting respirators.

What recordkeeping requirements are specified under OSHA?

- Employee medical surveillance records must be maintained for duration of employment plus 30 years.
- All employee exposure sampling data must be retained for 30 years.
- Training materials must be retained 1 year after termination of employment for each employee.
- All records must be made available to the employee, to OSHA, and with permission to the employee's union representative.
- Special provisions are established for records when an employer goes out of business.

Any employer, large or small, who falls under the jurisdiction of OSHA must provide:

- Respirators at no cost to employees,
- Protective clothing, when appropriate, at no cost to employees,
- A medical surveillance program at no cost to employees, and
- Awareness training (communication of potential hazards).

STATE AND LOCAL REGULATIONS

Several provisions in AHERA and ASHARA encourage states to develop their own regulatory programs. For example, states are encouraged to establish and operate training and certification programs for the various categories of asbestos professionals, as long as the programs are at least as stringent as AHERA's Model Plan. In addition, some states have established requirements that exceed EPA's in the area of notification of abatement actions, abatement work practices, and transportation and disposal of asbestos-contaminated waste. Inspectors/management planners should consult state and local regulatory agencies in their areas.

The following pages outline federal agency regulations both by year and by regulatory action.

EXHIBIT H-1

CHRONOLOGY OF ASBESTOS LEGISLATION

YEAR	EPA	OSHA	Other
1995		OSHA revisions of 1994 become effective October 1.	
1994	ASHARA Interim Final Rule published including revisions to MAP.	Revisions to General and Construction Industry and Construction Standards and issuance of Shipyard Standard.	
1993	EPA published list of asbestos containing products which are banned from manufacturer, importation, processing and distribution.		
1992	ASHAA reauthorized (ASHARA), requiring accreditation of designers, inspectors, contractors, supervisors and workers involved in asbestos detection and remediation in public and commercial buildings.		DOT HMR revised with less stringent requirements when shipping friable asbestos within the United States.
	EPA issues draft list of asbestos products still covered by Ban and Phase-Out Rule.		
1991	Fifth Circuit Court of Appeals vacates most of Ban & Phase-Out Rule		
1990	Extensive NESHAP revisions including Category I & II non-friable material definitions, point counting and waste disposal manifests.	Court-ordered amendments to asbestos standard for the construction industry regarding informing employees of the hazards of smoking and working with asbestos; employee sign comprehension.	DOT Hazardous Materials Regulations (HMR) 49 CFR Part 107 et. al. published based on UN standards. Included new asbestos classification, hazard communication, packaging and handling requirements.
		Proposed revisions to the Asbestos Standards published in the *Federal Register.*	
1989	Ban & Phase-Out Rule		
1988		Amendment of general and construction industry asbestos standards to include 30-minute excursion limit *(1.0 f/cc)*	
1987	TSCA amended to reflect AHERA		
	Worker Protection Rule		

EXHIBIT H-1

CHRONOLOGY OF ASBESTOS LEGISLATION (cont'd)

YEAR	EPA	OSHA	Other
1986	AHERA	Construction Industry Standard issued. Permissible exposure level lowered to 0.2 *f/cc* and action level of 0.1 *f/cc e*stablished.	
1984	EPA/NESHAP standard formally recognized		
	Asbestos School Hazard Abatement Act (ASHAA) - loan and grant program to help eliminate hazards		
1982	Identification and notification of friable ACM in schools rule (EPA/TSCA).		
	Required reporting of production and exposure data on asbestos (EPA/TSCA).		
1979	Technical assistance program to schools initiated to identify and control friable ACM		Controls regarding transport of friable ACM (DOT)
1978	All friable spray-on material prohibited, all demolition and renovation covered by no visible emissions standard (EPA/NESHAP)		
1977			Consumer Product Safety Commission prohibition of asbestos in patching compounds and emberizing agents.
1976		Occupational exposure standard lowered to 2 f/cc	
1975	No visible emissions standard extended to waste collection, disposal and processing industries not previously covered		
1974	Effluent guidelines for manufacturing sources (EPA/FWPCA)		
1973	No visible emissions.		
	Standard for milling, manufacturing and building demolition.		
	Spray application of friable material (>I%) prohibited.		
1971	Asbestos listed as hazardous air pollutant.	Existing occupational exposure standard 5 f/cc.	

EXHIBIT H-2

CLARIFICATION OF NESHAP REQUIREMENT TO PERFORM POINT COUNTING TO QUANTIFY ASBESTOS BELOW 10%

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY WASHINGTON, D.C. 20460
MAY 8 1991
OFFICE OF AIR AND RADIATION
MEMORANDUM

SUBJECT: Clarification of Asbestos NESHAP Requirement to Perform Point Counting

FROM: John B. Rasnic, Acting Director Stationary
Source Compliance Division
Office of Air Quality Planning and Standards

TO: Air Management Division Directors, Regions III and IX
Air and Waste Management Division Director, Region II
Air Pesticides and Toxic Management Division Directors, Region I, IV and VI
Air and Radiation Division Director, Region V
Air and Toxic Division Directors, Region VII, VIII and X

Revisions to the Asbestos NESHAP were promulgated on November 20, 1990 and included a requirement to perform point counting to quantify asbestos in samples where the asbestos content is below ten percent.

This requirement has been the subject of many questions, and the attached guidance document has been developed to clarify when point counting is required.

It should be understood that while the point count rule was published as a revision to the Asbestos NESHAP, the intent of the revision is to improve the quantitative analysis of asbestos for all applications. Therefore, the revision is required for all NESHAP monitoring, under the conditions discussed in the attached clarification and recommended for AHERA and other asbestos monitoring applications. This guidance document was prepared with the cooperation of the following parties: the National Institute of Standards and Technology, EPA's Office of Toxic Substances, Office of Research and Development, and the Emissions Standards Division and Stationary Source Compliance Division of the Office of Air Quality Planning and Standards. If you have any questions, please contact Scott Throwe of my staff at ITS 398-8699 or Michael Beard of the Office of Research and Development at ITS 629-2623.

Attachment
cc: Air Compliance Branch Chiefs
Asbestos NESHAP Coordinator
Sims Roy (MD-13)
David Kling (TS-799)

CLARIFICATION OF NESHAP REQUIREMENT TO PERFORM POINT COUNTING TO QUANTIFY ASBESTOS BELOW 10%

Since the amendment to the NESHAP for asbestos (Federal Register, Volume 55, Number 224, November 20, 1990) there have been several questions regarding the interpretation of the point count rule. Also, several recommendations for improving the quantitative analysis of asbestos in bulk samples have been made. This clarification notice addresses these questions and discusses the recommendations. A discussion of important considerations related to the quantitative analysis of asbestos in bulk samples follows the clarification statements. This clarification applies to all regulated asbestos containing materials as defined in 43 CFR Section 61.141.

First, a sample in which no asbestos is detected by polarized light microscopy (PLM) does not have to be point counted. However, a minimum of three slide mounts should be prepared and examined in their entirety by PLM to determine if asbestos is present. This process should be carefully documented by the laboratory.

Second, if the analyst detects asbestos in the sample and estimates the amount by visual estimation to be less than 10% the owner or operator of the building may (1) elect to assume the amount to be greater than 1% and treat the material as asbestos-containing material or (2) require verification of the amount by point counting.

Third, if a result obtained by point count is different from a result obtained by visual estimation, the point count result will be used.

DISCUSSION

The recently amended NESHAP for asbestos (Federal Register V.55, N. 224, 11/20190) requires that when the asbestos content of a bulk material is determined using procedures outlined in the interim method (40 CFR Part 763 Appendix A to Subpart F), and the asbestos content is estimated to be less than 10% by a method other than point counting, the quantitative analysis must be repeated using the point count technique. This action was taken after several reports of data from split samples analyzed by visual estimation by two or more laboratories produced conflicting results which made it difficult to determine if a sample should be classified as an asbestos-containing material. The materials were reanalyzed point count and by inter-laboratory exchange of prepared samples resulting in a consistent set of data. A review of data from performance audits indicated an unacceptable number of false negatives (reporting the sample as containing less than 1% asbestos for asbestos-containing samples containing greater than 1% asbestos)and an unacceptable number of false positives (reporting the sample as containing greater than I% asbestos for samples containing less than 1% asbestos).

The Office of Research and Development (EPA/ORO) informally interviewed laboratories to determine the cause of these errors and learned that: (1) some laboratories did not view a sufficient amount of the sample to detect asbestos when present or failed to properly identify the asbestos component, resulting in false negatives and (2) some laboratories employed arbitrary rules for determining quantity, such as "one fiber detected is considered to be greater than 1%", resulting in false positives. Several round-robin studies and eighteen rounds of performance audit data indicate nearly all laboratories greatly overestimate the amount of asbestos using visual estimation techniques which are not related to standard materials of known composition. Because these false negatives and false positives result in either operations not being covered by NESHAP that should be or unnecessary expenditure of funds for abatement, respectively, the Agency believes that additional effort on the part of the laboratory is warranted.

It should be noted that samples in which no asbestos is detected during analysis by polarized light microscopy (PLM) do not have to be point counted. However, a minimum of three slide mounts should be prepared and examined in their entirety by PLM to determine if asbestos is present. Point counting will not improve the probability of detection of asbestos where no asbestos has been detected by PLM unless the analyst has only made a very cursory examination of the sample. In fact, the detection limit for the point counting method would be higher (less likelihood of detection) than that expected by visual estimation due to the fact that the only asbestos fibers counted are those that fall directly under the reticle index (cross line or point array), whereas (in theory) all fibers are observed during visual estimation.

When asbestos is observed to be above the laboratory blank level during PLM analysis, but less than I% asbestos counts are recorded during point counting, the laboratory should report the sample contains trace asbestos. Also, false negatives that result from (1) misidentification of asbestos fibers as non-asbestos or (2) due to the inability of the microscopist to detect and confirm the presence of asbestos will not be corrected by the point counting technique.

Accurate results by point counting are obviously dependent on correct identification of fibers. A similar relationship is true for false positives, although it would be expected that point counting could improve quantitative results, given the pervasive tendency of laboratories to overestimate asbestos content, especially at the lower concentrations (less than 10%). However, the laboratory should take care to examine a sufficient amount of any sample to be sure that it does not contain asbestos. If the sample is not homogenous, some homogenization procedure should be performed to ensure that slide preparations made from small pinch samples are representative of the total sample. A minimum of three slide mounts should be examined to determine the asbestos content by visual area estimation. Each slide should be scanned in its entirety and the relative proportions of asbestos to non-asbestos noted. It is suggested that the amount of asbestos compared to the amount of non-asbestos material be

recorded in several fields on each slide and the results be compared to data derived from the analysis of calibration materials having similar textures and asbestos content.

The parties legally responsible for a building (owner or operator) may take a conservative approach to being regulated by the asbestos NESHAP. The responsible party may choose to act as though the building material is an asbestos containing material (greater than 1% asbestos) at any level of asbestos content (even less than 1% asbestos). Thus, if the analyst detects asbestos in the sample and estimates the amount to be less than 10% by visual estimation, the parties legally responsible (owner or operator) for the building may (1) elect to assume the amount to be greater than 1% and treat the material as regulated asbestos-containing material or (2) require verification of the amount by point counting.

The interim method states that asbestos shall be quantified using point counting or an equivalent estimation technique. The Agency (ORD) has been conducting research to determine procedures for defining "equivalent estimation". Recent studies have suggested that the use of gravimetrically prepared standard materials, in conjunction with quantitative techniques, can be used to improve the analyst's ability to estimate asbestos quantity. A procedure for the formulation of calibration materials and quality assurance (QA) procedures for their use has been drafted and is being tested. The Agency believes that use of such materials and QA procedures, as well as other objective measurement techniques, have the potential to greatly improve quantitative estimates of asbestos, especially in the range below 10%. If the research proves these procedures to be worthy, the Agency will consider proposing a revised method. A draft of the proposed procedure will be circulated to all NVLAP labs for comment when it has been approved internally.

EXHIBIT-3

ASBESTOS NESHAP TRAINING REQUIREMENTS FOR ON-SITE REPRESENTATIVE

Federal Register
Vol. 56, No. 177
Thursday, September 12, 1991

Environmental Protection Agency
40 CFR Part 61
[[FRL-3995-4]

Asbestos NESHAP Training Requirements for On-Site Representative

Agency: Environmental Protection Agency

Action: Notice of guidance.

Summary: The purpose of this guidance is to explain how the new Asbestos NESHAP training requirements may be met. The Asbestos NESHAP was revised on November 20, 1990. One of the new requirements of the Asbestos NESHAP is that an on-site representative (such as a foreman or management level person) trained in the asbestos demolition and renovation provisions and the means of complying with them be present when the regulated asbestos-containing material (RACM) is stripped, removed or otherwise handled or disturbed. Evidence that the required training has been completed shall be posted at the demolition or renovation site and made available for inspection by EPA or the delegated Agency.

Effective Date: November 20, 1991

For Further Information Contact: Ms. Omayra Salgado at (703) 308-8728.

Supplementary Information: The Asbestos School Hazard Abatement Reauthorization Act (ASHARA), signed into law on November 28, 1990, included an amendment to the Asbestos Hazard Emergency Response Act (AHERA) which requires that EPA revise the AHERA Model Accreditation Plan, originally intended only for schools. to extend accreditation requirements to include persons performing asbestos-related work in public and commercial buildings. These requirements would apply to the asbestos removal associated with the demolition and renovation of buildings that are subject to the NESHAP. These requirements may be in effect as early as 1992.

When the Asbestos NESHAP was last revised, these statutory changes had not been foreseen. As a consequence, the Asbestos NESHAP contained a requirement for training and a refresher course. EPA wishes to avoid duplicative asbestos training requirements, therefore, the Agency has decided to recognize valid accreditation as an AHERA Asbestos Abatement Contractor/Supervisor as satisfying the Asbestos NESHAP training requirements.

The Asbestos Abatement Contractor/Supervisor curriculum is a training program under the current AHERA that meets the NESHAP requirements. Persons are presently required to complete four days of training and then pass an examination to become accredited under this program. Completion of the Asbestos Abatement Contractor/Supervisor training course to comply with the NESHAP training requirement is strongly recommended since all persons performing asbestos-related work will be required to take AHERA training when EPA revises the AHERA Model Accreditation Plan to include public and commercial buildings.

In light of this requirement, it would appear to be ill-advised to develop a training course that does not qualify for AHERA accreditation.

Guidance

- Successful completion of the AHERA Model Accreditation Plan course titled Asbestos Abatement Contractor/Supervisor is strongly recommended to satisfy the Asbestos NESHAP training requirements.

- Completion of the Asbestos Abatement Contractor/Supervisor refresher training course every 2 years will comply with the Asbestos NESHAP training requirements. However, completion of the refresher course, every year, is required to maintain AHERA accreditation. For this reason an accredited person probably will need to complete the refresher course each year in order to continue working as an AHERA accredited Contractor/Supervisor, and also to qualify for refresher training.

- Those persons who are accredited as an AHERA Asbestos Abatement Contractor/Supervisor at the time the NESHAP training requirement takes effect (November 20, 1991), will be accredited as a NESHAP on-site representative until the certificate expiration date. Completion of the appropriate AHERA refresher training is required thereafter required thereafter.

Dated: September 9, 1991

John B. Rasnic, Director, Stationary Source Compliance Division, Office of Air Quality Planning and Standards. [FR Doc. 91-21974 Filed 9-11-91: 8:45 am]

SECTION I

Recordkeeping for the Management Planner

OBJECTIVES:

1. To become familiar with requirements for recordkeeping in AHERA.

2. To recognize which documents and records need to be retained.

3. To understand the benefits of complete documentation.

NOTE: Words underlined in the text can be found in the Glossary at the end of this notebook.

INTRODUCTION

An effective management plan is keyed to a comprehensive recordkeeping system. The Management Planner develops a report which is submitted to the Local Education Agency (LEA). The report presents the results of the building inspection, the assessment of ACBM found in the building, a discussion of recommended response options the LEA should implement to manage the ACBM, recommendations regarding prioritization of those response actions, and guidance concerning the cost of various options.

Upon receiving the Management Planner's report, the LEA is responsible for developing the asbestos management plan. The Planner's report essentially becomes the LEA's management plan and is submitted to the state for approval.

BENEFITS

The purpose of the recordkeeping process is to establish and maintain a standardized system which clearly documents implementation of an asbestos control program. The steps taken by the LEA/building owner to identify asbestos material and associated hazards and minimize the potential exposure to employees and building occupants must be recorded for future reference. AHERA is specific concerning the various records and documentary information to be maintained. It is the LEA's responsibility to establish a recordkeeping system and maintain the required records as part of its management plan.

ELEMENTS OF RECORDKEEPING

In general, the recordkeeping system must track three types of data:

- data on the physical condition of the ACBM,
- actions taken on the ACBM, and
- the data associated with the personnel involved with the asbestos management program.

The tracking of the ACBM may be thought of as the tracking of a business's physical inventory requiring that the condition of the material be recorded at intervals (record of the surveillance), the recording of substantive changes in material status (removal, enclosure, encapsulation, or repair), various required reports to governing bodies (notices of abatement and disposal actions to the EPA), and the recording of an up-to-date inventory on a periodic basis (re-inspections).

Required recordkeeping for personnel includes the identity, training, medical monitoring and exposure of persons. This information should be recorded in a form which will be available for a period of at least 30 years.

Despite the fact that the Management Planner does not set up or maintain LEA records, (except in the instance that the LEA contracts for such services), the Planner should be certain that the LEA is aware of the AHERA recordkeeping requirements.

The various types of documents and records to be included in the recordkeeping system are outlined below.

1. For each preventive measure and/or response action taken:

   - Detailed written description of the measure or action
   - Methods used
   - Location
   - Justification for why a specific measure or action was selected
   - Start and completion dates of all work
   - Names and addresses of all contractors involved and accreditation information
   - If ACM was removed, name and location of storage or disposal sites, copy of waste manifest

2. For any air sampling conducted:

   - Name and signature of person collecting samples
   - Date and location where samples were collected
   - Name and address of laboratory analyzing samples
   - Date and method of analysis
   - Results of analysis
   - Name and signature of analyst
   - Building activity or conditions at the time sampling was conducted

3. For persons required to be trained for maintenance and repair operations, training records must be maintained, including:

   - Employee's name and job title
   - Date training completed
   - Location of training and training organization's name
   - Copy of training schedule indicating topics covered in lectures and workshops
   - Number of hours of training

4. For each time periodic Surveillance is performed:

   - Inspector's name
   - Date of the Surveillance
   - Notation of changes (or lack of) in the condition of the ACBM
   - Record the Designated Person's response to any changes in condition of the ACBM

5. For each time that cleaning is performed:

   - Name of person(s) doing cleaning
   - Date of cleaning
   - Locations cleaned
   - Methods used in cleaning

6. For each time operations and maintenance activities are performed:
   - Name of person(s) performing activities
   - Start and completion dates of action
   - Locations
   - Description of activity, including preventive measures taken
   - If ACBM was removed, name and location of storage/disposal site, copy of waste shipment record

7. For each time a major asbestos activity is performed (i.e., a major fiber release episode):
   - Name, signature and state of accreditation for each person involved in activity
   - Start and completion dates of project
   - Location(s)
   - Description of project, including preventative measures taken
   - If ACBM was removed, name and location of storage/disposal site, copy of waste shipment record
   - Clearance sampling data

8. For each minor fiber release episode:
   - Date of episode
   - Location
   - Method of repair
   - Preventive measures or response action taken
   - Name(s) of person(s) performing work, state of accreditation and number, if applicable
   - If ACBM was removed, name and location of storage/disposal site, copy of waste shipment record
   - Air monitoring data, including clearance sampling data, if applicable

9. Suggested documentation but not required:

- Complete historical blueprint of facility, if available
- Documentation on materials/products used in construction or renovation of the facility that may contain asbestos (include any correspondence with manufacturers)
- Location and photographs of warning signs and barriers placed to prevent unauthorized access to areas of ACBM
- Required state and federal forms dealing with notification and compliance
- All correspondence pertaining to asbestos in the facility
- Copies of notification statements, press releases, meeting agendas (with attendance rosters)

The reasons for maintaining complete and detailed records of asbestos management are many. Documentation can expedite response actions and make future renovation in any facility easier. The legal liabilities involved with asbestos are another reason to maintain thorough records. The more thorough the documentation, the more defensible the actions taken. Further, poor or sloppy recordkeeping could imply callousness toward employees, building occupants, and the public. In the case of LEA's, records are kept because they are required by AHERA and NESHAP (waste shipment records).

Some forms which may assist the LEA in its recordkeeping task are discussed in section G (Operations and Maintenance) of this student manual.

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SECTION J

Assembling and Submitting a Management Plan

OBJECTIVES: 1. To be able to recognize the components of a complete management plan.

2. To appreciate how the LEA will use a management plan.

NOTE: Words underlined in the text can be found in the Glossary at the end of this notebook.

INTRODUCTION

Each local educational agency (LEA) must have an asbestos management plan for school buildings under its authority. This plan was to be submitted to the state Governor (or designee), no later than October 12, 1988. LEA's were required to begin implementation of their management plan by July 9, 1989 and to complete implementation in a timely fashion. LEA's were allowed to submit their management plan in stages. A copy of the plan must be available in the school administrative offices for viewing by the public.

A management plan should be used as a guidance document for asbestos control. A brief description of the elements of the plan as required by AHERA follows. Exhibit J-l lists these elements. Other sections of the student manual provide detailed information on the various components of the plan.

Management plans should be considered working documents. They set forth a framework for short and long-term actions to be taken by the LEA to protect building occupants. They must be kept up to date (e.g., response actions, dates and results of Surveillance).

COMPONENTS OF A MANAGEMENT PLAN

The management plan must be developed by an accredited Management Planner. It must include a list of buildings covered by the plan and state whether each building contains friable ACBM, non-friable ACBM, and friable and non-friable suspected ACBM which has been assumed to be ACM

The plan must provide the name and qualifications of the person named by the LEA to carry out the schools' responsibilities under AHERA. This information must be updated when the individual responsible for this duty changes.

Inspection Statement

An inspection statement is to be included which describes all inspection and response action activities that were carried out before the new regulations became effective on December 14, 1987.

Inspection and Re-inspection Results

A copy of the inspection and re-inspection reports filed by an accredited Building Inspector accompanies the management plan.

Response Actions

All recommended response actions for friable ACM need to be addressed. Information that should be included includes: the type of action planned, the location where the action is to take place and the timetable for completion of the specific response actions. Once the response action is carried out, this too must be documented.

Remaining Asbestos

If any asbestos will remain in the school after response actions are taken, it needs to be documented. Detailed information on what type is present, its location, the measures taken to ensure its integrity, and the potential for exposures are all to be covered in the management plan.

Re-inspection and Other Activities

A plan and timetable for re-inspection and long-term surveillance activities needs to be specified. This may be in the form of statements, such as the building will be checked semi-annually. Or, the actions may be presented in the form of a chart with specific dates for particular activities. Whichever form, it must include the following:

- Plans for periodic surveillance and re-inspections of friable and non-friable asbestos in a school building under the authority of an LEA.

- Plans for informing and educating school employees (school service and maintenance personnel) and building occupants, or their guardians, about the location, response actions, and safety procedures which are to be observed with respect to friable and non-friable asbestos

Financial Resources

An evaluation of the resources needed to fully implement the plan is to be included in the management plan. This includes the expenses associated with response actions and the expenses to carry out re-inspection, surveillance, and operations and maintenance activities.

Operations and Maintenance (O&M)

An operations/maintenance and repair program needs to be addressed. Details regarding O&M plans can be found in Section G of this student manual.

CONCLUSION

The management plan should provide elaboration on all aspects of the plan. For example, in selecting a response action, justification is necessary for the particular choice, rationale for its prioritization, and an explanation of the resources required to implement the response should appear in the plan.

The management plan is viewed as a planning, or working, document. It not only sets out a course of action for the LEA, but it becomes documentary evidence of progress in implementing asbestos control options. Given the cost and financing information contained in the plan, it provides guidance on matters such as annual and long-term school budgeting and community tax and bond issues. In addition, the management plan will help school administrators identify potential finding sources to implement their asbestos control program.

The management plan should become the "standard operating procedure" for the maintenance and custodial department of a facility, and as such, should be simple, direct and easily understood. Care should be taken to assemble the management plan in a standard for what which meets regulatory requirements as well as a logical progression of identification of ACBM, location, and methods for control.

EXHIBIT J-1

ELEMENTS OF THE MANAGEMENT PLAN (AHERA)

MANAGEMENT PLANS
(763.93)

1. General Inventory
2. Inspection Report
3. Designated Person Identification
4. Response Actions
5. Response Action Details, Reason, Schedule
6. Accreditation Statements
7. Remaining ACBM
8. O&M Plan
9. Initial Notification
10. Cost Estimation
11. Accreditation Statement for Other Consultants
12. Management Planner Optional Compliance Statement
13. Signed Statement by Designated Person

Ongoing Recordkeeping
Annual Notifications

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SECTION K

Cost Estimating and Financing Response Actions

OBJECTIVES:

1. To understand the factors involved in estimating the costs for implementing an asbestos-control program.

2. To become acquainted with sources of financing for asbestos control programs.

NOTE: Words underlined in the text can be found in the Glossary at the end of this notebook.

INTRODUCTION

The Management Planner is charged with recommending the "least burdensome" response actions consistent with "protecting human health and the environment." AHERA also specifies that long and short range costs should be considered in evaluating ACBM control options.

This section addresses the various factors which affect costs of conducting various response actions: removal, encapsulation, enclosure, repair, and O&M (including re-inspection). Combining cost with technical information of effectiveness (see Section E), as is illustrated, should be useful in evaluating and comparing the costs and effectiveness of alternative actions. This section also discusses financing options for response actions.

COSTS OF ALTERNATIVE RESPONSE ACTIONS

Abatement and O&.M costs are highly variable. Costs vary by region of the country, type of building occupancy status of building, type of ACM, amount and location of the ACM, and the hazard rating of the ACM. These and other general factors are outlined below. Cost elements of each alternative response action are then described.

General Factors Affecting Costs

Size of Project

Since both abatement and O&M are labor-intensive, the larger the job, the greater the cost.

Complexity of the Project

Regardless of the size of the job (with the exception of very small projects), more complex projects imply greater costs. Most abatement jobs will involve relatively high fixed set-up costs for construction of containment structures. If the area is irregular, has high ceilings, special floors to be protected, etc., or the building is occupied, the fixed initial costs will be higher. Scheduling other building improvement operations together with abatement - renovation, replacement, redecoration, or demolition -may reduce set-up costs. Similarly, costs to develop and implement O&M plans will depend on the number of O&M areas, their location, and the range of activities affecting them.

Amount and Application of ACM

Costs depend on whether ACM was used on walls, floors, ceilings, structural members, etc., as well as how thick it is, how it was applied, and the type of asbestos used. The cost of removal will also depend on whether the ACM has been enclosed or encapsulated.

Need for Replacement Materials

Removal of ACM may dictate the installation of replacement materials. For example, asbestos-free materials will be needed to replace the fire retardancy or acoustical function of removed ACM.

Quality of Contract Specification

Generally speaking, the more precise the contract specifications (i.e., for service contractors as part of an O&M program or for abatement contractors), the more competitive the bids from qualified contractors will be. In addition, selection of a qualified service or abatement contractor reduces the likelihood of cost overruns or subsequent liability costs due to inadequate work.

Elements Of Cost Estimation

ACM Abatement

Cost estimates are generally expressed in terms which correspond closely to the unit activities needed to be carried out. Exhibit K-I lists some typical unit operations involved in the various types of abatement The specific tasks shown all involve the following categories of expenditures.

Labor - Asbestos abatement is a labor-intensive operation, and labor costs tend to be the largest component of total cost. Typically, labor will constitute from 35% to 45% of the total cost of ACM removal. Labor costs include wages, taxes, benefits, per diem and/or lodging. Union scale wage rates tend to run high. A typical removal "team" may consist of a foreman and four laborers. Such a team may be expected to remove 100-400 linear feet of small piping or 125-225 square feet of ACM per day, depending on the following conditions: size of the project, access to the material, thickness of material, type of material, and height of the material above the floor.

Equipment - Specialized and often expensive equipment is essential when working with ACM. Much of the protective equipment must be disposed of after a job rather than reused. For reusable equipment, amortized purchase cost, depreciation and maintenance costs contribute to equipment charges. Such equipment includes supplied air compressors, showers, negative pressure units, HEPA vacuum cleaners, spray equipment, and scaffolding.

Material Costs - Abatement jobs normally require a considerable quantity and variety of consumables. Personal protective equipment, containment materials, duct tape, glove-bags,

surfactants, encapsulants, etc., will be required on most jobs. Costs for supplies and material would normally run between 12 - 17% of the total bid price.

General Liability Costs - Insurance required to protect the owner and the contractor from potential losses involving property damage, third party liability, and long-term disease manifestation, will cost 6 - 16% of the bid price. This cost depends on the type of insurance, the amount of insurance, and the contractor's track record.

Profit - Contractor's profit margin must reflect a desirable rate of return after taxes on available working capital. A higher degree of risk or retention of liability in asbestos removal projects relative to other construction business may justify a higher rate of return.

Other Costs - Air monitoring must be conducted at the conclusion of each abatement project to ensure that fiber levels are sufficiently low. Air sampling may· cost $300-$400 per day, and laboratory analysis of samples may range from $20-$300 per sample, depending on the number of samples, the "turnaround" time required for the results and the method of analysis (PCM or TEM).

The most commonly used yardstick for comparing costs is the cost per square (or linear) foot for ACM removed and replaced, or encapsulated. A similar yardstick is used for spray-applied enclosures (encasement). Although actual costs vary widely by region, building, and individual project (based on factors described above), ranges of typical costs are:

- Removal and Replacement
  - Surfacing Material — $11 - $24 / square foot
  - Thermal Systems Insulation — $9 - $35 / linear foot
- Encapsulation — $3 - $10 / square foot
- Encasement — $10 - $20 / square foot

Costs for enclosures other than spray-applied encasements are even more variable. They depend entirely on the type of enclosure and the means of attaching the enclosure material around the ACM.

The above estimates of ACM abatement costs are approximate. Better estimates can be obtained by contacting a few reputable local contractors describing the amount, type, and general characteristics of the ACM to be abated, and asking for a budget price range.

O&M Programs

Operations and maintenance programs typically have low initial costs but continuing annual costs. Cost elements of an O&M program include:

- Equipment - respirators, HEPA-vacuum cleaners, portable enclosures and showers, and air sampling equipment.
- Labor - time for worker training and additional time for maintenance and custodial tasks.
- Supplies - cleaning material, labels, bags and drop cloths, disposable clothing, and other consumables.
- Other - training for service workers and informational meetings for building occupants; higher costs for service and construction work by outside contractors; recordkeeping requirements; higher insurance costs.

The costs of an O&M program will be specific to the characteristics of each building. However, a rough estimate of initial and annual costs can be calculated by consulting with an equipment/supply company, as well as obtaining salary schedules for the affected workers. Training programs may run up to 5 days for service workers, and costs for outside contract work may be 20-35% higher than the same work conducted in asbestos-free environments.

Other Costs

Two types of costs - direct and indirect - need to be analyzed. Direct costs include all expenses incurred to assure that the work, whether O&M or removal, is conducted properly. Direct costs have a "hidden" component - temporary relocation of equipment and workers, rental expenses, and other ancillary costs may be significant. Indirect costs reflect productivity and perhaps revenue losses due to disruption of work routines and other types of business interruption. Indirect costs are more difficult to quantify than direct costs; however, indirect costs may be substantial.

For schools, the most obvious direct costs other than for the abatement itself are for equipment and personnel relocation. Even if the abatement work can be scheduled during vacation periods, equipment and furniture will have to be moved. If abatement during the school year is unavoidable, costs of temporarily relocating students and staff should be estimated. The resulting disruption in school administration will likely make school operations less efficient, but the "costs" are likely to be measured in parent, student, and staff discomfort rather than in dollar outlays. Indirect costs for owners of buildings other than schools may be more tangible in money terms.

COMPARING COST AND EFFECTIVENESS OF ALTERNATIVES

Response Action Alternatives

Cost and effectiveness of alternative response actions should be compared only after a schedule of actions has been developed For example, alternatives for a school may include the following:

Immediate removal of all ACBM (Implementation of an O & M program until “immediate" removal occurs, as needed.)

Immediate removal of ACBM in the highest hazard categories (1-3) and removal of ACBM in all other categories when combined with planned renovation/remodeling/demolition; instituting an O&M program until all ACBM is removed.

Immediate removal of ACBM in hazard category I only and removal in all other categories combined with renovation/remodeling/demolition as planned; instituting an O&M program until all ACBM is removed.

Present Value Calculations

The cost of the above alternatives should be estimated taking into account the time value of money. This means calculating all future costs in net present value terms. "Present value" is the amount of money a building owner would have to invest now in order to pay for future response actions, considering expected rates of return and rates of inflation." Present values can be calculated as follows:

$$PV = \frac{C_1 (1+i)}{(1+d)} + \frac{C_2 (1+i)^2}{(1+d)^2} + \frac{C_3 (1+i)^3}{(1+d)^3} + \frac{C_n (1+i)^n}{(1+d)^n}$$

Where:

- PV is the present value of future abatement costs,
- i is the expected annual rate of inflation (expressed as a fraction, i.e., 1% =0.01).
- d is the expected annual "discount rate"; the expected rate of return on investments or the costs of borrowing money.
- n is the number of years in the future that the costs will have to be paid.
- C is the estimated cost of a response action.

The above equation discounts future payments by what is called the nominal discount rate, that is, the expected rate of return on investments in future years taking into account the expected rate of inflation. As indicated, the further out in time the cost is borne, the lower the value of that cost in today's terms. This is true even though inflation raises the actual cost of response actions. For example, a three percent annual inflation rate will raise the cost of a $1 million abatement project to about $1.8 million in 20 years. If the discount rate averages six percent per year for the next 20 years, the $1.8 million is only worth roughly $560,000 in today's dollars.

Some building owners will want to do their own present value calculations. Others may be totally unfamiliar with the concept of present value, but may want the Management Planner to make the calculations. Whoever makes the calculations will have to assume a value for "i", the inflation rate, and "d", the discount rate. A value of 1-5% has been used by economists for these types of calculations in the recent past.

AN EXAMPLE

The three alternative schedules for response actions sketched out above will be used to illustrate how costs can be estimated in present value terms:

The School Profile

- Steel frame construction, 4 story central structure, 2-1 story wings
- 80,000 square feet of space
- 30 years remaining useful life

ACBM Profile

Type	Location	Hazard Rating	Amount
Fire proofing	On beams above drop ceiling on 1st - 3rd floors in central structure	2	100,000 Sq Ft
Thermal System Insulation	On boilers and piping in boiler room	2	500 Sq Ft 1,000 Linear Ft
Thermal System Insulation	On pipes in locker rooms	1	100 Sq Ft
Acoustical Plaster	Throughout 2 wings	5	40,000 Sq Ft

Abatement Costs

Removal and replacement of fireproofing	100,000 sq. ft. @ $18	=	$1,800,000
Encasement of fireproofing	100,000 sq. ft. @ $8	=	800,000
Removal and replacement of TSI in boiler room	500 sq. ft. @ $12 1,000 ln. ft. @ $15	= 	6,000 15,000 21,000
Removal and replacement of TSI in boiler room	100 ln. ft. @ $20	=	2,000
Enclosure of TSI in locker room	100 ln. ft. @ $5	=	500
Removal and replacement of acoustical plaster	40,000 sq. ft. @ $15	=	600,000
Encapsulation of acoustical plaster	40,000 sq. ft. @ $8	=	320,000
O&M - All ACBM	$5,000 per year		
TSI or acoustical plaster only	$3,000 per year		

Alternative 1: Immediate removal of all ACBM Costs:
$1,800,000 + $21,000 + $2,000 + $600,000 = $2,423,000

Effectiveness: Conducted properly, potential exposure is eliminated. Conducted improperly, fiber levels and potential exposure could increase, at least until the building was decontaminated.

Alternative 2: 1. Immediate removal of ACBM in categories 1-3, and

2. Removal of other ACBM combined with renovation.

Costs: a. $1,800,000 + $21,000 + $2,000 = $1,823,000

b. Assume (1) the wings will be renovated in 10 years, (2) a cost savings of 20% for combined abatement/renovation, and (3) an inflation rate of 3% per year, and (4) a discount rate of 6% per year.

Removal of acoustical plaster:

PV =(0.8) ($600,OOO) x $(1.03)^{10} \div (1.06)^{10}$	=	$360,000
O & M for 10 years @ $3,000 per year:		
PV =$3,000 + $3,000 x $(1.03)^{2} \div (1.06)^{2}$ +….+ $3,000 $(1.03)^{10} \div (1.06)^{10}$	=	$26,000
Total	=	$2,209,000

Effectiveness: Removal considerations are the same as Alternative 1. The effectiveness of O&M for the acoustical plaster is high, since the ceiling is above the reach of most students. The ceiling could be encapsulated for 10 years, but the cost would outweigh the O&M savings. Encapsulation might also make any water leak problems more difficult to repair.

Alternative 3:

1. Immediate removal of ACBM in category 1,
2. Removal of other ACBM combined with renovation or use of other abatement techniques.

Costs: Without going into details on the cost of each abatement and O&M option, the key tradeoffs can be illustrated by the options for the fireproofing.

a. Removal in 30 years:

PV = $1,800,000 $(1.03)^{30} \div (1.06)^{30}$ =	$760,000
O & M for 30 years @ $5,000=	99,000
	$859,000

b. Encasement: $800,000 + $50,000 for cleaning ceiling tiles + ? for removal of fireproofing after 30 years.

Effectiveness: An O&M program for the fireproofing will be difficult to enforce, since students frequently jump up and knock the ceiling tiles out of place. Encasement combined with cleaning the tiles would essentially eliminate the need for O&M.

What alternative does the Management Planner recommend that the LEA choose? The first concern is for the thermal insulation in the locker room. It has the highest hazard rank (1) due to its current poor (significantly damaged) condition. Repair is determined not to be a lasting solution due to the likelihood of future damage. The next concern is for the fireproofing in the central structure. Despite the fact that it has the same hazard rank (2) as thermal insulation in the boiler room, an O&M program will be much less effective for the fireproofing – students are much more difficult to control than the maintenance staff. Thus, removal (or encasement) of the fireproofing receives the second highest abatement priority. The choice between removal or encasement will be based on cost estimates and judgments regarding the costs of eventually

removing encased fireproofing. Removal of the acoustical plaster in conjunction with future renovation is chosen by the LEA as the most cost-effective approach.

FINANCING RESPONSE ACTIONS

Political Considerations

Expressing costs in net present value terms allows for fair comparisons among all alternatives. However, school boards may also be concerned about when the expenses will occur and how they will be met. Bonds may have to be sold and taxes raised. Thus, one response action plan may be preferable to another from a political perspective even though it does not have the lowest net present value. Whether the Management Planner should include political considerations in his or her report to the LEA should be negotiated with the LEA.

Financing Options

The main source of Federal finding for abatement projects in schools has been the Asbestos School Hazard Abatement Act (ASHAA) of 1984. This Act authorized EPA to distribute $600 million in loans and grants to schools who have demonstrated financial need as well as serious hazards in their buildings. To date, EPA has distributed $422 million of congressionally appropriated funds. To obtain these Federal funds, schools must complete ASHAA application forms and submit these completed forms to their EPA regional office. Because funding for this program has been appropriated on an annual basis, schools should contact their EPA Regional Asbestos Coordinator to determine whether ASHAA funds are currently available.

Some states may have developed funding programs for school abatement projects. LEA's should contact their State Department of Education to determine whether these funds are available.

**Note: ASHAA funding expired in 1995.*

EXHIBIT K-1

TYPICAL OPERATIONS IN AN ABATEMENT PROJECT

Removal	**Encapsulation**	**Enclosure**
Develop work plan	Develop work plan	Develop work plan
Isolate work area	Isolate work area	Isolate work area
Erect scaffold	Spray encapsulant	Construct mechanical enclosure or spray encasement
Remove insulation - areas (wall, ceiling) - boiler - pipe - fittings	Clean work area	
	Conduct air sampling	Clean work area
	Remove barriers	Conduct air monitoring
Dispose of asbestos in landfill		Remove barriers
Spray surfaces w/ encapsulant		
Seal exposed pipe ends		
Clean dirt and debris		
Conduct air sampling		
Remove plastic barriers		
Install insulation - areas (wall, ceiling) - boiler - pipe - fittings		

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SECTION L

Glossary

Algorithm	A formal numerical procedure for assessing suspect material; results are given a numerical score
Amended Water	Water to which a surfactant has been added
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 (AHERA definition)
Asbestos Hazard Emergency Response Act (AHERA)	U.S. EPA Regulation 40 CPR Part 763. Applies to all schools, public and non-profit private, grades K-12
Category I Nonfriable ACM	Includes asbestos-containing packings, gaskets, asphaltic roofing products, resilient flooring, pliable sealants, and pliable mastics (NESHAP definition)
Category II Nonfriable ACM	Includes all nonfriable asbestos-containing materials which are not Category I Nonfriable ACM (NESHAP definition)
Claims-made Insurance	A form of insurance in which a claim is allowed only if the insurance is in effect when the claim is made, that is, when the injury or effect is observed
Class I Work Activity	The removal of thermal system insulation and surfacing ACM and PACM (OSHA definition)
Class II Work Activity	The removal of ACM which is not thermal system insulation or surfacing material (OSHA definition)
Class III Work Activity	Repair and maintenance operations where thermal system insulation and surfacing ACM and PACM may be disturbed (OSHA definition)
Class IV Work Activity	Maintenance and custodial activities during which employees contact but do not disturb ACM and PACM, and activities to clean up dust, waste, and debris resulting from Class I, II, or III activities (OSHA definition)
Competent Person	A person capable of identifying asbestos hazards and who has authority to eliminate hazards (OSHA definition)

Damaged Friable Miscellaneous Material	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 the 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 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 (AHERA definition)
Damaged Friable Surfacing Material	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 the 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 ACM surface; water damage; significant or repeated water stains, scrapes, gauges, mars or other signs of physical injury on the ACM Asbestos debris originating from the ACBM in question may also indicate damage (AHERA definition)
Damaged or Significantly Damaged Thermal System Insulation	Thermal system insulation on pipes, boilers, tanks, ducts, and other thermal system insulation equipment which 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 (AHERA definition)
Decontamination	Cleaning contaminated areas. Decontamination chambers are used in ACM abatement projects
Designated Person	A person appointed by a local education agency to be in charge of the asbestos control program (AHERA definition)
Direct Costs	The costs of an ACM response action reflected by the itself; temporary relocation of people and equipment and related

	needs
Encapsulation	The use of an agent to seal the surface (bridging encapsulant) or penetrate the bulk (penetrating encapsulant) of ACM
Encasement	Enclosures which generally consist of a structural shell which is sprayed over the ACM in one or two layers. The systems are mechanically fastened in a manner similar to mechanical enclosures to assure they stay in place
Enclosure	A resilient structure, built , (or sprayed) around ACM designed to prevent disturbance and contain released fibers
Errors and Omissions Insurance	A type of insurance which protects professional for mistakes they may make in contracted plans and recommendations
Excursion Limit	A level of airborne fibers specified by OSHA as short-term occupational exposure to asbestos. It is 1.0 fibers per cubic centimeter of air as averaged over a 30 minute sampling period, as measured by phase contrast microscopy
False Negatives	Reporting bulk samples as containing less than l% asbestos for asbestos-containing samples containing greater than 1% asbestos
False Positives	Reporting bulk samples as containing greater than 1% asbestos for samples containing less than 1% asbestos
Friable	Material that can be crumbled, pulverized, or to powder by hand pressure when dry
Functional Spaces (areas)	Spatially distinct units within a building much identifiable populations of building occupants
General Liability Insurance	A type of insurance which covers the insured for damage to property and person caused by his or her own negligence
Glovebag	A device used to remove a section of pipe insulation without isolating the entire space or room
Hazard Assessment	The interpretation and evaluation of physical assessment data in order to set abatement priorities and rank areas for response actions
Heating, Ventilating, and Air-conditioning (HVAC) System	The system of pipes, ducts, and equipment (air conditioners, chillers, heaters, boilers, pumps, fans) used to heat, cool, move, and filter air in a building. HVAC systems are also known as mechanical systems

High Efficiency Particulate Air (HEPA)	A type of filter which is 99.97% efficient at filtering particles of 0.3 micrometers in diameter
Homogeneous Sampling Area	An area of material which appears similar throughout in terms of color and texture.
Indemnify	To pay for or pay back. Indemnification clauses in contracts are intended to cover the cost of judgments and/or legal defenses in the event of litigation
Indirect Costs	The costs of an ACM response action reflected by productivity losses due to disruption and business interruption
Local Education Agency (LEA)	Includes: 1) any local education agency defined under the Elementary and Secondary Education Act, 2) the owner of any nonpublic, nonprofit elementary or secondary school building, 3) the governing authority on any school operated under the Defense Dependents' Education Act (AHERA definition)
Liability	Being subject to legal action for one's behavior
Major Fiber Release Episode	The uncontrolled or unintentional disturbance, falling, or dislodging of more than 3 square or linear feet of friable ACBM (AHERA definition)
Management Plan	A plan for each LEA to control and manage ACBM (AHERA definition)
Management Planner	A person accredited under the U.S. Environmental Protection Agency Model Accreditation Plan to conduct hazard assessments and make response action recommendations to Local Education Agencies concerning ACBM in schools
Medical Surveillance Program	Periodically examining all employees exposed at or above the OSHA permissible exposure limit or excursion limit, or who engage in a particular type of asbestos-related activity for a specified period of time, or who wear a tight - fitting respirator during work
Minor Fiber Release Episode	The uncontrolled or unintentional disturbance, falling, or dislodging of 3 square or linear feet or less of friable ACBM (AHERA definition)

Negative Initial Exposure Assessment	A demonstration by the employer that employee exposure during an asbestos operation is expected to be consistently below the PELs (OSHA definition)
Occurrence Insurance	A form of insurance in which a claim is allowed regardless of when the claim is filed. For asbestos insurance, the "occurrence" could be the time of first exposure
Operations & Maintenance (O&M) Plan	A plan for an O&M program, which is designed to clean up asbestos contamination, minimize future fiber release, and maintain ACM in good condition
Permissible Exposure Limit (PEL)	A level of airborne fibers specified by OSHA as an occupational exposure standard for asbestos. It is 0.1 fibers per cubic centimeter of air, 8-hour time-weighted average, and 1.0 f/cc as a 30 minute Excursion Limit, as measured by phase contrast microscopy
Phase Contrast Microscopy (PCM)	A method of analyzing air samples for fibers using a light microscope
Physical Assessment	Assessing suspect material to determine the current condition of the material and the' potential for future disturbance
Present Value	The value of future expenditures in terms of today's dollars
Presumed Asbestos Containing Material (PACM)	Thermal system insulation and surfacing material found in a building built no later than 1980 (OSHA definition)
Preventative Measures	Response actions taken to reduce the potential for ACM disturbance, usually within the context of the O&M program
Public and Commercial Building	The interior space of any building which is not a school, with the exception of residential apartment buildings of fewer than 10 units or detached single-family homes. This includes industrial facilities, government-owned buildings, office buildings, universities, hospitals, shopping malls, churches, etc. (ASHARA definition)
Pulmonary Function Test	A test of breathing ability given as part of a medical surveillance program
Regulated Asbestos Containing Material (RACM)	Includes all friable ACM, all Category I Non-friable ACM which has become friable, all Category I which has been or will be subjected to sanding, grinding, cutting, or abrading, and Category Non-friable ACM with a high probability of becoming crumbled, pulverized, or reduced to powder by the forces acting upon it (NESHAP definition)

Removal	Scraping, vacuuming, or otherwise taking ACM out of a building and discarding it
Repair	Restoration of damaged or deteriorated ACM to intact condition
Respiratory Protection program	A set of procedures and equipment required by OSHA if employees wear respirators
Response actions	Actions specified in the management plan to control ACM; includes repair, O&M, removal, encapsulation, and enclosure
Self-contained breathing apparatus (SCBA)	Air-supplied respirators in which a tank worn on a person's back contains the air
Significantly damaged friable miscellaneous material	Friable miscellaneous ACM where the damage is extensive and severe (AHERA definition)
Significantly damaged friable surfacing material	Friable surfacing ACM in a functional space where the damage is extensive and severe (AHERA definition)
Small-scale, short-duration activities	Maintenance or abatement activities which may contact ACBM but do not represent a major ACBM disturbance
Surfactant	An agent added to water to decrease surface tension and thus increase waters ability to "wet" or penetrate bulk material
Tort	A legal wrong, sometimes referred to as negligence
Transmission electron microscopy	A method of analyzing air samples for asbestos fibers using a transmission electron microscope and, possibly, associated instruments for further identifying asbestos
"Type C" respirators	Air-supplied, airline respirator in which outside air is compressed, purified, and delivered to the wearer