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Draft revision, August 1997

# Asbestos NESHAP Inspection and Safety Procedures Workshop

# Draft Student Manual

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Education and Outreach Group
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# Inspection and Safety Procedures
# Workshop

# Draft
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# INTRODUCTION

By the early 1970s the health hazards of asbestos exposure were widely recognized. In 1973, in order to reduce the public's potential exposure to airborne asbestos, the Environmental Protection Agency (EPA) published the asbestos *National Emission Standards for Hazardous Air Pollutants (NESHAP)* regulation. The asbestos NESHAP regulated the demolition of buildings containing asbestos-containing fireproofing and insulating material and restricted the spraying of asbestos-containing materials on buildings and structures for fireproofing and insulating purposes.

Since 1973 the asbestos NESHAP has been revised several times. The regulation now prohibits use of pre-molded, wet-applied, or decorative spray-on asbestos-containing material and regulates renovation, waste handling and disposal activities as well.

In 1984 EPA issued its first *Asbestos Demolition and Renovation Enforcement Strategy* whose primary objective was to provide effective and uniform enforcement of the asbestos NESHAP. Since on-site inspections were critical to accomplishing this goal, EPA developed two workshops - one which detailed inspection procedures and the other which dealt with inspector safety. These workshops were soon combined to create the current Asbestos NESHAP Inspection and Safety Procedures Workshop which has been used to train EPA, State and local agency personnel charged with enforcing the regulation.

During the asbestos NESHAP workshop, inspection procedures and the asbestos NESHAP regulation are discussed in detail. In addition, since EPA, State and local agencies are beginning to implement coordinated asbestos programs under the *Clean Air Act (CAA)* and the *Toxic Substances Control Act (TSCA)*, the basic requirements of other regulations, such as the *Asbestos Hazard Emergency Response Act (AHERA)* and the *Worker Protection Rule (WPR)* are also discussed. It is hoped that inspectors conducting asbestos NESHAP compliance inspections will be able to recognize potential violations of other regulations as well and contact the appropriate asbestos program personnel for follow-up.

The information contained in this workshop is consistent with the *Asbestos Demolition and Renovation Enforcement Strategy* regarding inspector training, inspection criteria, and enforcement procedures, and is also consistent with EPA policy to coordinate all asbestos program offices.

# SECTION 1

# BACKGROUND INFORMATION

## HISTORY OF ASBESTOS USE

Thousands of years ago ancient people discovered that certain rock fibers could be woven into a tough fabric that would not burn. This material, known as "asbestos" (a term incorrectly derived from a Greek word meaning "inextinguishable") was used to create lamp wicks, clothing, cremation cloths, handkerchiefs and napkins.

Use of asbestos fabric continued throughout the ages. It has been reported that Emperor Charlemagne (A.D. 742-814) impressed his enemies with the incombustible properties of a tablecloth, and that Benjamin Franklin, in 1725, similarly impressed his London host by tossing a purse made of asbestos into a lit fireplace.

The properties of asbestos were not generally known, nor asbestos commercially available, until the mid-1800s when commercial production of asbestos products began in Italy and subsequently spread to the British Isles and North America. During this time the Industrial Revolution catapulted our society from an organically-based culture (one dependent on wood, bone, hide, hemp, etc.) to one based on the widespread use of extracted metals and ores. The expanding use of the steam engine during this time fostered the growth of the gasket and insulation industries where the properties of the "miracle fiber" asbestos were soon recognized and put to use.

In the late 1870s large deposits of asbestos were discovered in Canada. Asbestos has also been found and commercially mined in Australia, Korea, and South Africa and in the States of Arizona, California, Georgia, New Hampshire, North Carolina, Vermont and Virginia.

Asbestos product use in America was greatest from the 1940s until the late 1970s when the health hazards associated with asbestos exposure became widely recognized. By this time asbestos had become an integral component of approximately 3600 commercial products. During World War II enormous quantities of asbestos were used in ship-building and other industries. Following the war, and until the late 1970s, asbestos was widely used in buildings for fireproofing, thermal and acoustical insulation, condensation control and decoration.

It has been estimated that in the U.S. approximately 30 million tons of asbestos have been used in the construction and manufacturing industries since the early 1900s.

## GEOLOGICAL INFORMATION

Asbestos minerals formed millions of years ago as molten material filled cracks in the cooling surface of the earth and hardened. Unlike other minerals which form tightly-bound crystals upon cooling, asbestos minerals coalesce into densely-packed bundles of fibers.

**Asbestos**

**Serpentine Group**

- Serpentine (Chrysotile)

**Amphibole Group**

- Cummingtonite - Grunerite (Amosite)
- Riebeckite (Crocidolite)
- Anthophyllite
- Actinolite - Tremolite

Asbestos minerals are divided into two major classes - serpentine and amphibole asbestos - which differ from one another both physically and chemically. The serpentine group contains only one asbestos mineral, chrysotile, whose scroll-like, white fibers are very fine (0.02-0.08 $\mu$m in diameter), flexible, heat resistant, and exhibit high tensile strength. Because of these characteristics, chrysotile has been incorporated into thousands of commercial products including insulation, cement products and roofing materials, and consequently is the type of asbestos most commonly found in buildings. The amphibole group contains five asbestos minerals: amosite, actinolite, anthophyllite, crocidolite and tremolite. Of these, however, only amosite, a brown asbestos with brittle, needle-like fibers (0.06-0.35 $\mu$m in diameter), has been used extensively, primarily in high-temperature applications where great thermal resistance is needed. Amosite is commonly found in high-pressure steam line and boiler block insulation.

Table 1-1 provides a brief synopsis of the mineralogy and chemistry of asbestos minerals.

**Asbestos Fibers**

Since the 1960s asbestos fibers monitored in workplaces where asbestos is in use have been defined as any of the minerals named in Table 1-1 that display, by phase-contrast microscopy (PCM), particles of aspect ratio greater than or equal to 3:1, lengths greater than 5 $\mu$m, and widths less than 3 $\mu$m. Since the fiber has become the principal occupational exposure measurement, however, a more specific definition for the physical properties of asbestos fibers was published in EPA's *Method for the Determination of Asbestos in Bulk Building Materials*, EPA/600/R-93/116, July 1993.

As stated in this document, asbestiform minerals, when viewed by light microscopy, generally have the following characteristics:

- Mean aspect ratios ranging from 20:1 to 100:1 or higher for fibers longer than 5 $\mu$m (with aspect ratios being determined for fibers, not bundles);

- Very thin fibrils, usually less than 0.5 $\mu$m in width, and

- Two or more of the following:
  - Parallel fibers occurring in bundles,
  - Fibers displaying splayed ends,
  - Matted masses of individual fibers, and/or
  - Fibers showing curvature.

**TABLE 1-1. THE ASBESTOS MINERALS**

| Group | Name | Nominal Composition | Characteristics |
|---|---|---|---|
| Serpentine | Chrysotile | $Mg_3Si_2O_5(OH)_4$ | White asbestos; fine, silky, wavy fibers; flexible and high tensile strength. |
| Amphiboles | Amosite | $(Mg,Fe)_7Si_8O_{22}(OH)_2$ | Brown asbestos; straight, rigid fibers; high thermal resistance. |
| | Crocidolite | $Na_2Fe^2_3 + Fe^3_2 + Si_8O_{22}(OH)_2$ | Blue asbestos; straight, rigid fibers. |
| | | | Brittle white fiber. Rarely used. |
| | Anthophyllite | $(Mg,Fe)_7Si_8O_{22}(OH)_2$ | Colorless to pale green; rarely used. |
| | Tremolite-Actinolite | $Ca_2(Mg,Fe)_5Si_8O_{22}(OH)_2$ | |

Figure 1-1 illustrates a comparison of asbestos fibers to other more recognizable materials.

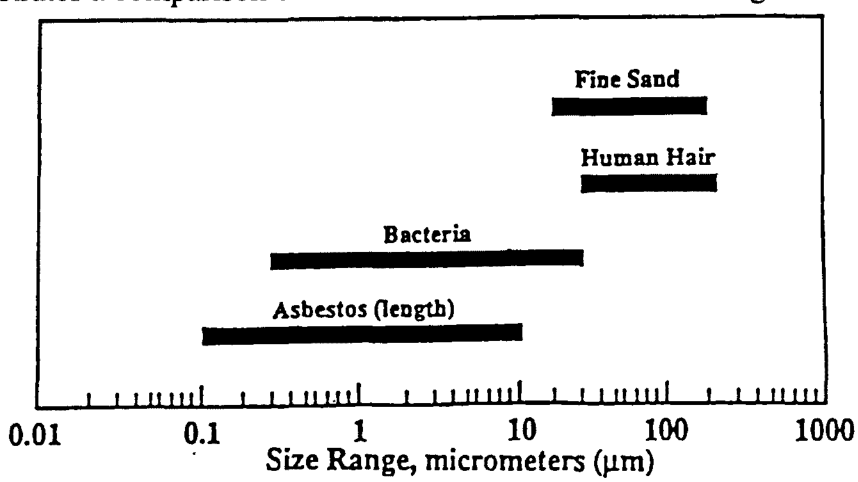
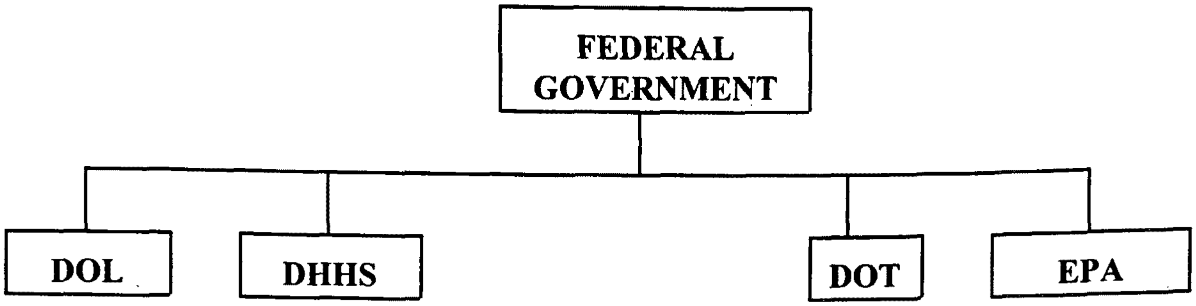



Figure 1-1. Size Comparisons

## FEDERAL REGULATORY AGENCIES




Several federal agencies which regulate asbestos are discussed below.

**Department of Labor (DOL)**

Within the DOL, OSHA (Occupational Safety and Health Administration) has published several asbestos standards designed to protect employees at their worksites: *Shipyard Employment Asbestos Standard* (29 CFR 1915.1001), *General Industry Standard* (29 CFR 1910.1001), and *Construction Asbestos Standard* (29 CFR 1926.1101).

**Department of Health and Human Services (DHHS)**

Within DHHS, NIOSH (National Institute of Occupational Safety and Health), tests respirators and acts as the research arm of OSHA.

**Department of Transportation (DOT)**

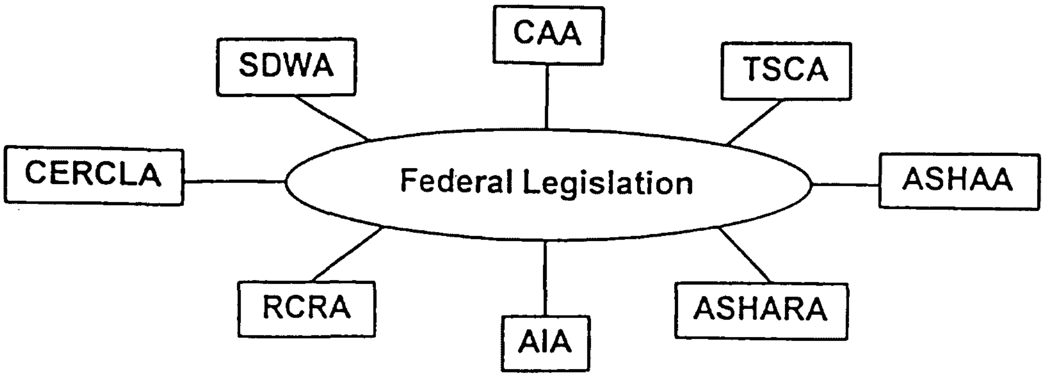
DOT regulates the transport of commercial asbestos and asbestos waste and dictates the labeling of waste bags and marking of transport vehicles.

**Environmental Protection Agency (EPA)**

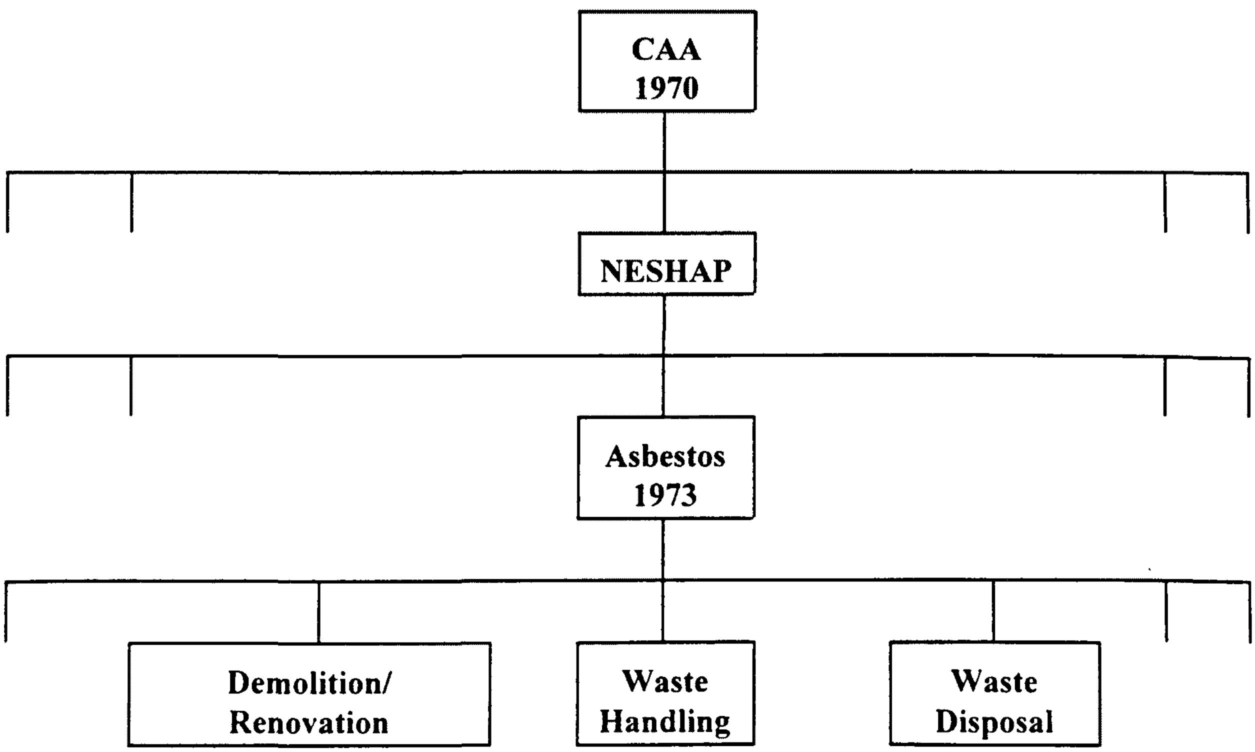
EPA enforces several regulations (Clean Air Act, Toxic Substances Control Act, Safe Drinking Water Act, Resource Conservation and Recovery Act, Comprehensive Environmental Response, Compensation and Liability Act, etc.) which help protect citizens from the harmful effects of asbestos.

## FEDERAL LEGISLATION

In order to reduce potential exposure to asbestos, numerous regulations have been developed by Federal, State, and local governments. Only Federal asbestos regulations will be discussed in this manual, however, for it would be impractical to attempt to provide information concerning the widely varying State and local regulations as well. Inspectors should, however, become familiar with other asbestos regulations applicable in their areas.




**Clean Air Act (CAA) (42 U.S.C. 7401, et seq.)**



The *Clean Air Act (CAA)* was signed into law in 1970 to address the problem of hazardous air pollutants, substances for which "no ambient air quality standard is applicable and which, in the judgment of the Administrator, may cause or contribute to an increase in mortality or an increase in severe irreversible, or incapacitating reversible illness."

Once EPA lists a material as a hazardous air pollutant, stationary source emission standards may be established. To date, *National Emission Standards for Hazardous Air Pollutants (NESHAP)* have been developed under Section 112 of the CAA for arsenic, benzene, beryllium, coke oven emissions, mercury, perchloroethylene, radionuclides, vinyl chloride, and asbestos.

The purpose of the asbestos NESHAP, first promulgated in 1973, is to protect the public from exposure to asbestos in the ambient air. The asbestos NESHAP program is examined in this manual as it pertains to demolition and renovation of buildings containing asbestos building materials and subsequent waste disposal. (The asbestos NESHAP also regulates manufacturing and fabricating operations, spray application of asbestos, waste disposal for asbestos mills, inactive waste disposal sites, and establishes standards for asbestos mills and roadways.)

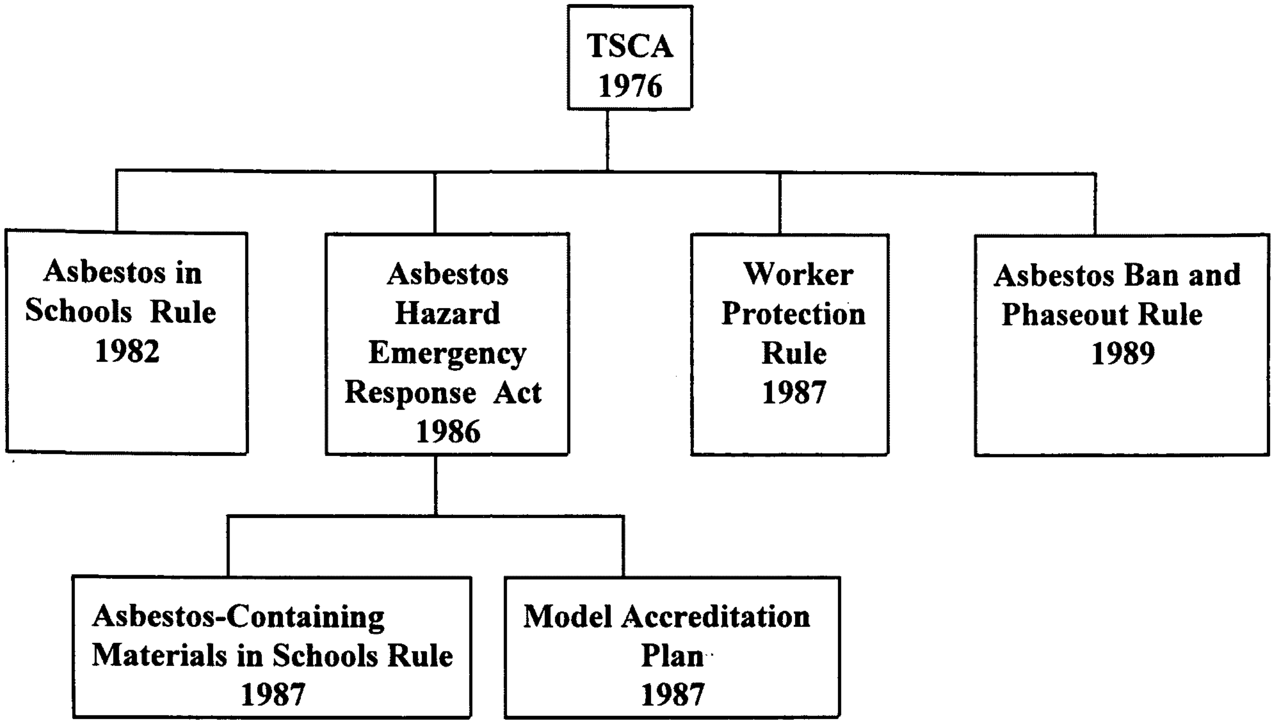
Non-compliance with the provisions of the CAA constitutes a felony.

The demolition/renovation provisions of NESHAP are broken down into four basic categories which will be discussed in detail during this workshop.

**Demolition/ Renovation**

- **Notification**
- **Work Practices**
- **Waste Handling**
- **Waste Disposal**

## Toxic Substances Control Act (TSCA) (15 U.S.C. 2601, et seq.)




The *Toxic Substances Control Act (TSCA)*, signed into law in 1976, permits EPA to identify and evaluate potential hazards from chemical substances. It also allows EPA to regulate the production, use, distribution and disposal of such substances. Several regulations, discussed below, have been issued under the auspices of TSCA. Copies of TSCA documents may be obtained by calling the TSCA Hotline at 202-554-1404.

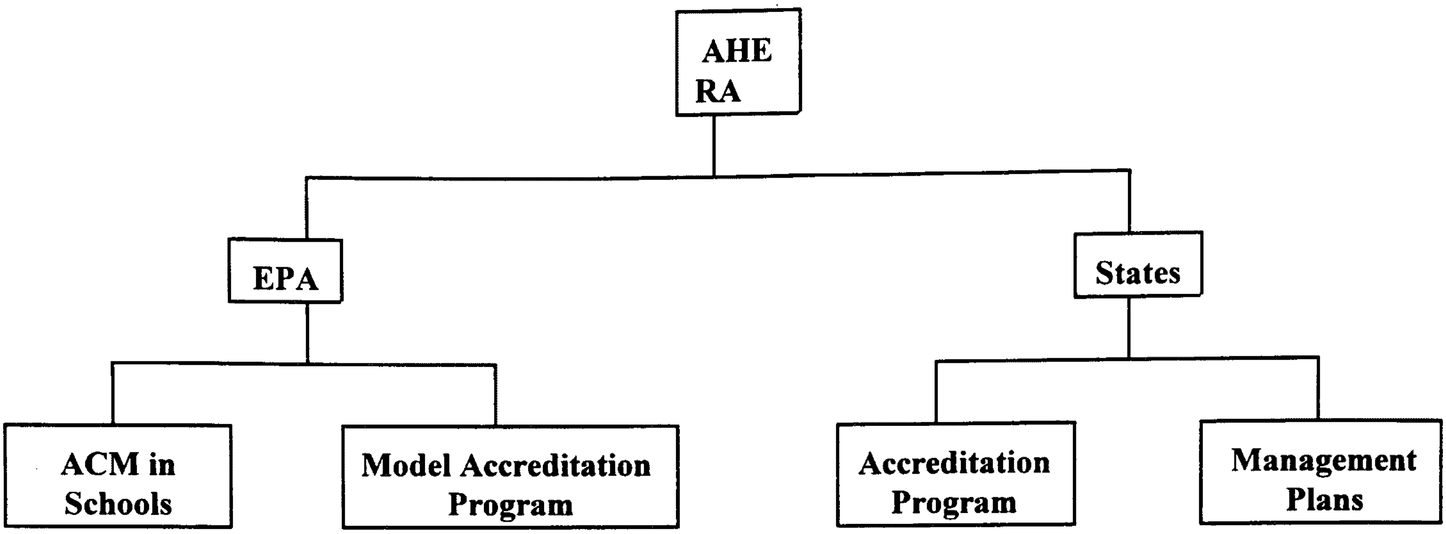
### *Asbestos in Schools Rule (40 CFR Part 763 Subpart F)*

**Asbestos in Schools (AIS) Rule**

- **Inspections (friable ACM)**
- **ACM analysis**
- **Notifications**
- **Recordkeeping**

The original *Asbestos in Schools (AIS) Rule*, proposed in 1979 and enacted in 1982, set up requirements for inspection of public and private schools (as defined in the *Elementary and Secondary Education Act*) grades K-12 for friable suspect asbestos-containing material (ACM). The required inspections involved sampling and subsequent analysis of such material to determine the presence of asbestos. The AIS Rule also required the schools to provide notification to school workers and parents concerning the presence of asbestos, to post warning signs if friable ACM were found, and to maintain records accessible to the public regarding the inspections. There were no requirements for abatement nor provisions for funding. The AIS Rule did provide guidance for abatement (i.e., removal, encapsulation, enclosure or maintenance programs). The requirements of this regulation were to have been met by June 1983.

*Asbestos Hazard Emergency Response Act (AHERA) (15 U.S.C. 2641)*




In order to improve upon the 1982 AIS, Congress passed the *Asbestos Hazard Emergency Response Act (AHERA)* in 1986. AHERA was added as an amendment *(Title II - Asbestos Hazard Emergency Response)* to TSCA and required both EPA and the States to address asbestos hazards which might exist in schools. EPA was required to promulgate rules regarding asbestos-containing materials in schools and had to develop a model accreditation plan for persons who inspect for asbestos, develop management plans, and design or conduct response actions. States were required to adopt an accreditation program at least as stringent as the EPA model and to review management plans submitted by school systems.

*Asbestos-Containing Materials in Schools Rule (ACM in Schools) (CFR Part 763 Subpart E)*

**ACM in Schools**

- **Inspections**
- **Management Plans**
- **Response Actions**
- **Reinspections**

In 1987, in response to the AHERA mandate, EPA published its *Asbestos-Containing Materials in Schools Rule,* commonly referred to as AHERA, which required that public and private schools (grades K-12) be inspected for the presence of friable and nonfriable asbestos-containing building materials (ACBM) and that determinations of ACBM conditions and hazards be made. Based on the inspections, the schools were also required to develop and implement management plans and reinspect schools every three years.

*Model Accreditation Plan (MAP) (40 CFR Part 763 Subpart E Appendix C)*

**Model Accreditation Plan (MAP)**

- **Workers**
- **Contractors/Supervisors**
- **Inspectors**
- **Management Planners**
- **Project Designers**

In 1987, also in response to the AHERA mandate, EPA published its *Model Accreditation Plan (MAP)* which established initial and refresher training requirements for inspectors, management planners, abatement project designers, asbestos abatement contractors/supervisors, and asbestos abatement workers. The MAP also included information regarding qualifications, examinations, decertification requirements and reciprocity.

**Model Accreditation Plan (MAP) Interim Final Rule (1994)**

- **Clarifies applicability**
- **Increases minimum number of training hours**
- **Adds definitions and recordkeeping requirements**
- **Specifies deadlines for States, course providers and individuals**

In 1990, revisions to the original MAP were mandated by the *Asbestos School Hazard Abatement Reauthorization Act* (ASHARA). On February 3, 1994, EPA published its *Asbestos Model Accreditation Plan; Interim Final Rule* (59 FR 5236) which replaces the original MAP. The revised document, effective April 4, 1994, clarifies the types of persons who must be accredited to work with asbestos in schools and public and commercial buildings; increases the minimum number of hours of training, including additional hours of hands-on health and safety training for asbestos abatement workers and contractor/supervisors; and effects a variety of other necessary changes as mandated by ASHARA.

The new MAP adds two new components to the original MAP: (1) definitions which help to determine the scope and applicability of the rule, and (2) new recordkeeping requirements for the providers of accredited training courses. The changes also specify the deadline for States to modify their accreditation programs to be no less stringent than the revised MAP and prescribe deadlines for training course providers and persons who must obtain accreditation to comply with new requirements.

> **Additional MAP Components**
>
> - **Training requirement distinctions for five training disciplines**
> - **New project designer topics**
> - **New enforcement criteria and Federal procedures for withdrawing approval (persons/programs)**
> - **New training certificate information**

The revised MAP also distinguishes between the training requirements for each of the five accredited training disciplines; adds several new topics to the project designer training curriculum; establishes new enforcement criteria and Federal procedures for withdrawing approval from accredited persons and training programs; and stipulates new information requirements for training certificates. The organization and some of the language of the original MAP have also been changed, but these modifications are only technical and do not impose new substantive requirements.

***Worker Protection Rule (WPR) (40 CFR Part 763 Subpart G)***

> **Worker Protection Rule (WPR)**
>
> - **State/Public Employees**
> - **OSHA Construction Standard**
> - **Abatement Activities**
> - **Notification**
>   - **Emergency projects**
>   - **Projects > 3 LF/SF**

In 1987 EPA published the *Worker Protection Rule (WPR)* which extended the provisions of the OSHA asbestos construction standard to State and public employees who had been exempted by their States from the OSHA regulation. The WPR essentially duplicates the old OSHA Construction Standard (29 CFR 1926.58) with the following exceptions:

- it applies only to State and public workers involved in abatement activities; and

- it contains notification requirements for emergency projects and projects involving more than three linear or square feet of friable asbestos-containing material.

It is EPA's intention to revise this document in the future to reflect changes made to OSHA's Construction Standard.

*Asbestos Ban and Phaseout Rule (ABPO) (40 CFR Part 763 Subpart I)*

> **Asbestos Ban and Phaseout Rule (ABPO)**
> - **3 stages**
> - **Manufacture, import, processing ban**
> - **Distribution in commerce ban**

In 1989 EPA published the *Asbestos Ban and Phaseout Rule (ABPO)* which prohibited, at staged intervals, the future manufacture, importation, processing, and distribution in commerce of almost all asbestos-containing products. The ABPO required that products subject to the bans be labeled to promote compliance with and enforcement of the rule. Upon application, and in very limited circumstances, EPA may allow exemptions from the Rule's bans.

In October 1991 the U.S. Court of Appeals for the Fifth Circuit overturned EPA's ban, arguing that the Agency failed to consider less burdensome alternatives than an outright ban.

In November 1991, in response to a request by EPA for clarification of the overturning of the ABPO, the U.S. Court of Appeals stated that EPA could ban new uses of asbestos and products that were not on the market on July 12, 1989, the effective date of the ABPO rule.

EPA most recently clarified the provisions of the ABPO in the Federal Register (58 FR 58964), November 5, 1993. (See Table 1-2)

**Table 1-2. ACM Currently Banned**

| | |
|---|---|
| • New uses of asbestos<br>• Corrugated paper<br>• Rollboard<br>• Commercial paper<br>• Specialty paper<br>• Flooring felt | |

**Asbestos School Hazard Abatement Act (ASHAA) (Public Law 101-637)**

| **Asbestos School Hazard Abatement Act (ASHAA)**<br>• **Grants and loans**<br>• **Information distribution**<br>• **Training institutes** |
|---|

In 1984 the *Asbestos School Hazard Abatement Act (ASHAA)* was written to provide a source of special funding for the *Asbestos in Schools* program. The Act provided a $600 million grant and loan program to assist financially needy schools with asbestos abatement projects.

ASHAA also provided for compilation and distribution of information concerning asbestos, and funded the start-up of training institutions. The original recipients of training funding were Tufts University (MA), Georgia Institute of Technology, and the University of Kansas.

**Asbestos School Hazard Abatement Reauthorization Act (ASHARA) (Public Law 101-637)**

| **Asbestos School Hazard Reauthorization Act (ASHARA)**<br>• **Grants and loans**<br>• **MAP revisions** |
|---|

The *Asbestos School Hazard Abatement Reauthorization Act (ASHARA)*, signed into law in 1990, reauthorized funding for schools in need and mandated revisions to EPA's *Model Accreditation Plan (MAP)* developed under AHERA. ASHARA required EPA to increase the minimum number of training hours required for asbestos abatement workers, and extend accreditation requirements to include persons who inspect for ACM or who design or conduct response actions with respect to friable ACM in public and commercial buildings. In addition, ASHARA authorized EPA to modify the MAP as necessary to implement the extension of accreditation requirements to public and commercial buildings, and amended penalty provisions of TSCA Section 207 (15 U.S.C. 2647).

**Asbestos Information Act of 1988 (AIA) (Public Law 100-577)**

**Asbestos Information Act (AIA)**
- **Manufacturers**
- **EPA**

The *Asbestos Information Act (AIA)* was signed into law in October 1988. The AIA required former and current manufacturers and processors of certain asbestos products to submit information identifying their products to EPA and required EPA to organize and publish the submitted information. On February 13, 1990 EPA published in the Federal Register a summary of the information submitted by 38 companies.

**Resource Conservation and Recovery Act (RCRA) (42 U.S.C. 6901, et seq.)**

**Resource Conservation and Recovery Act (RCRA)**
- **Cradle to grave management**
- **Facility siting**
- **Landfill operations**

The *Resource Conservation and Recovery Act (RCRA)* was enacted in 1976 to regulate the management of hazardous waste, to ensure the safe disposal of wastes, and to provide for resource recovery from the environment by controlling hazardous wastes "from cradle to grave."

In 1976 asbestos became regulated as a hazardous substance under RCRA. It was delisted that same year, however, because its classification as a RCRA waste was inappropriate - unlike other substances regulated by RCRA, asbestos does not migrate appreciably in soils, nor does it pose any threat to ground water. RCRA currently regulates asbestos waste disposal only in a general way, through facility siting and general landfill operation requirements.

**Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 U.S.C. 9601, et seq.)**

**Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)**

- **"Superfund"**
- **RQ = 1 pound asbestos**
- **National Response Center**

The *Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)* of 1980, most commonly referred to as "Superfund" because its authority was clarified in the *Superfund Amendments Reauthorization Act (SARA)* of 1986, was passed into law to address the problems associated with the actual or potential release of hazardous substances into the environment. Under CERCLA, reportable quantities (RQs) have been established for a number of hazardous materials. The RQ for asbestos is one pound. Should a release or threat of release of at least one pound of asbestos occur, the National Response Center (1-800-424-8802) must be informed immediately. Noncompliance with the provisions of CERCLA may result in prosecution for a felony offense and the assessment of heavy fines.

**Safe Drinking Water Act (SDWA) (42 U.S.C. 300)**

**Safe Drinking Water Act (SDWA)**

- **Digestive tract cancers**
- **7 x $10^6$ fibers (>10 µm in length) per liter**

The *Safe Drinking Water Act (SDWA)* was enacted in 1974 in order to assure that all people served by public water systems would be provided with a supply of high-quality water. The Act established a program to require compliance with national drinking water standards for contaminants that may have an adverse effect on public health. The Act also focused on the removal of contaminants found in water supplies and established programs intended to protect underground sources of drinking water from contamination.

During the early 1980s the issue of potential health hazards associated with ingestion of asbestos fibers was closely examined by EPA's Office of Drinking Water (ODW). The ODW reviewed numerous human and laboratory animal epidemiological studies and, despite the uncertainty of research conclusions linking an increased risk of development of digestive tract cancers to exposure to asbestos fibers, proposed to establish an asbestos fiber limit in drinking water.

The 1986 SDWA Amendments required EPA to regulate asbestos as a contaminant of drinking water. In 1991 a limit of seven million asbestos fibers (greater than 10 µm in length) per liter of drinking water was established in the *National Primary Drinking Water Regulations.*

## SECTION 2

## ASBESTOS DEMOLITION AND RENOVATION ENFORCEMENT STRATEGY

On April 5, 1984, the first *Asbestos Demolition and Renovation Enforcement Strategy* was issued. This strategy document focused on demolitions and renovations because EPA had determined that the number of these sources was greater than the total number of all other sources, the compliance status for demolition/renovation sources was much worse, and inspections of these sources were more difficult due to the transitory nature of the operations.

The objectives of the enforcement strategy were to: 1) provide effective and uniform enforcement of the Asbestos NESHAP standard by regions and the delegated States, and 2) provide emphasis and assurance to regions and States that asbestos is a high priority item and that EPA is committed to a strong enforcement posture.

From October 1, 1985 through November 17, 1987, the Inspector General (IG) Office conducted an audit of EPA's administration of the asbestos NESHAP. The audit included EPA regional, State and local programs.

The audit had six principle objectives:

1. To determine whether regional EPA offices, State and local agencies gave sufficient priority to implementing an effective asbestos NESHAP program;

2. To determine whether inspections of demo/reno sites were conducted properly;

3. To evaluate inspection strategies;

4. To determine if enforcement actions were appropriate (Would they deter future violations?);

5. To determine whether proper safety equipment was used and if inspectors were adequately trained prior to field activities; and

6. To determine the accuracy of SPMS (Strategic Planning and Management System) data for demo/reno sites.

Since the IG audit revealed many weaknesses in the administration of the asbestos NESHAP program, EPA reexamined its enforcement strategy and published a revised version of it on March 31, 1988.

In November 1990 revisions to the asbestos NESHAP were promulgated to promote compliance and enhance enforcement efforts. The revisions include monitoring, recordkeeping, and reporting requirements for milling, manufacturing, and fabricating. In addition, notification requirements for demolitions and renovations were modified, and recordkeeping and reporting requirements were added for waste disposal. Also, several revisions clarify the intent of the rule and others reflect enforcement determinations previously made.

In February 1991, EPA published its *Implementation Strategy for Revised Asbestos NESHAP* as an addendum to the enforcement strategy in effect. This new strategy document was designed to assist EPA Regional offices and the States in implementing the revisions to the NESHAP. Because the regulation of disposal sites and the addition of requirements for waste shipment records are among the more significant changes in the NESHAP, the new implementation strategy focuses primarily on requirements for waste disposal. Outreach strategies for informing building owners and contractors of the revisions are discussed as are strategies for informing disposal site operators of the new requirements.

In view of the new waste disposal requirements, suggestions are made on how to inspect waste shipment records (WSRs) and adjust agency inspection schemes, including targeting, to accommodate the new requirements. Suggestions are given for using construction permits and WSRs to identify non-notifiers. Data management and targeting using the National Asbestos Registry System (NARS) are discussed in general, while enforcement of the new recordkeeping and reporting requirements is covered specifically. Finally, policy and guidance documents that are relevant to the interpretation and enforcement of the asbestos NESHAP are identified.

## STRATEGY COMPONENTS

The following summarizes the most current strategy information issued by Headquarters to regional agencies. The complete strategy documents (1988 ... *Enforcement Strategy* and 1991 *Implementation Strategy* ...) can be found in supplemental materials provided with this course manual.

### 1. Outreach

Outreach programs aimed at increasing public awareness of the asbestos NESHAP requirements should be established. Agencies are encouraged to publicize the asbestos NESHAP requirements by the following mechanisms:

- national and local press releases;
- distribution of informational pamphlets to removal contractors, State or local associations of building owners/managers, asbestos

abatement groups, State or local air pollution and environmental associations;

- distribution of information concerning waste disposal requirements to waste haulers, waste site operators and State or local solid waste associations;
- on-site educational efforts;
- coöperative arrangements with building inspection departments;
- informational mailings to previous asbestos NESHAP violators;
- distribution of a list of available asbestos training courses to contractors, building owners and managers;
- seminars and demonstration workshops for contractors, and owners and managers of commercial buildings;
- discussion forums with school district administrators, architects, lenders, real estate groups, and insurance agency representatives; and
- radio talk shows on the hazards of asbestos.

### 2. Contractor Training

Contractor training is a requirement (effective November 1991) and an effective way of educating contractors as to what is required of them under the asbestos NESHAP. Most States have established some type of training program and/or certification for asbestos removal contractors. Also, the Asbestos Hazard Emergency Response Act (AHERA) requires States to establish accreditation programs for persons who inspect, develop management plans, or design or conduct response actions in schools. States should be encouraged to extend the AHERA certification requirements to all demolition/ renovation contractors.

### 3. Inspector Training

To increase inspector effectiveness in finding violations and documenting evidence at demolition and renovation projects, inspectors should receive training on inspection procedures, safety, the NESHAP requirements and other pertinent regulations. The Stationary Source Compliance Division (SSCD) offers such training to Region and State inspectors. Asbestos inspectors should also attend courses at one of the Hazard Abatement Assistance Branch (HAAB) training centers to become aware of what certified removal contractors are being taught about the asbestos NESHAP. Delegated State and local agencies should be encouraged to send their inspectors to both the SSCD and HAAB training, as well as any contractor certification training provided at the State level.

Inspectors should contact local AHERA personnel or State departments of labor and industry, or refer to the National Directory of AHERA Accredited Courses (NDAAC) available through the NDAAC Clearinghouse (1-800-462-6706) to obtain information regarding worker, contractor/supervisor, inspector, management planner, and project designer training course providers.

**4. Inspections**

Inspections are the foundation for enforcement actions for substantive violations. In order to determine compliance and to collect evidence, inspectors must enter active removal areas.

Three items -- the inspectors' checklist, a camera, and safety gear -- are especially important and are considered standard inspection gear. Whenever possible, inspectors should collect samples and observe work practices. While it is preferable to inspect a site during active removal operations, a compliance determination based on evidence collected (e.g., photographs and samples of material) is possible at a removal site when no removal activity is occurring.

**5. Inspection Targeting**

Because of the tremendous increase in the number of notifications received by EPA and the delegated agencies, Regions and their delegated agencies must make more efficient use of inspectors' time by implementing a targeting system that strategically identifies which notifications or contractors to follow up with inspections. A computer tracking system is available that will assist in prioritizing inspections by identifying removal sites where violations are most likely to occur. Inspection priority should be based on a simple evaluation of computer tracking data involving the assessment of contractor compliance history and on specific criteria for notifications. In addition to inspection targeting based on computer tracking data, citizen complaints should be followed up with inspections. Special attention should also be given to demolitions and renovations for which no notification was received. Information from building permits, waste disposal site records, other contractors and agencies, and various publications can assist in this effort.

**6. Program Alternatives**

When delegated agencies find it difficult to maintain a high level of inspections due to funding limitations, they should adopt cost-effective alternative mechanisms. Examples of alternatives include adoption of a state-wide contractor certification program or the adoption of a system of collecting fees for each removal operation to help fund enforcement programs. When combined with a penalty policy of sufficient stringency for each violation type, the adoption of one or more such alternatives would be an acceptable State asbestos NESHAP enforcement program modification.

**7. Federal Enforcement Options**

EPA may take administrative and/or judicial actions against a NESHAP violator. EPA can pursue administrative actions through Section 113(d) orders or Section 303 orders. Section 113(d) administrative penalty orders may be issued to violators when they are found out of compliance with requirements, or to sources which submit deficient notifications.

Administrative penalty orders may assess civil penalties of up to $25,000 per day of violation. In general, they may be used only in cases where the total penalty does not exceed $200,000 and the first alleged date of violation occurred no more than 12 months prior to initiation of the administrative action.

Judicial action can take the form of civil action as provided for in Section 113(b), or criminal action as provided for in Section 113(c). Procedures are available for negotiated settlement through judicial consent decrees and are designed to facilitate the settlement process and enable Regions to increase judicial enforcement without straining resources. Section 113(b) civil actions can be used to seek immediate compliance and civil penalties of up to $25,000 per day of violation. Section 113(c) criminal enforcement actions are taken against parties who knowingly violate provisions of the asbestos NESHAP.

Another enforcement option is contractor listing under Section 306. When EPA lists a contractor, that contractor cannot be awarded any contract to perform work where Federal funds are involved. Under mandatory listing, contractors convicted of criminal air Act violations are automatically listed. Under discretionary listing, contractors that have continuing or recurring violations of clean air standards may also be listed.

## 8. Choosing an Enforcement Option

Each violation, listed by contractor, should be entered into the computer tracking system to provide a record of violations for individual contractors. Instructions are provided in Tables 1 and 2 of the *Asbestos Demolition and Renovation Enforcement Strategy* to assist in deciding when a particular enforcement action is appropriate.

## 9. Assessing Penalties

The Clean Air Act Stationary Source Civil Penalty Policy ("General Penalty Policy") provides guidance for determining the amount of civil penalties EPA will seek in pre-trial settlement of civil judicial actions under Section 113 (b) of the Clean Air Act ("the Act"). In addition, the General Penalty Policy is used by the Agency in determining an appropriate penalty in administrative penalty actions brought under Section 113 (d) (1) of the Act. Due to certain unique aspects of asbestos demolition and renovation cases, an appendix entitled *Asbestos Demolition and Renovation Civil Penalty Policy* (May 5, 1992) provides separate guidance for determining the gravity and economic benefit components of the penalty. Adjustment factors should be treated in accordance with the General Penalty Policy.

## 10. Reporting

The reporting format for STARS has been revised (see Appendix G of the *Asbestos Demolition and Renovation Enforcement Strategy*). Report violations in terms of substantive violations and notification violations and include the number of sources inspected. Regions must ensure that there is no double-counting of notifications.

## 11. Regional Oversight

Joint EPA-State inspection is the best method to review delegated agency inspections and establish the criteria for an acceptable compliance inspection. For Regions with both delegated and undelegated States, Regional inspections should be concentrated in the undelegated States. Regions should develop written inspection programs containing inspection criteria and targeting systems and should provide a written assessment of each delegated agency's compliance record.

### 12. Cross-Program Coordination

EPA NESHAP and TSCA inspections and OSHA inspection programs should be coordinated to maximize information collection and sharing, consolidate compliance assistance efforts, and unify enforcement activities among all EPA and OSHA asbestos programs.

## ADDITIONAL INFORMATION

The 1991 *Implementation Strategy* also provides a summary of new requirements and information regarding waste disposal site inspections and recordkeeping inspections at waste sites and contractors. The strategy also discusses the current status of NARS as it relates to incorporating waste shipment information into the database, and future plans. Violations associated with waste handling and disposal recordkeeping and reporting requirements are discussed, and information regarding important applicability and policy determinations provided as well.

# SECTION 3

# HEALTH EFFECTS OF EXPOSURE TO ASBESTOS

The fact that asbestos is a hazard to man's health was recognized quite early. In the first century AD both Romans and Greeks wrote of a sickness of the lungs in slaves whose occupation was the weaving of asbestos into cloth. However, the association of asbestos with chronic respiratory disease had to be rediscovered in the modern era.

A number of nonmalignant and malignant conditions are now known to be related to asbestos exposure. These include asbestosis, lung cancer, mesothelioma, and other cancers and conditions.

In the late 1920s, Dr. E.R. Merriweather, a London physician whose interest was piqued by a series of case reports, conducted an epidemiological study of 363 asbestos textile workers. He stated in his 1930 published report that 26 percent of the workers examined showed signs of asbestosis, a scarring of the lungs. This report firmly linked asbestos exposure with lung disease.

In 1949, Dr. Kenneth Smith, Medical Director of Johns-Manville, published a report describing an excess of cancer of the lung and pleura among individuals dying from asbestosis.

In South Africa, in the 1960s, numerous crocidolite miners were reportedly dying of a form of tuberculosis unresponsive to traditional antibiotic therapy. Dr. Chris Wagner discovered that many of these cases of "TB" were actually mesothelioma, a rare and fatal cancer of the tissue (mesothelium) that covers the internal organs and lines the chest and abdominal cavities.

It is now clear that among asbestos workers there is, in addition to the risk of asbestosis, a greatly increased risk of death from lung cancer and from pleural (chest) and peritoneal (abdominal) mesothelioma, malignancies that are seldom found in the general population. Moreover, asbestos has been linked with gastrointestinal and other cancers and conditions.

## ROUTES OF EXPOSURE

Through the course of normal human activities there are three principle exposure routes for asbestos fibers: (1) inhalation; (2) ingestion; and (3) skin contact. The following provides information regarding the potential hazards of each route of entry.

## HEALTH EFFECTS ASSOCIATED WITH INHALATION

As previously mentioned, epidemiological investigations have demonstrated that inhalation of asbestos fibers may lead to increased risk of developing one or more diseases. It is important to recognize that the majority of people who have developed asbestos-related diseases were asbestos workers who were frequently exposed to high concentrations of asbestos fibers every working day with little or no respiratory protection to minimize their risk.

In this section the respiratory system and each of the major diseases associated with asbestos exposure will be described. The risks of developing such diseases and ways to minimize the risks also will be noted.

### The Respiratory System

The respiratory system is divided into two segments: the upper and lower air passages. The upper air passage extends from the nose to the larynx, while the lower air passage extends from the larynx to the terminal bronchioles of the bronchial tube system. Once air has passed through the upper air passages, it moves into the region of the lower air passages via the trachea (windpipe) which traverses the neck. The trachea enters the thorax where it divides into two branches called bronchi. These bronchi lead to the left and right lungs as illustrated in Figure 3-1.

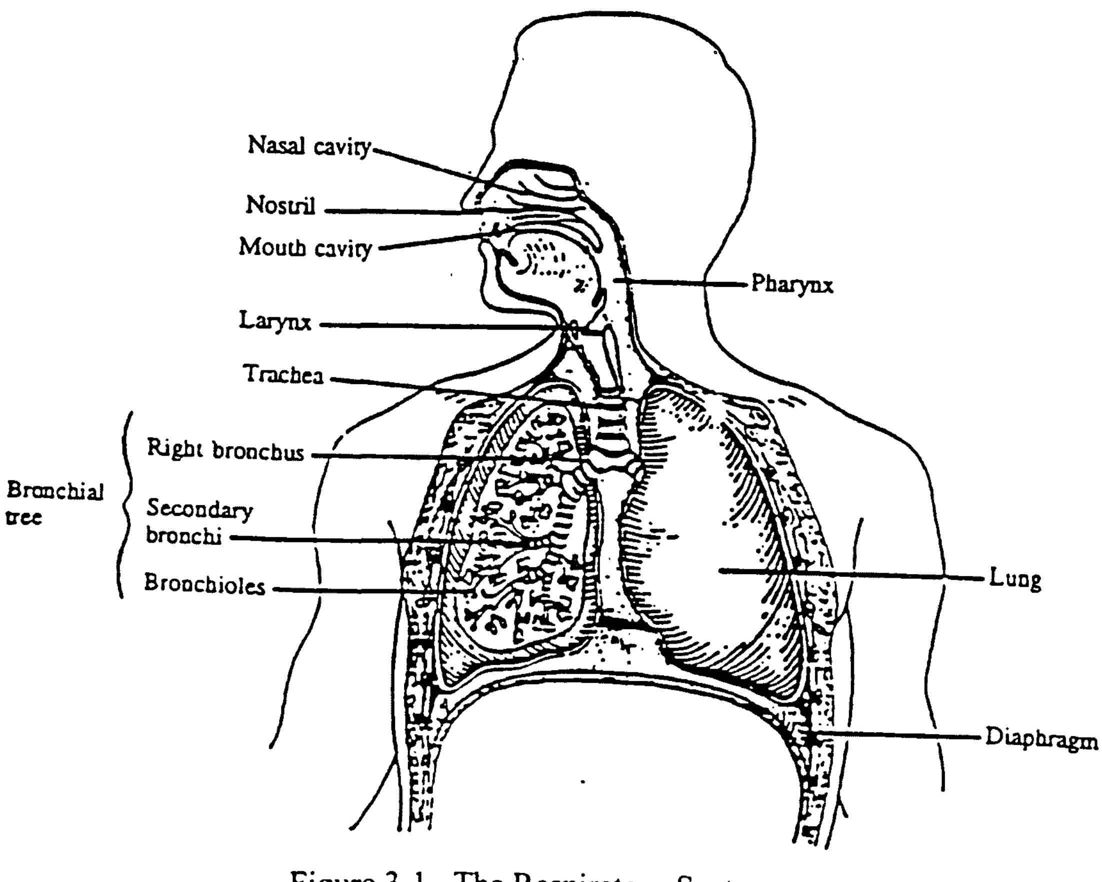



Figure 3-1. The Respiratory System

Each bronchus subdivides into many smaller bronchial tubes which, in turn, divide to become even finer bronchioles. The bronchioles end in microscopic air sacs made up of clusters of even tinier sacs called alveoli, which constitute most of the lung tissue. There are approximately 300,000,000 alveoli whose combined surface area is about 70 $m^2$.

The alveolar walls contain numerous capillaries, the body's tiniest blood vessels. In the lung the exchange of carbon dioxide for oxygen takes place across the thin membranes of the alveoli and capillaries.

**Defense Mechanisms**

During inhalation the larger particles in the air stream entering the nose are filtered out by the nasal hairs or trapped by the secretions of mucous membranes in the sinus cavities. A second level of defense is the triggering of the cough mechanism which forces particles out of the trachea into the throat area where they can be swallowed. A third level of physiological defense occurs in the lining of the trachea and bronchial tubes. There, tiny, hair-like, mucus-coated structures known as cilia beat upward in a wave-like motion. This motion, known as the muco-ciliary escalator, is responsible for moving contaminants from the air passageways to the throat where they are swallowed. The respiratory system appears to be able to filter out particles which are at least 5$\mu$ long.

The final line of defense rests within the alveoli. There, alveolar macrophages (mobile white blood cells) engulf foreign bodies and digest them using strong acids and enzymes.

**Routes of Inhalation Exposure**

It is important to recognize that there are asbestos fibers in all the air we breathe. Since the majority of asbestos-related health problems involves the lung and lung region, inhalation of asbestos fibers is undoubtedly a situation that must be minimized. Individuals may control their exposure to asbestos fibers by properly using respirators and minimizing the time spent in areas of high asbestos fiber concentrations. The various types of inhalation exposure pathways are listed below.

***Occupational Exposure***

Direct occupational exposure occurs in individuals who work in asbestos mines, mills, landfills, manufacturing or fabricating plants and asbestos abatement sites (See Table 3-1).

| TABLE 3-1. ASBESTOS ABATEMENT FIBER LEVELS | | |
|---|---|---|
| **Work Area Air Samples** | **Geometric Mean (f/cc) (50th percentile)** | **Range of Mean Fiber Concentrations Among Abatement Projects (f/cc)** |
| All work areas | 0.74 | less than 0.1 - 30.0 |
| Wet removal only | 0.48 | less than 0.1 - 12.0 |
| Dry removal only | 11.9 | 3.7 - 30.0 |

Reference: "Air Sampling at 52 Asbestos Abatement Projects" (William M. Ewing) referred to in "Draft Scenarios and Respiratory Protection Recommendations for EPA Inspectors (OHSS Memorandum, January 30, 1987).

### *Para-occupational Exposure*

Individuals who are exposed to asbestos fibers brought home by workers on their contaminated work clothes or who encounter asbestos fibers from deteriorating or disturbed friable asbestos building materials experience para-occupational exposure.

A 1984 EPA study estimated that over 700,000 of more than 3 million public and commercial buildings have some type of friable ACM within their structure.
In 1991 the Health Effects Institute-Asbestos Research (HEI-AR), established to determine for EPA the public's actual exposure to asbestos in such buildings, reported that their literature search revealed that occupants of public and commercial buildings are exposed to average concentrations of 0.00008 f/ml, an exposure level almost identical to urban outdoor concentrations of 0.0001 f/ml (See Table 3-2).

### *Neighborhood Exposure*

Neighborhood exposure is incurred by people who live or work near asbestos mines, manufacturing or fabricating plants, demolition or renovation sites, asbestos landfills or areas where equipment or machinery is sprayed with asbestos-containing fireproofing or insulating material.

### *Ambient Background Exposure*

Asbestos exposure by this pathway is a result of the release of fibers from the weathering of exposed asbestos-bearing rocks and from the use or weathering of asbestos-containing products such as brake linings, shingles or cladding (See Table 3-2).

| TABLE 3-2. AMBIENT ASBESTOS FIBER LEVELS | |
|---|---|
| **Area** | **Mean Fiber Concentration (f/ml)[1]** |
| **Outdoor** | |
| rural | 0.00001 |
| urban | 0.0001 |
| **Indoor** | |
| school[2] | 0.00051 (0.00038)[3] |
| public/commercial[4] | 0.00020 (0.00008)[3] |

1 Fibers >5 μm in length
2 N = 48
3 Mean fiber concentration with highest sample concentration excluded from mean
4 N = 54 (43 = GSA buildings)
Source: HEI-AR "Asbestos in Public and Commercial Buildings..." (1991) - non litigation data only.

On average, an adult male breathes approximately 20 cubic meters of air per day. Since airborne asbestos concentrations are expressed in fibers/cubic centimeter of air, for a typical ambient concentration of 0.0001 f/cc (or 100 f/$m^3$), the daily exposure to asbestos through inhalation is approximately 2000 fibers/day.

Because the medical community has been unable to establish a "safe level" of asbestos exposure, the regulatory community has been forced to rule that asbestos release be kept "to the minimal extent economically feasible."

**Diseases Associated with Asbestos Inhalation**

Several diseases and conditions have been linked to asbestos fiber inhalation. These include asbestosis, lung cancer, mesothelioma, gastrointestinal cancers, and other abnormalities. Much of the following information concerning the health effects of airborne asbestos has been extracted from the HEI-AR "Asbestos in Public and Commercial Buildings..." 1991 document.

***Asbestosis***

Asbestosis is a progressive, disabling, and potentially fatal disease caused by the inhalation of asbestos fibers. Inhaled asbestos fibers cause inflammation (alveolitis) to occur, which may result in the development of scarring and fibrosis and subsequent impairment of gas exchange. The extent of damage to the lungs is dependent upon the amount of asbestos in the lungs, fiber type and length, and individual susceptibility. Although all forms of asbestos are known to cause asbestosis, some researchers have found that amphiboles are more likely than chrysotile to cause the disease.

Common symptoms of asbestosis include fatigue, shortness of breath, chest pain, a dry or productive cough, and rales (a crackling sound heard posteriorly in the bases of the lungs). Asbestosis appears radiologically as irregular linear opacities predominantly in the lower lobes.

Studies designed to elucidate the development of asbestosis have revealed that alveolar macrophages (AMs) may be responsible for the initiation of the inflammatory and ultimate fibrotic response. AMs which accumulate where asbestos fibers are deposited in the lung produce a complex mixture of chemical substances including growth factors, prostaglandins (inflammatory agents), and active oxygen species (AOS) which are cytotoxic chemicals. In vitro studies involving rodent Ams have revealed that long asbestos fibers (those greater than 10 $\mu$m in length) cause a greater production of AOS than short fibers and nonfibrous particles do. Incomplete phagocytosis of long fibers is theorized to cause this difference.

There is a clear dose-response relationship between asbestos exposure and the development of asbestosis - the greater the exposure, the greater the likelihood of developing the disease. Asbestosis is prevalent among workers who have been exposed to large doses of asbestos fibers over a long period of time. These include miners, millers, manufacturers of asbestos products, insulators, shipyard workers, and veteran custodians. Like all asbestos-related diseases, asbestosis has a long latency period, typically 15-30 years.

Many individuals with asbestosis may suffer from asbestos-related lung cancer as well, although the relationship between lung fibrosis and cancer is unclear. There are an estimated 4,000 deaths/year associated with asbestosis; nearly all of these deaths occur in individuals who smoke and also suffer from emphysema.

Asbestos inspectors who use appropriate safety precautions as described in this workshop have a very small risk of developing asbestosis as a result of their work.

***Lung Cancer***

Asbestos-related lung cancers typically arise in the tracheobronchial epithelial or alveolar cells of the respiratory tract. Although such tumors are indistinguishable from those caused by cigarette smoke or radon decay products, the relationship between asbestos exposure and lung cancer has been well documented.

Lung cancer, like asbestosis, appears to be dose-related and exhibits a long latency period, typically 20-30 years. Symptoms of lung cancer include a cough or a change in cough habit and/or persistent chest pain.

Death rates among exposed workers are lowest in chrysotile miners and workers who manufactured friction materials and highest among individuals who mined and worked with amphibole asbestos. Lung cancers have also been found in talc miners and millers (tremolite/anthophyllite contamination suspected as the cause) and in building janitors, plumbers, pipefitters, construction laborers, welders and sheet metal workers.

While employees who did not smoke and were exposed to industrial concentrations of asbestos in the past have had a 5X greater risk of developing lung cancer than that of the general public, their risk is not as great as that experienced by a smoker with no known asbestos exposure (10X the risk). The effects of cigarette smoking and asbestos exposure are synergistic; that is, the combined effects create a greater than 50X risk of developing lung cancer in those individuals exposed to both asbestos and cigarette smoke.

Research into the relationship between smoking and asbestos exposure has revealed that smoking impairs clearing of asbestos fibers from the lungs and increases the retention of fibers in airway epithelial cells. A combination of cigarette smoke and asbestos has been shown to induce the production of AOS which can cause chemicals in smoke to become more mutagenic and carcinogenic. Toxic chemicals from cigarette smoke have also been found to adsorb onto asbestos fibers which, if taken into cells, may initiate tumor formation.

Lung cancer is extremely rare among nonsmokers, even those who have experienced quite heavy asbestos exposure, so an individual's decision not to smoke is an important defense mechanism.

While there are more than 434,000 deaths/year attributable to cigarette smoking, only 2,000 lung cancer deaths/year are believed to be caused by asbestos exposure. Since most of the lung cancers noted are thought to have resulted from exposures incurred in the past in industries where workers wore little or no protective equipment in highly contaminated environments, an asbestos inspector who follows appropriate safety procedures has very little risk of developing asbestos-related lung cancer.

***Mesothelioma***

Mesothelioma is a rare cancer of the mesothelium, a thin tissue layer which lines body cavities and surrounds internal organs. Mesothelioma arises from mesothelial cells or underlying mesenchymal cells in the pleura, pericardium or peritoneum. Mesothelioma which arises in the chest cavity is called pleural mesothelioma; that which develops in the abdominal cavity is called peritoneal mesothelioma. Both types of mesothelioma spread rapidly and are always fatal, usually within a year of diagnosis. There does not appear to be any increased risk of mesothelioma for smokers.

Pleural mesothelioma may begin as a small nodule which seeds the pleural cavity. The tumor involves both layers of mesothelium and can invade the chest wall and lung and spread to the rest of the body via the lymphatic and circulatory systems. Pleural mesothelioma accounts for approximately 85% of all reported cases and is characterized by shortness of breath, chest wall pain, and fluid in the chest cavity. The risk of acquiring pleural mesothelioma is higher following exposure to crocidolite than to either chrysotile or amosite asbestos.

Peritoneal mesothelioma, which accounts for the remaining 15% of reported cases, is characterized by abdominal pain and swelling and is almost always attributed to amosite or crocidolite exposure.

The latency period for the development of mesothelioma is usually 20-40 years or more following exposure. Although approximately 1500-2500 cases of mesothelioma are diagnosed each year in the U.S., the annual incidence of this disease may be either under- or overestimated, for mesothelioma may resemble metastases of other tumor types.

Most mesotheliomas can be linked to past asbestos exposure in an industrial environment or household contact with an asbestos worker. In some cases only brief exposure to asbestos has been implicated in the disease. Mesothelioma is also known to afflict individuals who live near asbestos mines. In 10-30 percent of all reported cases of mesothelioma, however, no known asbestos exposure has occurred.

Post-mortem studies involving lung tissue analysis have concluded that, like other asbestos-related diseases, the risk of developing mesothelioma is also dose-related. Although all asbestos fiber types have been implicated in the development of mesothelioma, amphiboles (amosite, and particularly crocidolite) appear to be more potent causes. Exposure to long ($>8\mu m$), thin ($<0.25\mu m$) fibers is also more likely to result in mesothelioma than exposure to shorter, thicker fibers.

***Other Diseases***

In some studies of workers occupationally exposed to asbestos, an increased risk of tumors of the gastrointestinal tract, larynx, kidney, ovary, pancreas, pericardium, eye and lymphatic system has been reported. Since many of these cancers may have other etiologies, the role of asbestos in their initiation is not clearly understood.

A *Journal of the National Cancer Institute* article published in December 1991 indicated that an elevated risk of colorectal cancer and adenomatous polyps (growths of glandular origin which are common precursors to colorectal cancer) was seen among study subjects who had a significant exposure to asbestos. Although the number of subjects was small (51 with cancer, 153 with adenomatous polyps, and 195 controls), of the 12 subjects (3% of the total population) who were classified as having had significant exposure to asbestos, 6 (50%) had adenomatous polyps and 3 (25%) had colorectal cancer.

***Other Abnormalities***

In addition to asbestosis, lung cancer and mesothelioma, inhalation of asbestos fibers is associated with the development of *pleural plaques, diffuse pleural thickening, pleuritis* and *benign lung masses*. Such diseases typically do not develop for 20 or more years following initial exposure and their prevalence is related to the duration of exposure.

*Pleural plaques* are diffuse areas of scar tissue that may form on the mesothelium of the chest cavity or, more rarely, on the pericardium. In individuals free of other lung disease, pleural plaques are asymptomatic and cause no significant lung dysfunction.

*Diffuse pleural thickening* is a more pronounced scarring of the pleura caused in most cases by adhesions resulting from *pleuritis,* an inflammation of the pleura. Pleural thickening can cause lung restriction and reduce lung volume.
*Benign lung masses* (that can be mistaken for carcinomas) are found in up to 10 percent of workers occupationally exposed to asbestos. Most benign lung masses are sites of inflammation and infolding of the lung tissue associated with adhesive fibrothorax.

Although once regarded as simply indicators of asbestos exposure, fibrotic pleural lesions are now recognized as capable of reducing lung function and causing disability. Some unconfirmed studies have reported that pleural plaques are associated with a higher incidence of lung and laryngeal cancer, and probably mesothelioma.

Since pleural disease may be the only indication of asbestos exposure in an individual, the detection of such abnormalities should trigger close medical surveillance.

## HEALTH EFFECTS ASSOCIATED WITH INGESTION

During the early 1980s the issue of potential health hazards associated with ingestion of asbestos fibers was closely examined by EPA's Office of Drinking Water (ODW). The ODW reviewed numerous human and laboratory animal epidemiological studies and, despite the uncertainty of research conclusions linking an increased risk of development of digestive tract cancers to exposure to asbestos fibers, proposed to establish an asbestos fiber limit in drinking water. In January 1991 a limit of 7 million asbestos fibers (greater than 10 $\mu$m in length) per liter of drinking water was established in the *National Primary Drinking Water Regulations.*

## HEALTH EFFECTS ASSOCIATED WITH SKIN CONTACT

Although repeated contact with asbestos has been known to cause warts, the dermal route of asbestos fiber entry to the body is not considered a major health issue. However, since ACM contains a variety of substances which may cause skin irritation and rashes, it is always wise to wear protective clothing when working with asbestos materials.

## THEORIES ON HAZARD RELATIONSHIPS

Factors which contribute to the development of asbestos-related disease include the following: extent of asbestos exposure; fiber type; fiber dimensions; age at exposure; and individual susceptibility. At the present time, however, no means exists to conclusively determine which individuals will or will not develop asbestos-related illnesses following exposure.

**Extent of Exposure**

In general, individuals who experience a lengthy exposure to high levels of airborne asbestos suffer a greater risk of developing any of the asbestos-related diseases than individuals who have not been so exposed. In addition, in the case of asbestosis, the greater the exposure, the greater the likelihood of developing a severe form of the disease.

**Asbestos Fiber Types**

All asbestos fiber types have been implicated in the development of asbestos-associated illnesses. Some human epidemiological studies, however, indicate that the risk of developing asbestosis, lung cancer, or mesothelioma is greater if an individual has been exposed to amphibole rather than serpentine (chrysotile) fibers.

The increased risk following exposure to amphibole fibers is thought to result from the body's inability to purge itself of inhaled amphibole fibers. Unlike chrysotile fibers, which ones body can rapidly dissolve following deposition (and whose lung burden thus equilibrates over time), amphibole fibers accumulate in the lungs throughout the duration of exposure.

This fact may help explain why both amosite and crocidolite have caused a high risk of mesothelioma after only a brief exposure, whereas chrysotile has not been so implicated. Short intense amosite exposure has also resulted in a high lung cancer rate.

Since the medical community cannot come to a consensus regarding the relative risks of amphibole vs. serpentine exposure (and because most people are exposed to a mixture of such fiber types anyway), the EPA and OSHA have chosen not to distinguish one from the other when regulating asbestos.

**Asbestos Fiber Dimensions**

In vitro studies, experiments with laboratory animals, and reviews of human exposure studies indicate that both fiber length and diameter (which affect penetration into and deposition of fibers within the lungs) are critical factors in the incidence of asbestos-related disease.

The pathogenicity of asbestos fibers increases with increasing length. Although the minimum length of asbestos fibers capable of generating a deleterious response is not specifically known, in vivo inhalation and injection studies have found that fibers less than 5 $\mu m$ are much less toxic than those greater than 5 $\mu m$. Very short fibers appear to produce little or no asbestos-related disease.

Medium-length fibers (8-10 $\mu$m) are capable of reaching the alveoli of the lungs and are implicated in the development of mesothelioma.

Fibers longer than >10 $\mu$m tend to be captured by the body's defense mechanisms and deposited in the airways. Some evidence suggests that very long fibers (>20 $\mu$m) cause severe damage to lung tissue. Fibers ranging from 15-25 $\mu$m have been implicated in the development of lung fibrosis and lung cancer.

The diameter of asbestos fibers also affects their pathogenicity; smaller diameters appear more harmful than thicker diameters. Fibers with diameters of approximately 0.1 - 3.0 $\mu$m appear to be most capable of causing harm. Fibers thinner than 0.1 $\mu$m are poorly retained in the lungs, and those with diameters >3 $\mu$m appear incapable of penetrating the lungs where they could do harm. The upper fiber diameter limit associated with asbestosis and lung cancer is about 3 $\mu$m. In the case of mesothelioma, the upper fiber diameter limit is much less, apparently because thin fibers more readily penetrate to the alveoli from which the durable fibers may migrate to the lung interstitium, pleural surfaces, and other parts of the body.

In conclusion, evidence suggests that exposure to long (>5 $\mu$m), thin (<3 $\mu$m) fibers generates a greater risk of developing asbestos-related diseases than exposure to short, thick fibers.

The EPA and OSHA do not attempt to regulate any particular size of asbestos fiber. In fact, it should be noted that the PCM analytical method for counting air fiber concentrations considers only those particles greater than 5 microns in length which have a minimum length to width (aspect) ratio of 3:1.

**Age at Exposure**

HEI-AR's literature review reports that lifetime risks of developing lung cancer and mesothelioma have been predicted in a number of studies which took into account age at first exposure and duration of exposure at a given fiber level. In general, the eventual lung cancer risk is assumed to be independent of age at exposure, but the predicted mesothelioma risk is much greater when exposure begins at an early age. The mesothelioma risk exceeds the lung cancer risk, even among smokers, for childhood exposure, whereas exposure in middle age results in a substantially lower mesothelioma risk. Among nonsmokers, the lung cancer risk is much smaller than the mesothelioma risk irrespective of age at exposure.

**Individual Susceptibility**

Another factor to consider in looking at the risks from asbestos exposure involves one's body's reaction to asbestos fibers. Why some people who are greatly exposed to airborne asbestos develop an asbestos-related disease while others who are similarly exposed develop a different asbestos disease or none at all is a question our present scientific/medical community cannot answer.

## SECTION 4

## IDENTIFYING ASBESTOS-CONTAINING MATERIALS

In order to properly conduct asbestos NESHAP compliance inspections, inspectors must be knowledgeable of the various commercial uses and applications of asbestos products and which of these are regulated under the asbestos NESHAP. Recognizing the various appearances, compositions, uses and application techniques can assist the inspector in deciding if a violation has or has not occurred. The remainder of this section provides information that should assist inspectors in recognizing ACM, both in the intact and disturbed state.

### IMPORTANT DEFINITIONS

*ACM* - Asbestos-containing material.

***Asbestos*** - The asbestiform varieties of serpentinite (chrysotile), riebeckite (crocidolite), cummingtonite-grunerite (amosite), anthophyllite, and actinolite-tremolite.

***Asbestos-containing waste materials (ACWM)*** - Mill tailings or any waste that contains commercial asbestos and is generated by a source subject to the provisions of this subpart. This term includes filters from control devices, friable asbestos waste material, and bags or other similar packaging contaminated with commercial asbestos. As applied to demolition and renovation operations, this term also includes regulated asbestos-containing material waste and materials contaminated with asbestos including disposable equipment and clothing.

***Category I nonfriable ACM*** - Asbestos-containing packings, gaskets, resilient floor covering, and asphalt roofing products containing more than 1 percent asbestos as determined using the method specified in appendix A, subpart F, 40 CFR part 763, section 1, Polarized Light Microscopy.

***Category II nonfriable ACM*** - Any material, excluding Category I nonfriable ACM, containing more than 1 percent asbestos as determined using the methods specified in appendix A, subpart F, 40 CFR part 763, section 1, Polarized Light Microscopy that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.

***Friable asbestos material*** - Any material containing more than 1 percent asbestos as determined using the method specified in appendix A, subpart F, 40 CFR part 763 section 1, Polarized Light Microscopy, that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure. If the asbestos content is less than 10 percent as determined by a method other than point counting by polarized light microscopy (PLM), verify the asbestos content by point counting using PLM.

*In poor condition* - The binding of the material is losing its integrity as indicated by peeling, cracking, or crumbling of the material.

*Regulated asbestos-containing material (RACM)* - (a) Friable asbestos material, (b) Category I nonfriable ACM that has become friable, (c) Category I nonfriable ACM that will be or has been subjected to sanding, grinding, cutting, or abrading, or (d) Category II nonfriable 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 this subpart.

*Resilient floor covering* - Asbestos-containing floor tile, including asphalt and vinyl floor tile, and sheet vinyl floor covering containing more than 1 percent asbestos as determined using polarized light microscopy according to the method specified in appendix A, subpart F, 40 CFR part 763, section 1, Polarized Light Microscopy.

## ASBESTOS USES AND CHARACTERISTICS

Since asbestos minerals are fibrous and exhibit varying degrees of heat resistance, tensile strength, flexibility, and chemical resistance, they have been incorporated into approximately 3,600 products. These products include heat-resistant textiles, reinforced cement, special filters for industrial chemicals and cigarettes, thermal and acoustical insulation, floor tiles, gaskets, and brake linings.

Table 4-1 provides a summary of asbestos content in several commercial product categories. In addition to asbestos, commercial products typically contain fillers, binders and other components.

**TABLE 4-1. SUMMARY OF ASBESTOS-CONTAINING PRODUCTS**

| Product | Average Percent Asbestos |
|---|---|
| **Insulating and Decorative Products** | |
| Spray Coating | 50 |
| Troweled Coating | 70 |
| Preformed Pipe Wrap | 50 |
| Boiler Insulation | 10 |
| **Cement Pipe and Sheet** | 20 |
| **Paper Products** | |
| Roofing Felt | 10 |
| Gaskets | 80 |
| **Plastic Products** | |
| Floor Tile | 20 |
| Coatings and Sealants | 10 |
| Rigid Plastics | 50 |
| **Friction Products** | 50 |
| **Textile Products** | 80 |

Of the six asbestos minerals, chrysotile use comprises approximately 93 percent of the total consumption of asbestos fibers. Chrysotile fibers are very thin, flexible, and strong, and have been used in fireproofing, cement products, asphalt and vinyl flooring, brake linings, clutch facings, gaskets, reinforced plastics and many other products.

The remaining 7 percent of the total asbestos fibers consumed consists primarily of amosite and crocidolite. Amosite, less flexible but more heat and acid resistant than chrysotile, is often found in high-temperature applications (e.g., block insulation, fire brick), but may also be found in small amounts as filter aids in pressure piping products and in spray-on fireproofing. Crocidolite, very resistant to acids and to the effects of outdoor exposure, may be found in combination with chrysotile in asbestos-cement pressure pipes, textile, and filtration products.

Anthophyllite, actinolite, and tremolite are used primarily in adhesives and cements. They are too brittle for textile products or for use as fibrous reinforcement.

The use of asbestos products has declined greatly since the late 1970s as EPA and the Consumer Product Safety Commission have banned the use of some products (insulation, fireproofing, lagging, etc.). There has also been a voluntary banning of asbestos use in items such as hair dryers.

Table 4-2 is provided to help inspectors recognize trade names of asbestos building products. This list includes information received by EPA from previous and current manufacturers of asbestos products under the *Asbestos Information Act of 1988* but should not be considered all-inclusive.

Table 4-3 provides additional information concerning asbestos-containing materials found in buildings.

## ASBESTOS USE IN BUILDINGS

The following categories of ACM are often found in buildings:

- surfacing materials
    - fireproofing
    - thermal insulation
    - acoustical insulation
    - decorative uses
- thermal system insulation
- miscellaneous

## Asbestos Surfacing Materials

Asbestos-containing surfacing materials are coatings which were spray-applied or troweled onto steel I-beams, decks, concrete ceilings and walls, and other surfaces. They were used for fireproofing, thermal insulation/condensation control, acoustical insulation, and decorative purposes. Often a single application served more than one of these purposes (e.g., acoustical and decorative; fireproofing and thermal insulation).

Sprayed coatings may appear cementitious or fluffy, while troweled coatings have a smooth finish and may be covered with a layer of plaster or other non-asbestos material. Both sprayed and troweled asbestos coatings are friable in most applications. In 1973 the spray application of most asbestos coatings to buildings, structures, pipes, and conduits was banned.

In its 1986 standard, OSHA banned all applications of asbestos-containing products through spray techniques. However, the U.S. Court of Appeals for the District of Columbia reviewed this ban and concluded that "the support for the ban plainly fails to meet the 'substantial evidence' standard... (and stated that the) ban cannot stand."

Effective January 19, 1990, OSHA amended the regulatory text of the final asbestos standard by deleting the prohibition regarding the spray application of asbestos-containing products. It is believed that deleting this prohibition will not significantly increase the risk to employees.

### *Fireproofing*

Since high temperatures can result in a deterioration of ductility, tensile and compressive strengths in building materials, asbestos has been widely used by the construction industry to fireproof structural steel.

### *Thermal Insulation/Condensation Control*

Asbestos-containing materials exhibit very low thermal conductivity. For this reason they were often applied to steel, concrete, or other building surfaces to minimize heat loss or gain. Such use of ACM reduced the amount of energy needed to heat or cool buildings and controlled condensation which could result in ceiling and wall "sweating," metal corrosion, and rotting of wood components.

### *Acoustical*

Since asbestos is fibrous in nature and thus lacks a reverberant surface, it has proved to be an excellent soundproofing material. It was used extensively in schools (hallways, stairwells, band rooms, gymnasiums), restaurants, hotels, and auditoriums for this purpose prior to the 1970s.

TABLE 4-2. TRADE NAMES

| Type of Application | Trade Names | | |
|---|---|---|---|
| Sprayed-on | Armaspray | Pyrospray | Econo-White 70 |
| | Spraycraft | Mono-spray | Z-tex |
| | Litecast 30 | Mono-K | Perltex Super-40 Perlite |
| | Decorative Spray Coatings | Fire-Shield Plaster | High-Sorb Acoustical Plaster |
| | Cover-Tex | White Spray-on Acoustical Plaster | Spray-Wyt |
| | Spray-Tex | Super White Sprayolite | Versakote |
| | Kaiser-Tex | QT Simulated Acoustical Spray Texture | Prep Coat #3 |
| | K-Spray Ceiling Texture | Imperial "QT" Texture Finishes | Perlcoustic |
| | | Improved Spray Texture B-8 | |
| | | Zonolite | |
| Pipe Coverings, Block Products, Cements | Superex (M, 1900) | Prasco | Cement (707, Super 606, 100, 303, A-01, 7M-0, LF-0, MW-0) |
| | Thermobestos | Caltemp (Caltherm) | Careytemp Finishing Cement |
| | Min-K products | Kaylo | Vitricel Cement |
| | Nonpareil | LK insulation | Porter Binding Mortar |
| | LT Cork Covering | Pyrocal | Transite products |
| | Alltemp | Calsilite | Firelite Furnace Cement |
| | Careytemp | Celasbestos | Insulkote |
| | Aircel (Aircell) | Watcocel | Duplex |
| | Carocel | Imperial insulation | Asbestile |
| | Defendex | Aristo insulation | Laptite |
| | Excel | Anti-Sweat Pipe Covering | Pallite |
| | Glosscell | Frost-Proof Pipe Covering | Super "66" |
| | Multi-Ply | Range Boiler Jacket | Eagle "66" |
| | Tempcheck | K-Fac 19 | One-Cote Insulating and Finishing Cement |
| | Hi-temp | Corrugated Wool Felt Air Cell Covering | Thermal insulating cement (No. 127, Colorok, Stormlap, Pabflex, Stonite) |
| | Thermalite | Pyrobestos | Insulating Cement (115, 214, Grade AA, A, HF, H.T., 203, A-11) |
| | Thermasil | | Satin Finish Cement |
| | Enduro | | |

1 Source = Asbestos: Publication of Identifying Information (55FR 5144), February 1990

TABLE 4-3. ASBESTOS-CONTAINING MATERIALS FOUND IN BUILDINGS[1]

| Subdivision | Generic name | Asbestos (%) | Dates of use | Binder/sizing |
|---|---|---|---|---|
| Surfacing material | sprayed- or troweled-on | 1-95 | 1935-1970 | sodium silicate, portland cement, organic binders. |
| Preformed thermal insulating products | batts, blocks, and pipe covering | | | |
| | 85% magnesia | 15 | 1926-1949 | magnesium carbonate |
| | calcium silicate | 6-8 | 1949-1971 | calcium silicate |
| Textiles | cloth | | | |
| | blankets (fire) | 100 | 1910-present [2] | none |
| | felts: | 90-95 | 1920-present | cotton/wool |
| | blue stripe | 80 | 1920-present | cotton |
| | red stripe | 90 | 1920-present | cotton |
| | green stripe | 95 | 1920-present | cotton |
| | sheets | 50-95 | 1920-present | cotton/wool |
| | cord/rope/yarn | 80-100 | 1920-present | cotton/wool |
| | tubing | 80-85 | 1920-present | cotton/wool |
| | tape/strip | 90 | 1920-present | cotton/wool |
| | curtains (theatre, welding) | 60-65 | 1945-present | cotton |
| Cementitious concrete-like products | extrusion panels: | 8 | 1965-1977 | portland cement |
| | corrugated | 20-45 | 1930-present | portland cement |
| | flat | 40-50 | 1930-present | portland cement |
| | flexible | 30-50 | 1930-present | portland cement |
| | flexible perforated | 30-50 | 1930-present | portland cement |
| | laminated (outer surface) | 35-50 | 1930-present | portland cement |
| | roof tiles | 20-30 | 1930-present | portland cement |
| | clapboard and shingles: | | | |
| | clapboard | 12-15 | 1944-1945 | portland cement |
| | siding shingles | 12-14 | unknown-present | portland cement |
| | roofing shingles | 20-32 | unknown-present | portland cement |
| | pipe | 20-15 | 1935-present | portland cement |
| Paper products | corrugated: | | | |
| | high temperature | 90 | 1935-present | sodium silicate |
| | moderate temperature | 35-70 | 1910-present | starch |
| | indented | 98 | 1935-present | cotton and organic binder |
| | millboard | 80-85 | 1925-present | starch, lime, clay |
| Roofing felts | smooth surface | 10-15 | 1910-present | asphalt |
| | mineral surface | 10-15 | 1910-present | asphalt |
| | shingles | 1 | 1971-1974 | asphalt |
| | pipeline | 10 | 1920-present | asphalt |

Table 4-3 (Continued)

| Subdivision | Generic name | Asbestos (%) | Dates of use | Binder/sizing |
|---|---|---|---|---|
| Asbestos-containing compounds | caulking putties | 30 | 1930-present | linseed oil |
| | adhesive (cold applied) | 5-25 | 1945-present | asphalt |
| | joint compound | | 1945-1975 | asphalt |
| | roofing asphalt | 5 | unknown-present | asphalt |
| | mastics | 5-25 | 1920-present | asphalt |
| | asphalt tile cement | 13-25 | 1959-present | asphalt |
| | roof putty | 10-25 | unknown-present | asphalt |
| | plaster/stucco | 2-10 | unknown-present | portland cement |
| | spackles | 3-5 | 1930-1975 | starch, casein, synthetic resins |
| | sealants fire/water | 50-55 | 1935-present | caster oil or polyisobutylene |
| | cement, insulation | 20-100 | 1900-1973 | clay |
| | cement, finishing | 55 | 1920-1973 | clay |
| | cement, magnesia | 15 | 1926-1950 | magnesium carbonate |
| Asbestos ebony products | | 50 | 1930-present | portland cement |
| Flooring tile and Sheet Goods | vinyl/asbestos tile | 21 | 1950-present | poly(vinyl)chloride |
| | asphalt/asbestos tile | 26-33 | 1920-present | asphalt |
| | sheet goods/resilient | 30 | 1950-present | dry oils |
| Wallcovering | vinyl wallpaper | 6-8 | unknown-present | — |
| Paints and coatings | roof coating | 4-7 | 1900-present | asphalt |
| | air tight | 15 | 1940-present | asphalt |

[1] Source = Guidance for Controlling Asbestos-Containing Materials in Buildings (Purple Book), 1985 (EPA-560/5-85-024)

[2] Present = Mid- to late '70's

### *Decorative Uses*

Although the spray application of asbestos onto structural components was banned in 1973, architects continued to specify the use of asbestos for decorative purposes. In 1978 EPA banned this use of ACM.

## Thermal System Insulation

Thermal system insulation includes a wide variety of materials applied to pipes, fittings, boilers, breechings, tanks, ducts, and other structural components to prevent heat transfer or water condensation. The following examples of thermal system insulation are based on product categories.

### *Pipe Insulation*

Preformed pipe insulation with an asbestos content of about 50 percent has been used for thermal insulation of steam pipes in industrial, commercial, institutional, and residential applications. This product is usually white and chalky in appearance and typically was applied as 3-foot long, half-round sections, held onto the pipe by a covering of plaster-saturated canvas and metal bands. Preformed insulation was applied on straight runs of pipe, while wet-applied coatings were used on elbows, flanges, and other irregular surfaces. The installation of wet-applied and preformed asbestos insulation was banned in 1975.

Another type of asbestos-containing pipe insulation is known as "air-cell" insulation. Air-cell insulation is manufactured on conventional papermaking equipment using asbestos fibers rather than cellulose. The final product may contain up to 85 percent asbestos and is typically coated or laminated with other materials.

Air-cell insulation looks and feels like corrugated cardboard and is generally rolled onto the pipe in several layers. It is medium gray in color and commonly held in place with a canvas wrap and metal bands.

Pipes may also be insulated with an asbestos-containing felt.

### *Boilers and Hot Water Tanks*

Asbestos-containing preformed block insulation has been used as thermal insulation on boilers, hot water tanks, and heat exchangers in industrial, commercial, institutional, and residential applications. The blocks are commonly chalky, white, 2 inches thick and from 1 to 3 feet square. They are often held in place around the boiler by metal wires or expanded metal lath. A plaster-saturated canvas was often applied as a final covering or wrap. The installation of this type of asbestos insulation was banned by EPA in 1975. Asbestos-containing fire brick and gaskets may also be found as heating system components.

### *Elbows, Valves and T-Fittings*

Batch mixed ACM has been trowel-applied to irregular joints (elbows, valves, T-fittings, etc.) on thermal systems. The insulation is often covered with a canvas wrap or other covering similar to the adjacent pipe wrap which may make it difficult to distinguish from the material in the straight runs. It is not uncommon to find asbestos-containing "elbow mud" or "lagging" adjacent to straight-runs of non-asbestos pipe insulation. ACM may also be found in valve packings.

**Note:** Fiber glass insulation may have been applied over existing asbestos insulation. Be sure to check the entire depth of insulation when searching for suspect ACM.

### Miscellaneous Building Materials

Miscellaneous materials include both friable and non-friable forms of asbestos-containing materials. Friable materials include ceiling tiles (such as the 2' x 3' drop-in types and the 1' x 1' glue-in panels), asbestos-containing paper (commonly found underneath wooden floor boards), plaster, and joint compound. It is estimated that 5 to 10 percent of currently installed ceiling tiles contain asbestos.

Both Category I and Category II nonfriable ACM may be found in buildings. Category I materials include resilient floor covering and mastic, packings, gaskets, and asphaltic roofing products. Category II materials include such items as asbestos-cement (Transite) sheet and pipes, terrazzo flooring, caulkings, glazing, ductwork flex connectors, siding shingles, and laboratory table tops. Although the asbestos in these products is typically tightly bound and nonfriable, with age, or during the course of demolition or renovation, such materials may become friable. Because of this, inspectors must evaluate such materials for their potential to become friable on a case-by-case basis.

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## SECTION 5

## ASBESTOS INSPECTOR SAFETY GUIDANCE

Safety requirements and/or guidelines for government employees involved in asbestos activities are addressed in one form or another in regulations and policies developed by several Federal government agencies/groups.

The Occupational Safety and Health Administration (OSHA) and the U.S. Environmental Protection Agency (EPA) have each promulgated regulations pertaining specifically to workers involved in the asbestos industry. The OSHA standards (29 CFR Parts 1910, 1915 and 1926) apply to general industry, shipyard and construction workers. The EPA Worker Protection Rule (40 CFR Part 763 Subpart G) extends provisions of the OSHA asbestos standard to State and local asbestos workers not covered by the Federal OSHA standard.

The National Institute for Occupational Safety and Health (NIOSH) and EPA were responsible for publishing respiratory protection safety guidance for persons who work in the asbestos abatement industry. Their document, *A Guide to Respiratory Protection for the Asbestos Abatement Industry* (EPA-560-OPTS-86-001, April 1986), provides information on the hazards associated with airborne asbestos, a model respiratory protection program, and recommendations concerning appropriate respirators for reducing asbestos exposure.

Most applicable to EPA asbestos NESHAP inspectors are the guidelines provided in EPA's *Health and Safety Guidelines for EPA Asbestos Inspectors*. These guidelines incorporate many of the procedures and practices recommended or required by the previously mentioned regulations and policies.

### OSHA ASBESTOS STANDARDS

OSHA regulates employee exposure to airborne asbestos fibers in the workplace. The current OSHA regulation encompasses three standards: General Industry (29 CFR Part 1910.1001), Shipyard Employment (29 CFR Part 1915.1001) and Construction (29 CFR Part 1926.1101). The Construction Standard is the first health standard issued solely for the construction industry.

The remainder of this subsection focuses on the regulatory requirements of the Construction Standard most pertinent to asbestos NESHAP enforcement personnel. This information is provided so that inspectors at abatement sites can better assess their personal needs regarding respiratory protection and protective clothing.

## Scope and Application

The Construction Standard regulates asbestos exposure in all work as defined in 29 CFR 1910.12(b), including, but not limited to, the following activities where chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, or actinolite asbestos is present:

- demolition or salvage;
- removal or encapsulation;
- construction, alteration, repair, maintenance or renovation;
- installation of products containing asbestos;
- spill/emergency cleanup; and
- on-site transportation, disposal, storage, containment of and housekeeping activities involving asbestos or products containing asbestos.

## Definitions

***Amended water*** - Water to which surfactant (wetting agent) has been added to increase the ability of the liquid to penetrate ACM.

***Asbestos*** - Includes chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, actinolite asbestos, and any of these minerals that has been chemically treated and/or altered. For purposes of this standard, "asbestos" includes PACM, as defined below.

***Asbestos-containing material (ACM)*** - Any material containing more than one percent asbestos.

***Class I asbestos work*** - Activities involving the removal of TSI and surfacing ACM and PACM.

***Class II asbestos work*** - Activities involving the removal of ACM which is not thermal system insulation or surfacing material. This includes, but is not limited to, the removal of asbestos-containing wallboard, floor tile and sheeting, roofing and siding shingles, and construction mastics.

*Class III asbestos work* - Repair and maintenance operations, where "ACM", including TSI and surfacing ACM and PACM, may be disturbed.

*Class IV asbestos work* - Maintenance and custodial activities during which employees contact but do not disturb ACM or PACM and activities to clean up dust, waste and debris resulting from Class I, II, and III activities.

*Clean room* - An uncontaminated room having facilities for the storage of employees' street clothing and uncontaminated materials and equipment.

*Competent person* - One who is capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure, who has the authority to take prompt corrective measures to eliminate them, as specified in 29 CFR 1926.32(f): in addition, for Class I and Class II work who is specially trained in a training course which meets the criteria of EPA's Model Accreditation Plan (40 CFR part 763) for supervisor, or its equivalent and, for Class III and Class IV work, who is trained in a manner consistent with EPA requirements for training of local education agency maintenance and custodial staff as set forth at 40 CFR 763.92(a)(2).

*Critical barrier* - One or more layers of plastic sealed over all openings into a work area or any other similarly placed physical barrier sufficient to prevent airborne asbestos in a work area from migrating to an adjacent area.

*Decontamination area* - An enclosed area adjacent and connected to the regulated area consisting of an equipment room, shower area and clean room...

*Demolition* - The wrecking or taking out of any load-supporting structural member and any related razing, removing or stripping of asbestos products.

*Disturbance* - Activities that disrupt the matrix of ACM or PACM, crumble or pulverize ACM or PACM, or generate visible debris from ACM or PACM. Disturbance includes cutting away small amounts of ACM and PACM, no greater than the amount which can be contained in one standard sized glove bag or waste bag in order to access a building component In no event shall the amount of ACM or PACM so disturbed exceed that which can be contained in one glove bag or waste bag which shall not exceed 60 inches in length and width

*Equipment room (change room)* - A contaminated room located within the decontamination area that is supplied with impermeable bags or containers for the disposal of contaminated protective clothing and equipment.

*Fiber* - A particulate form of asbestos, 5 micrometers or longer, with a length-to-diameter ratio of at least 3 to 1

*Glovebag* - Not more than a 60 x 60 inch impervious plastic bag-like enclosure affixed around asbestos-containing material, with glove-like appendages through which material and tools may be handled.

***High-efficiency particulate air (HEPA) filter*** - A filter capable of trapping and retaining at least 99.97 percent of all mono-dispersed particles of 0.3 micrometers in diameter.

***Negative Initial Exposure Assessment*** - A demonstration by the employer, which complies with the criteria in paragraph (f)(2)(iii) of this section, that employee exposure during an operation is expected to be consistently below the PELs.

***PACM*** - Presumed asbestos containing material.

***Presumed Asbestos Containing Material*** - Thermal system insulation and surfacing material found in buildings constructed no later than 1980. The designation of a material as "PACM" may be rebutted pursuant to paragraph (k)(5) of this section.

***Regulated area*** - An area established by the employer to demarcate areas where Class I, II, and III asbestos work is conducted, and any adjoining area where debris and waste from such asbestos work accumulate; and a work area within which airborne concentrations of asbestos exceed, or there is a reasonable possibility they may exceed, the permissible exposure limit.

***Removal*** - All operations where ACM and/or PACM is taken out or stripped from structures or substrates, and includes demolition operations.

***Renovation*** - The modifying of an existing structure, or portion thereof.

***Repair*** - Overhauling, rebuilding, reconstructing, or reconditioning of structures or substrates, including encapsulation or other repair of ACM or PACM attached to structures or substrates.

***Surfacing material*** - Surfacing material which contains more than 1% asbestos.

***Thermal system insulation (TSI)*** - ACM applied to pipes, fittings, boilers, breeching, tanks, ducts or other structural components to prevent heat loss or gain.

***Thermal system insulation ACM*** - Thermal system insulation which contains more than 1% asbestos.

**Permissible Exposure Limits (PELs)**

*Time-weighted average limit (TWA)*

No employee may be exposed to an airborne concentration of asbestos in excess of 0.1 f/cc of air as an 8-hour, time-weighted average (TWA).

*Excursion limit*

No employee may be exposed to an airborne concentration of asbestos in excess of 1.0 fiber per cubic centimeter of air (1 f/cc) as averaged over a sampling period of thirty (30) minutes.

**Regulated Areas**

- Establish where PEL may be exceeded.
- All Class I, II and III asbestos work shall be conducted within regulated areas.
- The area must be demarcated to minimize the number of people in the area and protect persons outside from exposure to airborne asbestos. Critical barriers, negative pressure enclosures, or signs [in accordance with paragraph (k)(7) of the standard] may demarcate the area.
- Access shall be limited to authorized persons.
- Respirators must be supplied to all persons entering a regulated area.
- Employees may not eat, drink, smoke, chew tobacco or gum, or apply cosmetics in the regulated area.
- All asbestos work performed in a regulated area must be supervised by a competent person.

**Exposure Monitoring**

*General Monitoring Criteria*

Each employer who has a workplace or work operation where exposure monitoring is required must perform monitoring to determine accurately the airborne concentrations of the asbestos to which employees may be exposed. Such determinations must be made from breathing zone air samples that are representative of the 8-hour TWA and 30-minute short-term exposures of each employee.

*Initial Exposure Assessment*

A competent person must conduct an exposure assessment immediately before or at the initiation of the operation to ascertain expected exposures during that operation or workplace.

The initial exposure assessment may be based on:

- representative 8-hour TWA and 30-minute short-term exposure monitoring conducted at the site;
- objective data demonstrating that the product or material containing asbestos minerals or the activity involving such product or material cannot release airborne fibers exceeding the TWA and excursion limit...;
- monitoring within the past year at other jobs which closely resemble the current job...

*Periodic Monitoring*

For Class I and II operations, daily representative monitoring is required unless a negative exposure assessment for the entire operation has been made.

For other than Class I and II operations, periodic monitoring of all work where exposures are expected to exceed a PEL, at intervals sufficient to document the validity of the exposure prediction must be performed.

Exception: Except when unlisted or modifications of listed control methods are being used, employers need not daily monitor employees who are equipped with supplied-air respirators operated in the pressure demand mode or other positive pressure mode respirator.

*Employee Notification*

Employers must notify affected employees, in writing, of the monitoring results as soon as possible. (*Note:* asbestos NESHAP inspectors should examine monitoring results at the worksite, but keep in mind that the data may not reflect current conditions.)

**Methods of Compliance**

*Engineering Controls and Work Practices*

The employer must use the following controls and work practices regardless of the levels of exposure:

- vacuum cleaners equipped with HEPA filters to collect all debris and dust containing ACM and PACM (except roofing); and

- wet methods or wetting agents (except where infeasible); and

- prompt cleanup and disposal of asbestos-contaminated wastes and debris in leak-tight containers (except in roofing operations).

In addition, the employer also must use the following to achieve compliance with the TWA permissible exposure limit and excursion limit:

- local exhaust ventilation equipped with HEPA filter dust collection systems;

- enclosure or isolation of processes producing asbestos dust;

- ventilation of the regulated area to move contaminated air away from the employee toward a HEPA filtration or collection device;

- work practices or other engineering controls that the Assistant Secretary can show to be feasible;

- supplemental respiratory protection (only when the feasible engineering and work practice controls described above have proven insufficient at reducing employee exposure to or below the PEL).

***Prohibitions***

The following work practices and engineering controls may not be used for any work related to asbestos or for work which disturbs ACM or PACM:

- high-speed abrasive disc saws (unless equipped with necessary engineering controls);

- compressed air (unless used in conjunction with an enclosed ventilation system designed to capture the dust cloud);

- dry sweeping, shoveling or other dry clean-up of dust and debris containing ACM or PACM; and

- employee rotation as a means of reducing employee exposure to asbestos.

***Class I Requirements***

Additional requirements for all Class I work (TSI and surfacing ACM and PACM):

- a competent person must supervise the activity;
- where more than 25 linear or 10 square feet of TSI or surfacing material is to be removed; or where a negative exposure assessment cannot be produced; or where employees are working in areas adjacent to the regulated area while Class I work is being performed:
  - critical barriers must be used (except outdoors); OR
  - another effective barrier or isolation method is used (surveillance and monitoring required);
- HVAC systems must be isolated in the regulated area by sealing with a double layer of 6 mil plastic or equivalent;
- impermeable dropcloths must be placed on surfaces beneath all removal activity;
- all objects within the regulated area must be covered with securely fastened, impermeable dropcloths or plastic sheeting;
- where a negative exposure assessment cannot be produced, or where exposure monitoring shows that a PEL is exceeded, the employer must ventilate the regulated area to move contaminated air away from the breathing zone of the employees toward a HEPA filtration or collection device;
- one or more of the following control methods must be used:
  - negative pressure enclosure system;
  - glovebag system (2 persons required);
  - negative pressure glovebag or glove box system;
  - water spray process system (40-hour training required)
  - mini-enclosure;
- alternative controls may be used as specified.

Appendix F (*Work Practices and Engineering Controls for Class I Operations - Non-mandatory*) of the Construction Standard contains more specific engineering controls and work practices.

*Class II Requirements*

For all Class II work (not TSI or surfacing):

- a competent person must supervise the activity;

- if conducted indoors where an NEA cannot be produced; where changed conditions indicate there may be an exposure > PEL; or where the ACM is not removed substantially intact:

  - critical barriers must be used;
  - another barrier or isolation method must be used;
  - impermeable dropcloths must be placed beneath;

- include use of HEPA filtered vacuum cleaners; wet methods or wetting agents; and prompt clean-up and disposal of asbestos-contaminated wastes and debris in leaktight containers;

- use specified work practices for the removal of vinyl and asphalt flooring materials; roofing materials; cementitious asbestos-containing siding and shingles or transite panels containing ACM on building exteriors (other than roofs); or gaskets;

- use alternative work practices and controls as specified.

***Alternative Methods of Compliance for Certain Roofing and Pipeline Coating Materials***

When installing, removing, repairing, or maintaining intact pipeline asphaltic wrap, or roof cements, mastics, coatings, or flashings which contain asbestos encapsulated or coated by bituminous or resinous compounds:

- a competent person must inspect and determine the roofing material is intact and will remain so;

- workers must have been properly trained;

- the material must not be sanded, abraded, or ground - manual methods are required;

- removed material must not be dropped or thrown to the ground (covered, dust-tight chute; crane; or hoist) and must be removed from the roof no later than the end of the work shift;

- the building owner must be informed of the presence and location of asbestos-containing products installed on non-residential roofs no later than the end of the job;

- all removal or disturbance of pipeline asphaltic wrap must be done using wet methods.

**Respiratory Protection**

The employer must:

- provide respirators and ensure that they are used when required during all:
  - Class I asbestos jobs;
  - Class II work where the ACM is not removed in a substantially intact state;
  - Class II and III work not performed using wet methods (exception: sloped roof, NEA, intact removal);
  - Class II and III work where an NEA is not produced;
  - work where employees are exposed above the TWA or excursion limit;
  - emergencies;
- select and provide the appropriate respirator (MSHA/NIOSH approved) to the employee at no cost;
- provide a tight fitting powered air-purifying respirator (PAPR) in lieu of a negative pressure respirator when requested and appropriate, and inform the employee of this option;
- institute a respiratory protection program when necessary; and
- ensure the proper fit of employee respirators.

Quantitative or qualitative fit testing must be performed at the initial fitting and every six months thereafter for *each employee* wearing a *negative-pressure* respirator. The qualitative fit tests may be used only for testing the fit of half-mask respirators where they are permitted to be worn, or of full-facepiece air purifying respirators where they are worn at levels at which half-facepiece air purifying respirators are permitted.

**Protective Clothing**

The employer must provide and require the use of protective clothing by employees exposed to > the TWA and/or excursion limit or when a NEA cannot be produced, or for any employee performing Class I > 25 LF or 10 SF of TSI or surfacing ACM and PACM. Contaminated clothing must be laundered and transported appropriately. Protective clothing must be periodically examined and repaired or replaced as needed.

**Hygiene Facilities and Practices**

***Class I > 25 Linear or 10 Square Feet of TSI or Surfacing ACM and PACM***

The employer must:

- establish a decontamination area consisting of a properly designed and equipped equipment room, shower area, and clean room (in series) adjacent and connected to the regulated area;
- provide described alternatives when the above is not feasible;
- ensure that employees use proper entry, use, and exit procedures;
- provide appropriate lunch areas.

***Class I < 25 Linear or 10 Square Feet of TSI or Surfacing ACM and PACM, and Class II and Class III (Exposures > PEL or No NEA)***

The employer must:

- establish an appropriately-sized equipment room or area adjacent to the regulated area for the decontamination of employees and equipment;
- ensure proper cleaning of work clothing, equipment and containers, and proper entry and exit from the regulated area.

**Communication of Hazards**

***Building and facility owners must:***

- determine the presence, location and quantity of ACM and/or PACM at the worksite before asbestos work begins;

- notify (in writing or personal communication) individuals who may occupy or work in or adjacent to work sites containing ACM or PACM.

***Employers whose Employees Perform Work Subject to the Construction Standard must:***

- identify the presence, location, and quantity of ACM and/or PACM;

- inform owners, employees who will perform the asbestos work, and adjacent personnel of this information and precautions to be taken.

***Signs***

The building owner must post comprehendible signs at the entrance to mechanical rooms/areas which contain ACM and/or PACM which identify the ACM, its location, and required work practices.

Warning signs which state the following must be provided to demarcate a regulated area:

**DANGER**
**ASBESTOS CANCER AND LUNG DISEASE HAZARD**
**AUTHORIZED PERSONNEL ONLY**

Where respirators and protective clothing are required, the following must also appear on the sign:

**RESPIRATORS AND PROTECTIVE CLOTHING**
**ARE REQUIRED IN THIS AREA**

*Labels*

Labels printed in large, bold letters on a contrasting background which state the following must be affixed to all products or containers of asbestos:

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

**DO NOT BREATHE ASBESTOS FIBERS**

Labels are not required where the asbestos fibers have been modified and will not foreseeably release airborne concentrations exceeding the PEL and/or excursion limit, or asbestos is present in concentrations less than 1.0 percent.

### *Employee Information and Training*

Employers must provide and ensure participation in free, comprehendible training for all employees who are likely to be exposed in excess of a PEL and for all employees who perform Class I through IV asbestos operations. The training:

- must be provided prior to or at the time of initial assignment and at least annually thereafter;
- for Class I (and certain Class II) operations must be equivalent to EPA's Model Accreditation Plan (MAP) asbestos abatement workers training (hands-on, minimum 32 hours);
- for other Class II operations involving asbestos containing roofing, flooring or siding materials, ceiling tiles or transite panels, must conform to the requirements of the Construction Standard (hands-on, minimum 8 hours);
- for Class III employees must be consistent with EPA requirements for training of local education agency (LEA) maintenance and custodial staff [hands-on, 16 hours per 40 CFR 763.92(a)(2)];
- for Class IV operations must be consistent with EPA requirements for training of local educational agency (LEA) maintenance and custodial staff [2 hours per 40 CFR 763.92(a)(2)].

### Housekeeping

- HEPA vacuums are required where vacuuming methods are selected;
- asbestos waste consigned for disposal must be collected and disposed of in sealed, labeled, impermeable bags or other closed, labeled, impermeable containers (except in roofing operations);
- asbestos-containing flooring material must be cared for as specified;

- waste, debris and dust in an area containing accessible TSI or surfacing ACM/PACM or visibly deteriorated ACM must be cleaned and disposed of as specified.

**Medical Surveillance**

Employees are covered by this part of the standard if engaged in Class I, II or III work or exposed at or above a PEL for a total of 30 or more days per year or required to wear a negative-pressure respirator.

Medical examinations must be free and performed by appropriate medical personnel. The exam must include a medical and work history, standardized questionnaire, a physical examination directed to the pulmonary, cardiovascular and gastrointestinal systems, a chest x-ray (physician's discretion) and pulmonary function tests [FVC and FEV(1)], and must be repeated annually.

**Recordkeeping**

The following objective data and exposure measurements must be maintained made available for review, and transferred as specified:

- information that products and activities cannot release asbestos fibers at or above the PEL and/or excursion limit (duration of employer's reliance upon this data);
- employee exposure monitoring (30 years);
- employee medical surveillance (duration of employment plus 30 years);
- employee training records (one year beyond last date of employment by employer);
- data to rebut PACM (as long as they are relied upon);
- required notifications (duration of ownership and transfer to successive owners).

**Competent Person**

The competent person must:

- have qualifications and authorization as required;
- provide frequent and regular inspection of the job sites;

- inspect Class I jobs at least once per work shift;
- inspect Class II, III and IV jobs as needed;
- be trained to meet the criteria of an EPA MAP supervisor for Class I and II work;
- be trained consistent with LEA maintenance and custodial staff [40 CFR 763.92(a)(2) - 16 hours) for Class III and IV work.

**Appendices**

The OSHA Construction Standard also incorporates several appendices; some are mandatory and others informational:

| Appendix | Title |
|---|---|
| A | OSHA Reference Method (Mandatory) |
| B | Sampling and Analysis (Non-Mandatory) |
| C | Qualitative and Quantitative Fit Testing Procedures (Mandatory) |
| D | Medical Questionnaires (Mandatory) |
| E | Interpretation and Classification of Chest Roentgenograms (Mandatory) |
| F | Work Practices and Engineering Controls for Class I Asbestos Operations (Non-Mandatory) |
| G | Removed and reserved. |
| H | Substance Technical Information for Asbestos (Non-Mandatory) |
| I | Medical Surveillance Guidelines for Asbestos (Non-Mandatory) |
| J | Smoking Cessation Program Information for Asbestos (Non-Mandatory) |
| K | Polarized Light Microscopy of Asbestos (Non-Mandatory) |

## EPA WORKER PROTECTION RULE (WPR)

The EPA Worker Protection Rule (40 CFR Part 763, Subpart G) was first published in the Federal Register on April 25, 1986. It was amended in 1987 to reflect OSHA's reduction of the PEL from 2.0 f/cc to 0.2 f/cc and is being revised once again. The WPR extends provisions of the OSHA Construction Standard to State and local government employees who are not covered by State asbestos standards approved by OSHA or by standards that EPA has determined are comparable or more stringent than the EPA rule. The WPR is essentially the same as OSHA's 1986 Construction Standard; the WPR, however, applies solely to asbestos abatement activities, whereas the OSHA standard applies to all construction activity involving potential asbestos exposures.

The WPR also has specific reporting requirements not included in the OSHA rule; EPA must be notified prior to undertaking an asbestos abatement project, and notice must be postmarked or delivered at least 10 days prior to abatement. The notification must also include a statement that governmental employees are conducting the asbestos abatement activities.

The 10-day notification is not required for abatement projects involving less than 3 square or linear feet of friable asbestos nor for emergency projects. For emergency projects, the employer must notify EPA "as soon as possible but in no case more than 48 hours after the project begins."

Alternatively, a source subject to the EPA WPR may choose to notify EPA pursuant to the asbestos NESHAP, as long as such notification clearly states that individuals subject to the WPR will be perform some or all of the abatement work.

## EPA/NIOSH GUIDANCE

In April 1986, NIOSH and EPA published a jointly prepared guidance manual entitled *A Guide to Respiratory Protection for the Asbestos Abatement Industry* (EPA 560-OPTS-86-001). This document was intended to provide practical guidance in the selection and use of respiratory protection for persons working in the asbestos abatement industry. The guide was also meant to apply to other types of work activities where exposure or the potential for exposure to airborne asbestos exists.

The document contains the following information:

- a model respiratory protection program;
- a checklist for use in developing or evaluating a respiratory protection program;
- a section on breathing air systems;
- a listing of sources of help for respirator users;
- appendices concerning fit test procedures, general safety considerations, heat stress considerations, and breathing air systems; and
- recommendations concerning the types of respirators appropriate for use in the abatement industry

Because the potential harm which can result from even minimal exposure to asbestos fibers has been well documented, NIOSH and EPA recommend that employers provide workers with the maximum feasible level of respiratory protection. This can be achieved through use of either:

- a Type C supplied-air respirator with a full facepiece operated in the pressure-demand mode and with an auxiliary self-contained breathing apparatus (SCBA) operated in the pressure-demand mode; or

- an SCBA with a full facepiece operated in the pressure-demand mode.

## SHEMD GUIDELINES

EPA's Safety, Health and Environmental Management Division's (SHEMD's) *Health and Safety Guidelines for EPA Asbestos Inspectors* (provided in the supplemental materials accompanying this manual) are designed to:

- provide for the health and safety of asbestos inspectors based on the best currently available information; and

- reduce the likelihood of significant asbestos exposures to the public through enhanced inspector guidance.

The guidelines, although developed for use by EPA inspection staff, are encouraged to be used by State and local inspectors, as well as contractors.

SHEMD will continue to monitor and analyze health and safety issues of concern to EPA asbestos inspectors and revise these guidelines periodically as additional significant information from field experience and other sources becomes available.

The following subsections outline the general requirements detailed in the guidance document. Specific recommendations pertaining to respirator selection, entry and exit procedures, and protective clothing requirements are addressed in other sections of this workshop manual.

### Health and Safety Plan

A general asbestos inspector health and safety plan must be prepared by each agency/group involved in conducting asbestos inspections. The plan should, at a minimum, include information on the following:

- *Emergency Procedures* - The plan must include procedures to follow in case of: (1) a medical emergency; (2) accidental release of asbestos; and (3) other emergency situations.

- *Personal Protective Equipment* - The plan must specify protective equipment requirements including respiratory equipment and protective clothing available and the types of inspections during which they should be used.

- *Operational Practices* - The operational practices for each type of inspection likely to be performed must be specified in the plan.

**Evaluation**

The senior management official should assure that the health and safety plans are reviewed and revised as necessary at least annually.

**Incident Reporting and Response**

The appropriate program manager must coordinate the reporting and response to any incidents involving injury or illness from asbestos for EPA's asbestos inspectors.

**Training**

All employees engaged in asbestos-related field inspection activities must receive a minimum of 24 hours of approved basic occupational health and safety training, must accompany an experienced asbestos inspector for at least three days of directly supervised field activities, and must receive eight hours of approved, formal refresher training annually.

All EPA employees required to wear respirators must receive six hours respiratory protection training, must be fit-tested at least semi-annually, and must receive approved refresher training annually. All EPA employees requested to enter hazardous waste sites or Superfund sites must receive the necessary training required under OSHA's regulation 29 CFR Part 1910.120.

**Medical Monitoring**

Employees who are routinely engaged in field activities which are likely to result in exposure to toxic substances or which require the use of respiratory protection, must be included in the Agency's Occupational Medical Monitoring Program. In addition, employees who wear respiratory protection must be deemed medically fit to wear such equipment.

**Protective Clothing**

Protective clothing selection and use are based on the type of inspection being done. The need for proper disposal of contaminated protective clothing is emphasized.

**Respiratory Protective Equipment**

Respiratory protection selection information specific to the following activities is provided:

- removal, demolition, and renovation inspections;
- asbestos manufacturing and fabricating inspections;
- bulk sample collection;
- waste disposal and storage site inspections;
- emergency removal operations at Superfund site inspections; and
- abandoned building inspections.

The guidance document mandates the establishment of a written respiratory protection program in accordance with OSHA 29 CFR Part 1910.134 and other OSHA and EPA documents.

OSHA 29 CFR Part 1910.134 stipulates that in an acceptable respiratory protection program:

- written standard operating procedures governing the selection and use of respirators must be established;
- respirators must be selected on the basis of hazards to which the worker is exposed;
- the user must be instructed and trained in the proper use and limitations of respirators;
- respirators must be regularly cleaned, disinfected, inspected, repaired, and stored properly;
- appropriate surveillance of work area conditions and degree of employee exposure or stress must be maintained;
- there must be regular inspection and evaluation to determine the continued effectiveness of the program;

- persons must not be assigned to tasks requiring the use of respirators unless it has been determined that they are physically able to perform the work and use the equipment (local physician, medical status reviewed periodically); and

- approved or accepted respirators which provide adequate respiratory protection must be used when available (MSHA).

Specific information regarding selection of respiratory protective equipment will be discussed elsewhere in this manual.

**Other Personal Protection Equipment**

The guidance recommends that eye protection be worn in eye hazard areas and that safety shoes and hard hats be worn where head and foot injuries might occur.

**Prohibited Practices**

Prohibited practices include smoking, eating, drinking, chewing gum or tobacco, and applying makeup in asbestos-contaminated areas.

**Personal Hygiene**

All persons who have been in asbestos-contaminated areas must remove contaminated clothing and other articles, dispose of waste material properly, and decontaminate thoroughly.

# SECTION 6

# ABATEMENT TECHNIQUES

A NESHAP asbestos inspector should be familiar with the procedures the asbestos abatement industry implements to comply with Federal and State regulations. This knowledge will result in a more complete inspection, especially in a pre-removal situation where actual abatement has not yet begun. By evaluating the set-up and proposed abatement plan, the inspector can determine if the project *may* be done in compliance with the asbestos NESHAP.

Although removal, encapsulation, enclosure and repair are all forms of asbestos abatement, NESHAP inspectors investigating demolition and renovation sites will most commonly encounter asbestos removal operations. For this reason, this section describes work area preparation, removal, and post-removal activities associated with common OSHA Class I and Class II abatement activities.

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## IMPORTANT TERMS

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***Aggressive air sampling*** - Air sampling which takes place after final cleanup while the air is being physically agitated with leaf blowers and fans to produce a "worst case" situation.

***Amended water*** - Water to which surfactant (wetting agent) has been added to increase the ability of the liquid to penetrate ACM.

***Asbestos-containing material*** - Any material containing more than one percent asbestos.

***Class I asbestos work*** - Activities involving the removal of TSI and surfacing ACM and PACM.

***Class II asbestos work*** - Activities involving the removal of ACM which is not TSI or surfacing material. This includes, but is not limited to, the removal of asbestos-containing wallboard, floor tile and sheeting, roofing and siding shingles, and construction mastics.

***Clean room*** - An uncontaminated room having facilities for the storage of employees' street clothing and uncontaminated materials and equipment.

***Critical barrier*** - One or more layers of plastic sealed over all openings into a work area or any other similarly placed physical barrier sufficient to prevent airborne asbestos in a work area from migrating to an adjacent area.

***Decontamination area*** - An enclosed area adjacent and connected to the regulated area consisting of an equipment room, shower area and clean room.

***Equipment room (change room)*** - A contaminated room located within the decontamination area that is supplied with impermeable bags or containers for the disposal of contaminated protective clothing and equipment.

***Glovebag*** - An impervious plastic bag-like enclosure affixed around not more than a 60 x 60 inch asbestos-containing material, with glove-like appendages through which material and tools may be handled. Information on glovebag installation, equipment and supplies, and work practices is contained in OSHA's Construction Standard (29 CFR Part 1926.1101).

***High Efficiency Particulate Air (HEPA)*** - A filter capable of trapping and retaining at least 99.97% of all mono-dispersed particles of 0.3 micrometers in diameter.

***HVAC system*** - Heating, Ventilation, and Air Conditioning system usually found in large buildings and industry facilities.

***LEV unit*** - Local Exhaust Ventilation machine designed to mechanically remove air contaminants from a point of operation.

***Mil*** - Prefix meaning one-thousandth; commonly used to describe thickness of polyethylene sheeting (6 mil poly = 0.006" thick.)

***Polyethylene (poly)*** - Plastic sheeting often used to seal off an area in which asbestos removal is taking place; used to prevent contamination of other areas.

***Regulated area*** - An area established by the employer to demarcate areas where Class I, II, and III asbestos work is conducted, and any adjoining area where debris and waste from such asbestos work accumulate; and a work area within which airborne concentrations of asbestos exceed, or there is a reasonable possibility they may exceed, the permissible exposure limit.

## REGULATORY REQUIREMENTS

Both OSHA's Construction Standard [29 CFR 1926.1101 (g)] and EPA's Asbestos NESHAP regulation [40 CFR 61.145(c) and 61.150] specify engineering controls and work practices to be used during asbestos abatement.

### OSHA

OSHA requires the use of the following engineering controls:

- vacuum cleaners equipped with HEPA filters;
- wet methods or wetting agents (where feasible);
- prompt clean-up and disposal of wastes and debris contaminated with asbestos in leak-tight containers;
- local exhaust ventilation equipped with HEPA filter dust collection systems;
- enclosure or isolation of processes;
- ventilation of the regulated area to move contaminated air away from the employees and toward a HEPA-filtration or collection device; and
- respiratory protection, where necessary.

**EPA**

EPA requires the following controls in most circumstances:

- adequately wet friable ACM and Category I and Category II nonfriable ACM in poor condition prior to its removal;

- after wetting, seal all asbestos-containing waste material in leak-tight containers or wrapping while wet;

- produce no visible emissions to the outside air during collection, mixing, and wetting operations;

- do not drop, throw, slide, or otherwise damage RACM and use dust-tight chutes or containers to transport RACM to the ground if it has been removed or stripped more than 50 feet above ground level and it was not removed as units or sections;

- use emission control methods which include: local exhaust ventilation and collection systems (designed to capture particulate asbestos); glove bag systems and leak-tight wrapping.

## CLASS I WORK OPERATIONS

OSHA requires a competent person to supervise Class I operations and allows the following control methods: negative pressure enclosures; glove bag systems; negative pressure glove bag and box systems; water spray process systems; small, walk-in enclosures; and appropriate alternatives. Since asbestos NESHAP enforcement personnel will typically encounter negative pressure enclosures and glove bag systems, these are described below.

## NEGATIVE PRESSURE ENCLOSURE

The following paragraphs detail typical preparations for establishing a negative pressure enclosure for a Class I operation involving the removal of more than 25 linear or 10 square feet of thermal system insulation or surfacing material.

### Work Area Preparation

Precleaning of the work area is conducted. HEPA vacuums are used to clean floors, walls and movable as well as immovable objects. Wet-wiping may also be done. Carpets may be steam-cleaned or removed entirely. Movable items are taken out of the work area and stationary objects covered and secured.

Critical barriers are established. Duct tape, expandable foam, caulking, poly, plywood and sheetrock are commonly used to seal all windows, doors, drains and other penetrations into the worksite. In the event that other engineering controls fail, these barriers will help prevent the escape of asbestos fibers from the work area.

Warning signs which meet the requirements of the OSHA asbestos standards must be posted at each entrance to the work area. These signs inform the reader that breathing asbestos dust may cause serious bodily harm.

The HVAC system is shut down and isolated by sealing with a double layer of 6 mil plastic (or the equivalent) to prevent transfer of asbestos dust throughout the building. The control panel for this system is tagged and locked (to prevent activation of the system) or the breaker associated with the HVAC system removed entirely. All contaminated air filters are removed from the system and disposed of as asbestos-containing waste. All vents and air ducts inside the work area are sealed, typically with plywood, sheet metal, poly and tape.

The electricity supplying the work area is shut off and the control panel locked and tagged. Contractors typically have an electrician wire in necessary amperage at the worksite. OSHA requires all electrical equipment in the enclosure to be connected to ground-fault circuit interrupters

The walls of the work area are usually covered with two layers of 4- or 6-mil poly. Strapping, nailing blocks, spray adhesive, staples and tape may be used to attach the poly to the walls Seams in the two layers are offset and the bottoms of the sheets alternately overlapped with the floor poly which extends up the walls 18-24".

Ceilings may be polyed when floor tiles are to be removed via mechanical means.

The floor of the work area is covered with a minimum of two layers of 6-mil poly. Seams are sealed using spray adhesive and duct tape, and strapping, spray adhesive, double-sided tape and/or staples may be used to securely fasten the poly at the wall/floor junction.

In certain situations an inspector may encounter a product known as Spray Poly® being used to prepare the walls and floor. This material is applied in equivalent thicknesses to polyethylene sheeting and serves the same purpose.

Arrows are applied to the prepared walls to indicate the locations of exits.

A decontamination area (decon) is established (Figure 6-1), in most cases contiguous to the work area. It is designed to allow passage to and from the work area while minimizing leakage of asbestos-containing dust to the outside. A typical unit consists of a clean room, a shower room and an equipment (dirty) room separated by airlocks. The airlocks may simply be two layers of poly hung at the openings to each room of the decon or they may be separate three-foot chambers alternating with and separated from each of the rooms in the decon by overlapping poly. The doorways themselves may be of various designs - arches, slits, inverted T's, etc.

Local exhaust ventilation (LEV) machines are brought in and turned on (Figure 6-1). An LEV machine contains a fan which draws contaminated air through a series of filters and exhausts the cleaned air to the outside. The final filter in the series is a High Efficiency Particulate Air (HEPA) filter.

LEV units are used to provide the OSHA-required four air exchanges per hour and -0.02 column inches of water pressure differential relative to outside pressure. Such a reduced pressure environment helps prevent the escape of contaminated air should a breach of containment occur. The air pressure inside the worksite may be monitored electronically. If the pressure differential is compromised, an alarm will sound to alert the abatement personnel

LEVs must be situated to direct air movement away from employees performing asbestos work within the enclosure. To provide the best movement of air through the workspace, LEV units should be located as far as possible from the decon and vent to the outside if possible The number of units needed depends on the volume and configuration of the room. The machines operate 24 hours a day from the beginning of a job until final air clearance is obtained

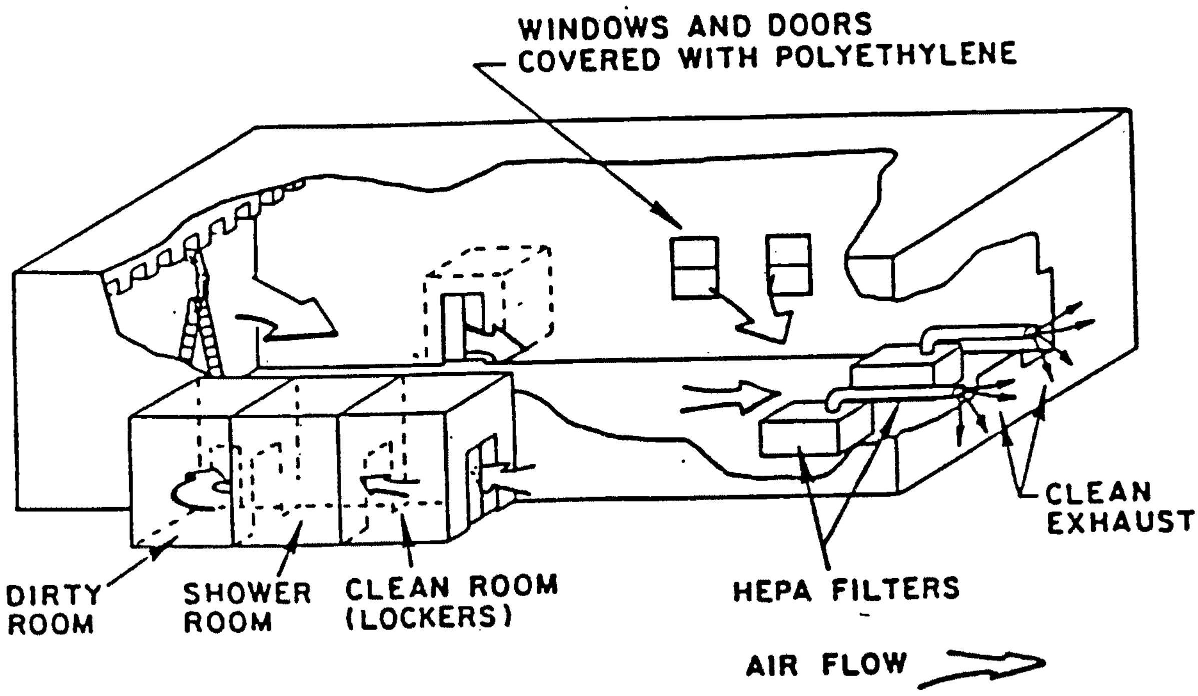


Figure 6-1. LEV Air Filtration System

**Asbestos Removal**

Beginning at the decon and proceeding toward the negative air machines, workers spray the asbestos-containing material so that it can be more easily removed. A wide variety of water-handling equipment may be used: garden sprayers, hoses and extension wands. Garden sprayers and hoses are used to soak the ACM prior to its removal and to maintain it in the wet state until it is properly collected for disposal. Extension wands provide a fine spray of water precisely where it is needed, thereby reducing the amount of water required.

Misters are used to moisten asbestos as it falls during the removal process. Pumps are used to apply amended water to the ACM and may also be used to apply encapsulants or other materials to the substrate after ACM removal.

Workers use a variety of tools for removing ACM and collecting it for disposal. Removal tools include long- and short-handled scrapers, joint compound knives, paint scrapers, nylon scrub pads, and a large assortment of brushes (ranging from toothbrushes to toilet brushes!). For cementitious ACM, chisels and hammers and various types of saws may be used. For hard-to-reach areas, power washers, whose water stream pressure is measured in thousands of pounds per square inch, may be used to clean asbestos-coated surfaces.

Collection tools include shovels and squeegees which are often made of plastic or rubber to prevent damage to the polyethylened floor.

ACM is usually loaded into plastic bags which are sealed, washed off in the shower or waste-handling area, placed into other labeled waste disposal containers (i.e. bags, fiber drums, metal drums) and removed from the worksite.

On occasion, however, usually on large jobs, two types of heavy-duty vacuum machines may be employed. Each machine transports wetted ACM to the outside equipment via a vacuum hose. Workers may use the hose itself to remove the ACM off the substrate or may collect material in a hopper first.
Depending on the type of vacuum apparatus, the removed ACM may enter the tank of a truck which will transport it as a slurry to an approved landfill or it may enter a hopper where it is further wetted and then bagged.

Heavy duty shredders may also be used at the job site. These break up metal lath and other materials being removed, making it easier to handle and dispose of the waste.

**Post-removal Activities**

Once all of the ACM has been removed, workers carefully clean all surfaces. A final visual inspection is made and an encapsulant may be applied to the cleaned surfaces (including the poly) to lock down any remaining fibers. On occasion, encapsulants of contrasting colors are applied at right angles to one another to ensure complete lockdown of remaining fibers.

The first layer of poly is then removed.

If the abatement work is being conducted in a school, or if the abatement contract specifies, aggressive sampling is done at this point. Leaf blowers or fans are used to create a "worst case" scenario in the cleaned area while large-volume air samples are taken.

PCM or TEM analysis of the air samples is then done. A job is often considered complete when the average fiber count as determined by PCM is $\leq$ 0.01 f/ml or when there are no more than 70 structures/mm as determined by TEM analysis, or when ambient or contract-specified levels are met.

Once final air clearance is obtained, the area may be reinsulated, the second sheet of poly and critical barriers removed, and the area reoccupied.

## GLOVE BAG SYSTEMS

Contractors may use the glove-bag technique to remove thermal system insulation (see Figure 6-2). Glove bags must be seamless on the bottom and made of 6-mil thick plastic. Linked bags, multi-sleeve bags, and bags which have been designed to permit the removal of horizontal or vertical runs of pipe insulation are available. Those used on elbows and other connections must be designed for that purpose and used without modifications. OSHA also permits the use of a glove bag which has a detachable waste bag.

Glove bags may be used only on surfaces not exceeding 150°F, and may be used only once and not moved.

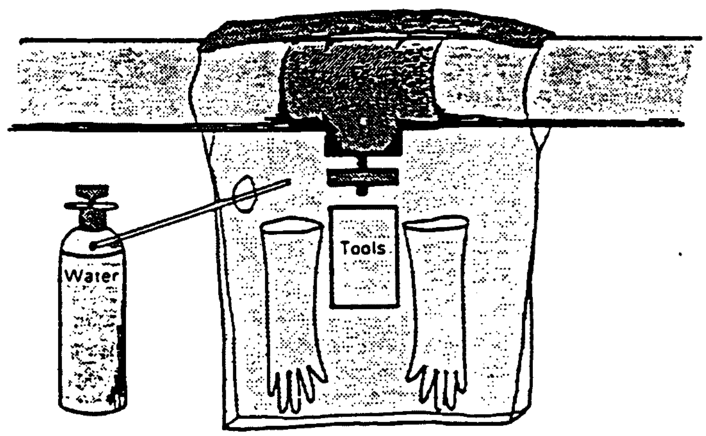


Figure 6-2. Illustration of a Glovebag.

OSHA requires two persons to perform a glovebag operation. These individuals must seal adjacent loose and friable material prior to attaching the glove bag.

Necessary tools and other materials are placed in the tool pouch of the glove bag and the bag sides cut down so that, when applied, the bag completely covers the circumference of pipe or other structure. The bag is sealed airtight and is required to be smoke-tested for leaks (and leaks sealed) prior to use.

The wand of a garden sprayer containing amended water is attached to the bag and the insulation soaked, removed and dropped into the bottom of the bag. The pipe and upper section of the bag are wiped clean and the ends of remaining insulation are sealed with encapsulant, rewettable fiber glass, or other wrapping material. The reusable tools are grasped in a glove and pulled outward; the sleeve is twisted and taped in two locations and the glove containing the tools cut off between the two taped sections. The enclosed tools are then placed into another glove bag for use or are deposited into a bucket of water and later cleaned. The glove bag is then twisted and loosely taped to isolate the ACM in the bottom of the bag. The sprayer wand is removed and a HEPA vacuum is required to be attached and used to remove the remaining air from the bag. The bag is tightly taped, the vacuum hose removed and the bag cut down from the pipe and deposited into another labeled disposal bag.

Some contractors now establish and maintain a reduced-pressure environment within the glove bag itself as the insulation is being removed. Two techniques have been devised; in both, a HEPA vacuum attached to the glove bag is operated continuously during the removal process. In one method the glove bag is altered to allow air from outside the bag to replace the extracted air. In the other method the HEPA vacuum is fitted with a special nozzle which significantly reduces air flow from the bag.

## CLASS II WORK OPERATIONS

The OSHA Construction Standard requires certain work practices and engineering controls for Class II work. All Class II work must be supervised by a competent person and HEPA vacuums, wet methods or wetting agents, and prompt clean-up and disposal of wastes and debris in leak-tight containers (except for roofing materials) must be employed.

### FLOORING MATERIAL REMOVAL

#### OSHA Requirements

For all **indoor** Class II jobs where a negative exposure assessment has not been produced; where there may be exposure above the PEL; or where the ACM is not removed substantially intact:

- critical barriers must be installed;

- another barrier or isolation method must be used to prevent migration of airborne asbestos from the regulated area; and

- impermeable dropcloths must be placed on surfaces beneath all removal activity.

For removing ACM-containing vinyl and asphalt flooring (or where the absence of ACM in a building constructed no later than 1980 has not been confirmed), employees must comply with the following work practices:

- flooring or its backing must not be sanded;

- vacuums equipped with HEPA filter, disposable dust bag, and metal floor tool (no brush) must be used to clean floors;

- resilient sheeting must be removed by cutting (with wetting of the snip point and wetting during delamination) - rip-up is prohibited;

- all scraping of residual adhesive and/or backing must be performed using wet methods;

- dry sweeping is prohibited;

- mechanical chipping is prohibited unless performed in a negative pressure enclosure which meets regulatory requirements;

- tiles must be removed intact, if possible;

- wetting may be omitted if tiles are heated and removed intact.

*Note:* Asbestos linoleum/vinyl-sheet good backing is considered friable under the asbestos NESHAP.

**Flooring Removal Techniques**

***Water/Amended Water/Solvents***

Water, amended water or solvents may be spread onto floor tiles in order to loosen them. After a period of soaking, the tiles may be removed using long-handled scrapers (ice chippers) or gas- or electrically-powered mechanical chisels. Remaining mastic may be removed using solvents or sanders.

*Note:* If extensive breakage renders the material friable, RACM is produced and the provisions of the asbestos NESHAP apply.

### *Dry Ice*

Although rarely used for this purpose nowadays, dry ice (frozen carbon dioxide) can be used to remove floor tiles. When dry ice is applied to the tiles, the intense cold causes the tiles to contract and detach from the substrate.

### *Infrared Machines*

Infrared machines may be used in the removal of floor tiles. These machines heat the flooring, thereby softening the tiles and adhesive, and allow for its easy removal.

### *Shot-blasters*

Shot-blasters are sometimes used in the removal of floor tile mastic. These machines direct a barrage of small pellets (shot) against the mastic and vacuum up and separate the mastic/pellet mixture. The pellets are continually reused and the pulverized material is segregated for disposal.

EPA permits the use of shot blasters only when wet methods are utilized; any other use constitutes dry removal.

### *Other Mechanical Methods*

Since friable material is created during their use, the provisions of the asbestos NESHAP apply to the removal of regulated amounts of resilient flooring subjected to:

- jackhammers;
- rotating blade scrapers (buffers with blades);
- mechanical sanders;
- rotating blade saws.

## ROOF REMOVAL

### OSHA Requirements

OSHA requires the following work practices to be followed:

- roofing material must be removed in an intact state to the extent feasible;
- wet methods must be used to remove roofing materials that are not intact, or that will be rendered not intact during removal (if feasible, and safety hazards are not created);
- cutting machines must be continually misted during use (unless safety hazards are created);
- dust resulting from the use of a power roof cutter must be collected by a HEPA dust collector, HEPA vacuumed, or gently swept and completely wiped up and immediately bagged or placed in covered containers.

### Roof Removal Techniques

Most of the following information has been extracted from *Applicability of the Asbestos NESHAP to Asbestos Roofing Removal Operations* (EPA 340-B-94-001, August 1994).

Shingles are normally used on inclined roofs and may be either asphalt or cement-based. Because of steep slopes, shingles are typically removed manually by workers using shovels and/or pry bars. When removing asbestos-cement shingles, workers may first clip off the heads of the nails, remove the shingles, and then remove the rest of the nails.

With built-up roofs, several methods of cutting the roof membrane are available. The method chosen depends not only upon the nature of the job, but upon State and local asbestos regulations as well. In most cases power roof cutters are used to cut roof membranes into manageable sections, but manual methods are sometimes used.

Generally, for built-up roofs, the membrane is separated (e.g., by cutting, slicing, punching or shearing) into sections approximately 2'x2', or 2'x4' or other sizes that can be managed by one or two workers, and that will fit into a cart or wheel-barrow and a 2' diameter chute. The sections are pried up using power roof removers, shovels or tear-off bars. Single-ply membranes may be sliced into long strips and rolled up.

Wetting is required whenever the method used may create RACM.

*Manual Methods*

Removal by manual methods usually involves the use of axes, hatchets and utility knives to chop or slice the roof membrane into sections that can be lifted by one or two workers with shovels, spud burs, pry bars, etc.

*Mechanical Methods*

*Rotating Blade (RB) Roof Cutter*

RB roof cutters are used extensively by roofing contractors to cut roof membranes for removal. A gasoline-powered engine turns a blade mounted near or toward the front of the machine. The cutting edge of the blade is blunt with about a ¼" kerf, as opposed to a tapered, sharp edge. This design allows the cutter to be used on gravel-covered roofs which would dull sharp blades. The adjustable-depth blade rotates so that the cutting action is from the underside of the membrane when the cutter is moving forward. RB roof cutters are used on both smooth- and gravel-surfaced roofs and are manually propelled.

***Note:*** Rotating blade cutters render the asbestos roofing friable. EPA considers a roof 5580 square feet or greater to be a regulated renovation when rotating blade cutters are used.

*"Slicer"*

A slicer is a self-propelled, two-wheeled tractor equipped with a blade that is used to slice through smooth roof membranes. Although this equipment is not commercially available, the slicer can be fabricated by attaching a heavy metal plate which houses an adjustable blade to the rear of the tractor. As the tractor moves forward, the blade neatly slices through the roofing material much like a utility knife.

***Note:*** Slicers do not render asbestos roofing material in good condition friable.

*"Roof Plow"*

A roof plow is similar to a slicer except that it slices the roof membrane from below. As a result, it is not dulled by roof aggregate and can be used on such roofs. The "plow" is attached to the rear of a self-propelled garden tractor and is pulled along through the membrane Because the plow slices the membrane, no dust or debris is created during its use. Plows are also not available commercially, but can be fabricated using available materials.

*Concrete/Asphalt Planer*

A planer is a machine used to remove concrete or asphalt from surfaces at controlled depths and profiles. Some models of planers come equipped with a misting device over the cutter assembly and can be used with a vacuum system designed for the planer. Both the concrete planer and vacuum unit are commercially available. The planer, however, has rarely been used in roof removal projects because the cutters are easily clogged with bituminous materials, and the short cutting depth necessitates several passes.

*Power Remover (Power Tear-off Machine)*

A power remover is used as an alternative to manually prying up pieces of sliced roofing material. A power remover consists of a wide actuating blade that can be mounted onto the front of a self-propelled tractor. Power removers also come as a one-piece assembly, i.e., with the blade and tractor as a single unit.

***Note:*** Power removers do not render asphalt asbestos roofing in good condition friable.

## SECTION 7

## OTHER SAFETY CONSIDERATIONS IN ASBESTOS WORK

Because the inspection environment for evaluating compliance with the asbestos NESHAP regulation is usually a building awaiting demolition or in some stage of renovation, increased asbestos exposure is only one of the many hazards an inspector may encounter on the job. This section enumerates the risks associated with worksite conditions and recommends safety procedures inspectors should follow.

### HEAT STRESS

All forms of heat illness are caused either directly or indirectly by the body's attempt to maintain its normal temperature of 98.6°F. Physical activity causes an increase in the body's metabolic rate, thereby increasing body temperature. The body attempts to dissipate heat via sweating. The loss of water and electrolytes via perspiration is the main factor responsible for all forms of heat stress, which include *heat cramps, heat exhaustion,* and *heat stroke.*

**Heat cramps** are painful muscular contractions of the arms, legs, hands, and trunk. They typically affect the lower legs first and are always preceded by marked sweating. Treatment consists of leaving the hot area and replenishing liquids.

**Heat exhaustion** usually results from dehydration. The individual becomes pale, has cold, clammy skin and is weak to the point of exhaustion. Other symptoms which may appear include headache, nausea, vomiting, muscle cramps, diarrhea, and giddiness. The blood pressure is low and the body temperature may be above or below normal. There is no increase in the body core temperature. If heat exhaustion occurs, the individual should rest in a cool area and drink ample fluids.

**Heat stroke** occurs when the body's sweating mechanism shuts down entirely. The skin becomes hot and dry and the body temperature quickly rises. The afflicted person must be cooled down immediately and, if conscious, encouraged to drink cool liquids. Medical help must be sought, for the condition may progress to delirium, stupor, unconsciousness, convulsions, deep coma, or even death in 30-50 percent of all cases.

Heat stress can be prevented almost entirely by taking a few simple precautions. Since dehydration is the main contributing factor to the development of heat stress, adequate fluid intake is essential. Plain water is the best liquid, but fruit juices (not fruit drinks, which contain inordinate amounts of sugar and may cause excessive thirst) may also be used. One should avoid all forms of alcoholic beverages, and tea, coffee, and other caffeinated drinks, for they are diuretic.

Use of electrolyte replacement drinks is usually not necessary. Since peoples' diets nowadays supply vast amounts of electrolytic substances, it is highly unlikely that anyone, even with profound perspiration, will suffer from a deficiency of them. Additionally, it has been determined that the use of such fluids actually slows down the absorption of water from the stomach into the bloodstream, thus retarding rehydration.

Other measures that can be taken to reduce the possibility of developing heat stress include use of a powered air-purifying respirator or a supplied air respirator (which help cool the face and lungs), increased local exhaust ventilation, and gradual acclimatization to the hot environment.

For any inspection lasting more than 15 minutes in an atmosphere of 70°F or higher, the inspector should follow the recommendations found in the NIOSH interagency document *Health and Safety Guidelines for Hazardous Waste Workers.*

## CLIMBING HAZARDS

In demolition/renovation jobs, a variety of climbing hazards exists. Railings and other structures may not be properly secured or may have been removed entirely during salvage operations. Scaffolding and ladders may not be in good condition. In addition, wearing a respirator may restrict an inspector's vision, thereby creating more need for caution when climbing.

### Scaffolding

Most asbestos renovation projects involve the use of both stationary and mobile scaffolding. OSHA standards require that when free-standing mobile scaffolding is used, the height must not exceed four times the minimum base dimension. This requirement is based on the fact that scaffolding is easily overturned. For mobile scaffolding on which workers can ride, the minimum base dimension should be one-half the height. OSHA also has established standards regarding guardrails, kickboards, and planking overhang. (See 29 CFR Part 1910 Subpart D "Walking/Working Surfaces.")

### Ladders

One should simply use common sense when using ladders. Be sure stepladders are fully opened and always face the ladder when using it. Check to see that all the steps are in good condition and never stand on the top step.

Extension ladders should be examined for missing safety feet and proper (1:4) lean ratio before use. Such simple precautions can prevent serious injury.

## WORKING SURFACES

Standard preparation of a worksite involves the placement of polyethylene sheeting on the floor. Amended water, often used to ensure the safe removal of asbestos, makes the floor very slippery, so great care must be taken by the inspector.

Additionally, the disposable boots worn by the inspector, airlines, electrical cords, bags of waste, stripped asbestos, and other debris present a tripping hazard to the inspector.

## ILLUMINATION

Active removal operations will have the best lighting since workers need to see well in order to properly clean the asbestos-coated surfaces. High humidity, however, may reduce visibility in the work area.

Pre-removal or post-removal inspections may need to be done with no on-site electrical lighting available. In order to see above suspended ceilings or into crawl spaces, etc., an inspector will need to use a powerful flashlight.

Hazards of poor lighting include risk of head injury from suspended objects such as low hanging pipes, light fixtures, etc., and other injuries due to tripping or falling over objects.

## ELECTRICAL SAFETY

One of the most common hazards, and one that gives the least warning, is electricity. Incorrect wiring, improper grounding, and lack of proper shielding result in a great number of electrocution deaths each year. Many of these fatalities result from contact with only 120 volts. The use of wet methods when removing asbestos increases the potential for electrical shock, especially when a person is working around electrical panels, conduit, light fixtures, alarm systems, junction boxes, computers, transformers, etc. In a typical removal project, the power to the worksite is locked out at the junction box and temporary power lines equipped with ground-fault circuit interrupters wired in.

Where injury may be caused by electrical hazards, protective gear (helmets, insulated gloves, etc.) should be worn.

The following is a listing of procedures that can reduce the risk of electrical shock:

- Have the site foreman escort you and explain how the electrical system has been ground faulted (as required by OSHA).
- Use non-conductive sample collection devices (wood, plastic, rubber).

- Use extreme caution when inspecting around energized wiring or equipment.
- Use care not to break through insulated coverings during inspection activities.
- Avoid accumulated water if an electrical wire or extension cord is lying in or near it.
- Consider electrical equipment and lines to be energized unless tested and determined firsthand otherwise.

## MISCELLANEOUS HAZARDS

### Falling Objects

Where there is a possibility of head injury from impact or from falling or flying objects, inspectors should wear head protection which meets ANSI Z89.1-1969 safety requirements for industrial head protection.

### Structurally Unsound Building

An inspector should determine, prior to entering a building, whether all or part of a building is structurally sound and safe to enter. Older buildings undergoing renovation may have stairs or floors in danger of collapse. If floors or stairs seem unsafe, the inspector should vacate the area immediately, taking care to walk along the outer edge of the floor or stairs where there is more support.

### Chemical Hazards

Some asbestos demolition/renovation activities may be conducted in buildings that have chemicals stored or in use. An inspector should be aware of items such as PCBs from transformers, hazardous chemicals from manufacturing operations, and chemical lines in the work area, and use appropriate protective equipment. Organic vapor respirator cartridges should be used where spray adhesives are being applied. Ammonia filtration may be necessary when Spray Poly® is being applied or at fertilizer manufacturing plants.

Inspectors visiting abatement worksites where solvents are being used in the removal of floor tiles should wear knee-high rubber boots to avoid a dermatitis reaction to the chemicals in use. Although dermatitis may not occur following initial contact with the chemical (liquid or fumes), subsequent exposure may result in a severe reaction.

Some inspectors develop a sensitivity to the rubber in the respirator facepiece. Such individuals should wear a silicone respirator instead.

Individuals who are allergic to latex should avoid wearing latex gloves.

**Biological Hazards**

An inspector entering abandoned buildings or confined spaces during an inspection should be aware that rats, stray dogs, poisonous spiders and snakes, bats or other creatures (including dangerous humans!) may reside there. Harmful insects, animal and bird feces, and mites are additional hazards inspectors may encounter.

An inspector's equipment should include a first aid kit containing supplies appropriate for medical emergencies which may arise. Bee-sting or snake-bite kits should be carried where necessary.

**Oxygen Deficiency**

Any poorly ventilated area (e.g., a crawl space, attic, or other confined space), areas which contain chemical, natural gas, or sewer lines, or sites where kerosene heaters or dry ice are in use may be oxygen-deficient. Supplied-air respirators must be used in such areas.

Inspectors should refer to OSHA's "Permit-Required Confined Spaces for General Industry" [29 CFR 1910.146 (Subpart J)] published 1/14/93 in the Federal Register (58 FR 4462) for further details regarding confined-space entry.

**Painted Skylights**

Inspectors should be aware that individuals have unwittingly stepped on and broken through skylights that have been painted over to match the roof.

**Claustrophobia**

An inspector, perhaps wearing a body-enclosing plastic suit and SCBA, may enter a confined area and become claustrophobic. Subsequent panicky behavior may cause severe injury not only to the inspector but to other individuals as well. One should discontinue the inspection if claustrophobia occurs.

**Noise**

Inspectors should carry hearing protection with them as standard equipment and use it when necessary.

**Machinery Hazards**

Inspectors should take adequate safety precautions when visiting sites where power washers, shredders or high-powered vacuum machines are in use.

**Thermal Hazards**

Inspectors may conduct asbestos NESHAP compliance inspections in areas with live steam lines. Since surface temperatures of these lines may be greater than 600°F and pinhole leaks may be invisible, inspectors should be exceptionally cautious. Inspectors should also avoid the use of protective clothing with low melting points (Kleenguard®=>300°F; Tyvek®=275°F) in these areas, for such clothing can adhere to the skin if contact is made with a heat source.

Inspectors should also be cautious in the vicinity of quartz lights used at abatement sites since these also generate a great deal of heat.

**Fire Hazards**

Since many types of electrical equipment, heat sources, flammable chemicals, and polyethylene are present at most abatement sites, inspectors should know the locations of fire extinguishers and emergency exits.

**Drowning Hazards**

Asbestos inspections may need to be done in such places as offshore oil rigs or beneath piers. Flotation devices should be used wherever a drowning hazard exists.

# SECTION 8

# RESPIRATORY PROTECTION

Much of the information in this section can be found in EPA's *Health and Safety Guidelines for EPA Asbestos Inspectors* which provides guidance in the selection and use of respiratory protection, and OSHA's respiratory protection regulation 29 CFR Part 1910.134 which requires employers to establish a respiratory protection program. Additional information has been extracted from EPA Order 1440.3 which establishes Agency-wide policy, responsibilities, and basic requirements regarding respiratory protective devices, and EPA's *Respiratory Protection Program Guideline* which provides management personnel with information necessary to establish and operate a respiratory protection program.

## CLASSES OF RESPIRATORS

The two major types of respiratory protection equipment available are air-purifying respirators (APRs) and supplied-air respirators (SARs). APRs have filters through which air passes before it is breathed. APRs may be classified as positive- or negative-pressure respirators depending on whether the user creates the suction to draw air into the mask (negative-pressure) or a fan propels filtered air to the facepiece (positive-pressure). SARs deliver air through a hose or airline from a tank or compressor to the user.

### Air-Purifying Negative-Pressure Respirators

- ***Single-use, disposable dust mask*** - Held onto the face by an elastic band or cloth ties. Disposable masks should never be used in an asbestos-contaminated atmosphere for they do not seal to the face and therefore cannot provide sufficient protection.

- ***Half-Mask*** - Fits over the bridge of the nose, along the cheeks, and under the chin. Two head bands form a four-point suspension to hold the mask in place and maintain the facepiece seal. During inhalation a slight vacuum (negative pressure) is created within the facepiece which causes ambient air to be drawn through filter media and into the facepiece. The expired air exits through an exhalation valve at the bottom of the facepiece.

- ***Full-Face*** - Fits over the face across the forehead, along the temples and cheeks, and under the chin. These devices have a head harness with a 5- or 6-point suspension. During inhalation a slight vacuum (negative pressure) is created in the facepiece which causes ambient air to be drawn through the filter media and into the facepiece. The expired air exits through an exhalation valve at the bottom of the facepiece.

- ***Advantages***

    - size;
    - cost ($106 - $215 for full-face);
    - freedom of movement;
    - ease of decontamination, cleaning and storage;
    - availability of combination cartridges;
    - adapter kit may be available to convert mask to a positive pressure airline respirator.

- ***Disadvantages***

    - filter use limited to specified contaminants;
    - filter loading increases breathing resistance;
    - facepiece fit is critical;
    - require filter changes;
    - not suited for atmospheres having less than 19.5 percent oxygen;
    - physiologically more stressful than supplied-air respirators;
    - require fit testing;
    - full facepiece reduces range of vision;
    - nose cup may have to be purchased as an accessory.

**Powered Air-Purifying Respirators (PAPRs)**

Powered air-purifying respirators (PAPRs) have battery-powered, motorized filtration units which blow purified air to the facepiece. Since this creates a slight positive pressure in the mask, any breach in the facepiece seal should permit only the outward flow of air from the mask, thereby preventing inhalation of contaminated air.

PAPRs may have tight-fitting facepieces or loose-fitting hoods or helmets. PAPRs with tight-fitting masks must supply a minimum of 4 cubic feet of air per minute (4 cfm) to the user, whereas the hood or helmet type must supply 6 cfm.

Some PAPRs are designed so that the motorized filtration unit is worn on the waist.

Alternatively, the unit may be an integral part of the mask itself.

- ***Advantages***

  - minimize leakage of unfiltered air into the mask;
  - fit testing is not required by OSHA;
  - possibly less stressful to use than negative-pressure respirators;
  - provide greater comfort to wearer.

- ***Disadvantages***

  - not suited for atmospheres having less than 19.5 percent oxygen;
  - require filter changes;
  - combination filters may not be available for expected contaminants;
  - operating time is limited by the battery pack;
  - tight-fitting facepiece PAPRs have the same protection factor as full facepiece negative-pressure respirators (according to EPA);
  - higher cost ($342 - $924) than negative-pressure respirators;
  - motor may short out if it gets wet (during showering, i.e.);
  - battery pack may develop "use life" memory shorter than expected operating time if the battery is not fully used;
  - due to their loose fit, hood or helmet type PAPRs do not afford the wearer protection from airborne asbestos fibers if the battery pack fails;
  - full facepiece reduces range of vision.

**Airline (Type C) Supplied-Air Respirators**

Airline (Type C) respirators consist of a half-mask, full-facepiece, hood or helmet to which Grade D breathing air is supplied through a small diameter, high-pressure airline. There are two modes of operation:

***Pressure-Demand Mode*** - The pressure-demand, supplied-air respirator has a regulator and valve design that maintains a positive pressure in the facepiece at all times. Should a reduction of pressure within the mask be sensed, air flow is increased to preserve a positive pressure.

***Continuous-Flow Mode*** - The continuous-flow, supplied-air respirator maintains a constant airflow and therefore, in most cases, a positive pressure within the facepiece at all times. Instead of a regulator, it uses a control valve or orifice to adjust air flow.

Each of the two types of supplied-air respirators has its advantages and disadvantages:

- ***Advantages***

  - lightweight;
  - breathing air supply is not limited to that which the user can carry;
  - provides a high level of protection.

- ***Disadvantages***

  - hose or airline restricts wearer's movement and may become damaged;
  - offers no protection if air supply fails;
  - expensive system to establish;
  - compressor which supplies the air must be located in an uncontaminated (asbestos-free) environment;
  - compressor which supplies the air should not be located in areas where there may be elevated levels of CO, gas fumes, or other potentially toxic substances;
  - full facepiece reduces range of vision;
  - system cannot easily be transported;
  - high cost ($854 - $1417)

**Airline Respirator with Self-Contained Auxiliary Air Supply**

This respirator combines an airline respirator with an auxiliary air supply (SCBA) to provide the user with respirable air if the main air supply fails.

- ***Advantages***

  - may be used in IDLH (Immediately Dangerous to Life and Health) atmospheres;
  - as previously stated for other SARs.

- ***Disadvantages***

  - auxiliary air supply time is limited (for escape purposes only);
  - additional equipment carried increases wearer stress;
  - requires additional training;
  - hose or airline restricts wearer's movement and may become damaged;
  - expensive system ($2117 - $2430);
  - compressor requirements as previously stated for Type C SARs;
  - full facepiece reduces field of vision.

## Supplied-Air (Type C) Respirator with HEPA Filter

This respirator system consists of a full-facepiece airline respirator with a backup HEPA filter. It allows the user to disconnect from the air supply system in an emergency and proceed through standard decontamination procedures while breathing through the HEPA cartridges.

- ***Advantages***

  - greater mobility during decontamination;
  - affords the wearer protection if the air supply fails.

- ***Disadvantages***

  - facepiece requires fit testing since respirator reverts to a negative-pressure mode when utilizing HEPA cartridges;
  - restriction of wearer's movement due to the airline;
  - not suitable for IDLH atmospheres;
  - possibility of damage to the hose or airline;
  - full facepiece reduces range of vision;
  - cost ($1423).

## Self-Contained Breathing Apparatus (SCBA)

The self-contained breathing apparatus consists of a full facepiece, regulator, and a respirable compressed air supply.. The SCBA allows the user to carry the air supply, thus eliminating the need for a stationary air supply. The SCBA must operate in the pressure-demand mode to be used in asbestos atmospheres.

- ***Advantages***

  - wearer carries own air supply;
  - highest protection factor;
  - pressure-demand type respirator is approved for IDLH conditions.

- ***Disadvantages***

  - use time limited by air supply (30 - 60 minutes);
  - devices are bulky and heavy;
  - requires more extensive training than for other respiratory devices;
  - decontamination may be difficult;
  - refilling tanks may pose problems;
  - very expensive ($1055 - $3338 for 30-min system.)

## RESPIRATORY PROTECTION

The overall protection afforded by a given respirator may be stated in terms of its ***protection factor*** and ***fit factor***. Each of these is defined as the ratio of the concentration of a contaminant in the ambient atmosphere to that inside the respirator facepiece under use conditions.

***Protection factors*** are values assigned to an entire class of respirators (e.g., half-face, full-face, etc.); they provide an average value which takes into account the variety of makes and models, and the different facial structures of the user population. Half-face, negative-pressure, air-purifying respirators have the lowest protection factor of all classes of respirators, whereas self-contained breathing apparatus (SCBA) systems have the highest.

***Fit factors***, on the other hand, are values specific to a given respirator model and to the individual being tested. It is highly possible, therefore, that a fit factor can be determined that is less than or greater than the protection factor assigned to that class of respirator. It should be noted, however, that at no time can the assigned protection factor be exceeded, regardless of the fit factor obtained. Also, if the obtained fit factor turns out to be less than the assigned protection factor, the fit factor must be used to determine the maximum fiber concentration in which the respirator may be worn.

### Protection Factors

Protection factors are determined using a procedure known as a quantitative fit test. During quantitative fit testing, an individual wearing a mask fitted with a probe is placed within an enclosure containing a challenge atmosphere. While the test subject performs a series of activities, air samples are drawn from within the facepiece and test chamber and analyzed for their relative concentrations of challenge material. The ratio between the amount inside the enclosure and the amount inside the mask is the protection factor.
The results of such fit testing conducted at the Los Alamos Scientific Laboratory on a great number of human subjects wearing various types of respirators were used to establish universally-accepted protection factors for all classes of respirators (See Table 8-1.).

Protection factors may be used to select appropriate respiratory protection when the ambient concentration of a contaminant and its PEL are known. For example, a respirator given a protection factor of 50 may be used in atmospheres not exceeding levels 50 times the PEL. However, according to OSHA, the protection factor assigned to any of the negative-pressure respirators may only be applied if the respirator has been quantitatively fit tested on the individual. If only qualitative fit testing (a less exacting procedure) has been done, the wearer can assume a protection factor of only 10.

| Table 8-1. Respirator Protection Factors | |
|---|---|
| **Respirator Type** | **Protection Factor (PF)** |
| APR, half-mask, HEPA | 10 |
| APR, full-face, HEPA | 50 |
| PAPR, HEPA | |
| OSHA | 100 |
| NIOSH - hood, helmet | 25 |
| NIOSH - tight-fitting | 50 |
| SAR, continuous flow | 100 |
| SAR, full-face, pressure-demand | 1,000 |
| SAR, full-face, pressure-demand with auxiliary SCBA, or SCBA | > 1,000 |

The higher the protection factor, the higher the maximum use concentration. Thus, the OSHA standard defines a range of protection factors from 10 for a half-mask air-purifying respirator to >1,000 for a supplied-air respirator equipped with auxiliary SCBA, or for an SCBA. It should be noted that the protection factor of 100 for a PAPR, as allowed by OSHA, has been reduced in a NIOSH Respirator Certification proposal (52 FR 32402, August 27, 1987). The proposed regulation allows a protection factor of 50 for a tight-fitting, full-facepiece PAPR and a protection factor of 25 for a loose-fitting hood or helmet PAPR.

**Fit Factors**

Fit factors, like protection factors, are determined by conducting a quantitative fit test on an individual wearing a specific make or model of a respirator. As with protection factors, a fit factor is defined as the ratio of challenge agent concentration outside the facepiece with respect to the challenge agent concentration inside the respirator facepiece.

As mentioned earlier, fit factors are specific to an individual and model of respirator. As such, fit factors may be greater or less than the assigned protection factor designated in the OSHA regulation. A fit factor can, therefore, be viewed as a check on assigned protection factors for that person and respirator model. It is important to recognize that if the fit factor for a specific respirator is found to be lower than the assigned protection factor, the calculated fit factor must be used to determine the maximum fiber concentration in which the respirator may be worn. If the fit factor for a specific respirator is found to be greater than the assigned protection factor, the protection factor must be used to determine the maximum fiber concentration in which the respirator may be worn.

## RESPIRATOR FIT TESTING

OSHA regulations require that either qualitative or quantitative respirator fit testing be conducted to ensure that a negative-pressure, air-purifying respirator seals properly to the worker's face. If a fit test is not successful with one brand or size of respirator, other brands or sizes should be tested until a proper fit is achieved. Employers must provide fit tests at the time of initial fitting and at least every 6 months thereafter.

### Qualitative Fit Testing

In qualitative fit testing a subject's sensitivity to a certain smell, taste or irritation from a "challenge" atmosphere helps determine the respirator fit. There are currently three recognized test protocols: (1) isoamyl acetate vapor (banana oil/IAA); (2) saccharin solution aerosol; and (3) irritant smoke (or stannic chloride). The banana oil test is based on individual sensitivity to smell; the saccharin solution aerosol to taste; and the irritant smoke to taste, smell and sensory irritation. Organic vapor cartridges are used in the respirator during the banana oil test, while particulate and HEPA/acid gas filters are worn during the saccharin and smoke test protocols, respectively. Screening must be performed before the qualitative fit test to ascertain whether the subject can sense the challenge agent.

Prior to having a qualitative fit test performed, the test subject must select the most comfortable respirator from a group of respirators of various sizes from different manufacturers. The respirator chosen must be worn at least 5 minutes to allow the individual adequate time to evaluate the positioning of the mask on the nose, mouth and chin, and to assess strap tension and slippage and determine overall comfort.

After this five-minute period, the subject "seats" the mask by rapidly moving the head from side to side and up and down, while taking a few deep breaths, and then performs a negative and positive "fit-check".

A negative-pressure "fit check" involves blocking the respirator inlets while inhaling. If air leaks into the facepiece, the mask should be repositioned and/or straps tightened, and the negative-pressure fit check repeated. If no leakage is noted, a positive-pressure test should be performed. The positive-pressure "fit check" involves blocking the exhalation valve and breathing out slightly to determine whether air can leak out of the mask through the facepiece seal.

The respirator must be worn for at least 10 minutes prior to fit testing in the challenge atmosphere.

*Qualitative Fit Test Procedure*

- The subject enters the test chamber located in a room separate from the screening room where the "fit checks" and odor screening were performed;

- The subject is given a piece of paper towel or other porous absorbent, single-ply material wetted with pure IAA and instructed to hang it on a hook at the top of the chamber. Alternatively, a nebulizer is used to introduce saccharin aerosol into the test chamber, or a ventilation tube containing stannic chloride or equivalent is used to introduce irritant smoke.

- After the IAA, saccharin or smoke is introduced, the subject performs each of the following test exercises (as delineated in 29 CFR Part 1926.1101, Appendix C) for at least one minute:

  1. Breathe normally.

  2. Breathe deeply. Be certain breaths are deep and regular.

  3. Turn head all the way from one side to the other. Inhale on each side. Be certain movement is complete. Do not bump the respirator against the shoulders.

  4. Nod head up and down. Inhale when head is in the full up position (looking toward ceiling). Be certain motions are complete and made about every second. Do not bump the respirator on the chest.

  5. Talk aloud and slowly for several minutes. Reciting the Rainbow Passage will result in a wide range of facial movements and be useful in satisfying this requirement.

**RAINBOW PASSAGE**

> When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the end of the rainbow.

  6. Jog in place.

7. Breathe normally.

- If at any time during the test the subject detects the banana-like odor, tastes the saccharin aerosol, or detects the irritant smoke, a different mask (manufacturer, size, material) should be tested until the individual passes the test.

The qualitative fit test procedure is essentially a pass/fail test that does not produce an absolute fit factor. It is assumed that a user who passes the test wearing a half-face respirator has achieved a protection factor of at least 10.

**Quantitative Fit Testing**

Quantitative fit testing is also conducted using a challenge atmosphere, but a probe is attached to the respirator to allow sampling of the air inside the facepiece. The air inside and outside the facepiece is measured using an electronic instrument that quantifies the test agent. The ratio of the two values provides a "quantitative" determination (fit factor) regarding respirator fit.

***Quantitative Fit Test Procedure***

Quantitative fit testing may be conducted using a special enclosure or an electronic device such as a Portacount® which does not require use of a chamber. A typical quantitative fit test involving a chamber is described below:

- Select a respirator for comfort and proper "fit" as discussed under qualitative fit testing and learn what procedures will be required during the test.

- Adjust selected respirator and conduct a negative- and positive-pressure test. Wear respirator at least 5 minutes to seat the facepiece.

- Conduct a qualitative fit test as previously described. (The test subject may undergo a quantitative test only after passing a qualitative fit test).

- Once a stable challenge agent concentration in the test chamber is established, enter chamber.

- Connect the facepiece probe and wait while the peak penetration of the challenge agent concentration inside the mask is measured. (It must not exceed 5 percent for a half mask or 1 percent for a full facepiece.)

- Be sure the challenge agent concentration inside the test chamber has stabilized.

- Perform the following nine exercises as the concentration of the challenge agent inside the facepiece is measured:

- Breathe normally, without talking, for 1 minute.

- Breathe deeply for 1 minute, taking care not to hyperventilate.

- Slowly turn head from side to side between the extreme positions for each side. Perform at least three complete cycles, holding the head at each extreme position for at least 5 seconds.

- Slowly move head up and down between the extreme positions of straight up and straight down. Hold the head at each extreme position for at least 5 seconds and perform at least three complete cycles.

- Recite the Rainbow Passage slowly and loudly.

- Grimace, frown, smile and generally contort the face for at least 15 seconds.

- Bend at the waist and touch toes. Return to upright position. Repeat for at least 30 seconds.

- Jog in place for at least 30 seconds.

- Breathe normally, as before, for one minute.

***Fit Factor Determination***

As the test subject performs the exercises, a strip chart recorder transcribes a trace indicating percent penetration of the challenge agent for each exercise. When the average peak penetrations for all the exercises are averaged, the quantitative "fit factor" is established.

***Note:*** Qualitative or quantitative fit tests must be repeated whenever an individual has a weight change of 20 pounds or more, significant facial scarring in the area of the facepiece seal, significant dental changes, reconstructive or cosmetic surgery, or any other condition that may interfere with facepiece sealing.

## SELECTION OF RESPIRATORS

The following information can be found in EPA's *Health and Safety Guidelines for EPA Asbestos Inspectors*. This document addresses the use of known or expected fiber concentrations and the type of inspection activity as the principal criteria for determining respirator usage. The entire guidelines document (which can be found in the supplemental materials accompanying this manual) should be reviewed by anyone conducting asbestos inspections.

## General Requirements

All EPA employees required to wear respirators must receive 6 hours of respiratory protection training, be fit-tested at least semi-annually, and receive approved refresher training annually.

In general, inspectors should not wear respirators unless they have been deemed "medically fit" to wear such protection. The determination of whether the individual is medically fit is made by a physician relying on information obtained through a medical and work history questionnaire, a physical examination including a chest x-ray, pulmonary function tests and other tests or information deemed necessary.

Inspectors should use only agency-owned respiratory protection equipment that they have been specifically trained and fit-tested to use. Inspectors should never use equipment offered by the abatement contractor. Supplied-air respirators other than SCBAs probably will not be worn by inspectors since it is doubtful that their agencies will provide the equipment necessary for this type of system.

## Respiratory Protection Equipment

Ideally, respirators should be selected according to the actual or potential airborne asbestos concentrations present at the site (See Table 8-2.). When an anticipated exposure level cannot be determined, an unknown exposure condition exists. Such a situation requires the use of atmosphere-supplying respirators such as a self-contained breathing apparatus (SCBA). Of currently available respiratory protective equipment, the SCBA offers the maximum level of respiratory protection. The buddy system is required in situations where the SCBA user is in an atmosphere that is either oxygen-deficient or highly toxic and would be life-threatening in case of respirator failure. All activities covered by these guidelines which would not result in a life-threatening or permanent injury situation would not require using the buddy system.

| Table 8-2. Respiratory Protection Requirements | | |
|---|---|---|
| **Respirator Type** | **Protection Factor** | **Maximum Fiber Concentration (f/cc) (PF x PEL)** |
| APR, half-mask, HEPA | 10 | 1 |
| APR, full-face, HEPA | 50 | 5 |
| PAPR, HEPA | | |
| OSHA | 100 | 10 |
| NIOSH - hood, helmet | 25 | 2.5 |
| NIOSH - tight-fitting | 50 | 5 |
| SAR, continuous flow | 100 | 10 |
| SAR, full-face, pressure-demand | | |
| | 1,000 | 100 |
| SAR, full-face, pressure-demand with auxiliary SCBA, or SCBA | | |
| | > 1,000 | > 100 |

Fortunately, much is known about the exposure conditions encountered at various worksites. In 1989, PCM analytical data for over 4,000 air monitoring samples taken during renovation activities at schools, residential buildings, hospitals, offices and industrial buildings were reviewed in a study conducted for EPA. The study concluded that when the OSHA asbestos standards for renovations were followed, no concentrations in excess of 0.82 f/cc were found in the removal areas during active abatement 95 percent of the time.

The OSHA permissible exposure limit (PEL) for asbestos is 0.1 f/cc and the NIOSH-recommended exposure limit is 0.1 f/cc. The EPA, on the other hand, recommends that inspectors exposures to asbestos be limited to below 0.01 f/cc as an 8-hour time-weighted average (TWA). Respirator selection criteria found in the *Health and Safety Guidelines...* are based on this TWA.

If asbestos inspectors can make a determination of a project's OSHA compliance prior to entering containment, and plan to spend no more than two hours inside containment, they can choose to use the lowest acceptable level of respiratory protection: ***a NIOSH-approved, full-***

***facepiece respirator with HEPA filtration, or any approved tight-fitting (i.e. having a tight face-to-facepiece seal) powered air-purifying respirator (PAPR) with HEPA filtration.*** This conclusion is based on the following assumptions:

- Exposures in renovation sites in compliance with OSHA rarely approach 2.0 f/cc.
- Full-facepiece, air-purifying respirators (and tight-fitting PAPRs) provide a protection factor of 50x.
- Inspectors will not be in the asbestos enclosure envelope for more than two hours per day.

A 50x protection at a concentration of 2.0 f/cc for two hours would result in an 8-hour TWA exposure of 0.01 f/cc TWA. Actually, most exposures would be far less than 0.01 f/cc, for most individuals attain greater than a 50x protection factor from full-face respirators and PAPRs, and often will not be in the envelope for two hours.

Air-purifying respirators include powered air-purifying respirators (PAPRs). These guidelines assume that PAPRs do not provide greater protection than do other air-purifying respirators due to the possibility that overbreathing (i.e., inhaling at a rate that is greater than the air supplied to the facepiece, resulting in a negative pressure in the facepiece) can occur. This guideline is consistent with the NIOSH *Respirator Decision Logic* of 1987 with respect to the protection offered by PAPRs. Additional PAPR studies are being planned by NIOSH; if PAPRs are shown to have higher protection factors in the future, appropriate changes will be made regarding selection of respiratory protection.

***OSHA Asbestos Standard Compliance***

An abatement project's compliance with the OSHA asbestos standards can be gauged by findings that:

1. Records indicate that all employees have been trained as required. Individuals (workers, contractors/supervisors) who perform the following activities with respect to friable ACBM in a school or public and commercial building must be accredited: (1) a response action other than a small-scale, short-duration (SSSD) activity, (2) a maintenance activity that disturbs friable ACBM other than an SSSD activity, or (3) a response action for a major fiber release episode. Such individuals must have their initial and current accreditation certificates at the location where they are conducting

work [40 CFR Part 763, Subpart E, Appendix C - *Asbestos Model Accreditation Plan (MAP)*].

Individuals performing abatement work in facilities other than schools, public, or commercial buildings need not be accredited under the MAP; they may, however, be subject to State and/or local training requirements.

2. Records, either on- or off-site, show that project employees have been given medical exams, including a determination that they are fit to wear respirators.

3. Amended water is being used to wet the ACM. (Check to see that amended water is on-site outside the envelope.).

4. No power tools are being used to remove ACM.

5. The envelope is secure and no dust or debris appears to be coming from the removal area.

6. Warning signs are posted and adequately labeled containers are being used.

7. Employees are carefully removing ACM and are not dropping materials on the floor.

8. Decontamination accommodations, including shower facilities, are in place.

9. Existing monitoring data indicate that asbestos fibers in the work area do not exceed 2.0 f/cc as an 8-hour TWA.

10. There is a written respiratory protection program and respirators are being used.

11. A removal plan has been (or can be) made available for review.

The asbestos NESHAP inspector must exercise proper judgment in determining that air-purifying respirators will provide adequate protection. The capability to make such determinations must be obtained through both classroom and on-the-job training.

**Removal, Demolition or Renovation Inspections**

EPA inspectors entering a removal area should select the appropriate respiratory protection according to the following locations and conditions.

### *No Respiratory Protection Required*

No respiratory protection is required ***outside*** of the asbestos area enclosing envelope when:

- inspecting office areas and other locations outside the barrier. All barrier seals must be intact, and all envelope entrances must have at least a double barrier. No visible airborne dust or debris that is potentially asbestos-contaminated should be present on any surface in the area;
- secondary containment is in place during glove-bagging operations. The secondary containment enclosure must be complete, and, for all but small-scale, short-duration operations, must also be under negative pressure;
- materials removed from the envelope have been cleaned and the pathway for removal of bags and equipment is clear and clean;
- all ventilation systems in the envelope are off and sealed (excluding negative-pressure systems designed for the removal project); and
- wet methods are being used.

No respiratory protection is required ***inside*** the envelope when:

- inspecting any restricted area that has already passed an appropriate clearance test (minimum of aggressive sampling demonstrating a concentration below 0.01f/cc by PCM); or
- no removal work has begun and all ACM is intact, not disturbed, not damaged, and no debris is present.

### *Respiratory Protection Required*

Respiratory protection will be required in many situations encountered by inspection personnel, both inside and outside the active removal area. For example, respiratory protection and personal protective equipment are required for inspections conducted outside the work area if the conditions listed in ***"No Respiratory Protection Required"*** have not been met. In addition, respirators and personal protective equipment are required whenever an inspector enters a work area that has not been cleared for reoccupancy. To determine the type of respiratory protection required, an inspector must rely on available information and observations of the conditions at the work site. As a *minimum*, an inspector must use either a full-face, air-purifying, negative-pressure respirator with HEPA filters or a powered air-purifying respirator (PAPR) with HEPA filters. An inspector can upgrade respirator selections at any time.

To determine the type of respirator to use, a number of conditions must be met. These conditions can be identified through a records review, pre-entry observations and interviewing site personnel. If adequate information is not available to document all of these conditions, an inspector must use his/her judgment to determine the level of respiratory protection to wear. If upon entering the work area enclosure the inspector determines that the conditions have not been met, he/she should immediately leave the work area and upgrade the level of respiratory protection.

*Air-purifying Respirators*

Full facepiece air-purifying respirators or tight-fitting PAPRs shall be worn by inspectors when:

- inspecting outside the barrier, and workers outside the barrier are wearing air-purifying respirators;

- inspecting outside the barrier where the barrier is not complete and/or asbestos-containing debris is present;

- inspecting inside the envelope when an inspection of the operation shows it to be in compliance with the OSHA asbestos standard. If, upon entering the envelope, visible emissions are seen or other evidence suggesting non- compliance is apparent, the inspector will *immediately* leave the area. Prior to returning to the removal area to document the violations, the inspector shall don SCBA gear;

- inspecting inside the barrier and no active removal or disturbances have occurred in past 24 hours and the inspection will not disturb any ACM.

*Atmosphere-supplying Respirators*

Atmosphere-supplying respirators are required when:

- performance of the asbestos abatement project is not in accordance with OSHA standards;

- materials are being removed which are not being properly wetted, or removal causes the generation of significant levels of dust;

- monitoring data at the site show levels in excess of 2.0 f/cc, or the EPA inspection may last for more than 2 hours;

- others at the site are wearing atmosphere-supplying respirators.

**Collecting Bulk Samples**

Inspectors collecting bulk samples should wear full-face, air-purifying respirators with HEPA filter cartridges (This includes NIOSH-approved, tight-fitting PAPRs equipped with HEPA filters.).

**Inspecting Asbestos Waste Disposal and Storage Sites**

Inspectors should select respiratory protection according the following criteria:

***No Respiratory Protection Required***

- All disposal trenches have been covered for a minimum of 24 hours and no ACM is visible at the disposal site.

***Respiratory Protection Required***

*Full-face APRs or tight-fitting PAPRs* should be worn when:

- airborne dust is not visible **AND**
- trenches are being dug at the disposal site; **OR**
- asbestos materials are on the ground or floor of the site, or damaged bags or drums are present; **OR**
- a storage site is being inspected.

*Atmosphere-supplying respirators (SCBA's or SARs)* should be worn when:

- others at the site are wearing atmosphere-supplying respirators; **or**
- airborne dust is visible.

**Inspecting an Abandoned Building**

Inspectors should select respiratory protection according to the following conditions:

***No Respiratory Protection***

- no suspect materials are present;
- intact suspect materials are present but no debris from those materials is observed.

*Respiratory Protection Required*

Full-face APRs or tight-fitting PAPRs should be worn when:

- suspect materials are visible on the floor or surfaces;
- collecting bulk samples.

## MEDICAL/PHYSICAL CONSIDERATIONS IN RESPIRATOR USAGE

### Medical Fitness

Wearing a respirator imposes a physical stress on the user. Air-purifying respirators require some effort during inhalation and exhalation to overcome the resistance of the filter media and valve seals. The physical weight of an SCBA may create a problem especially if extended work time and strenuous work are required. Airline respirators impose some physical stress due to the weight of the attached airline hose. OSHA regulations state that a person shall not be required to wear respiratory protective devices unless it has been determined that he/she is physically capable of doing so. A physician knowledgeable in the field of occupational health should assess one's pulmonary and cardiovascular status relative to respirator usage.

- Pulmonary considerations: the wearer should be examined for any respiratory impairment from disorders such as emphysema, obstructive lung disease, bronchial asthma, etc. Pulmonary function tests, chest x-rays, and completion of a medical and work history questionnaire provide useful information.

- Cardiovascular: the wearer's medical history and current cardiovascular status should be determined. A stress test may be required for certain individuals.

### Miscellaneous Considerations

- Respiratory protective devices must not be worn when any condition prevents a good face seal

  - Facial hair lying between the sealing surface of a respirator facepiece and the wearer's skin prevents a good seal. Stubble, a moustache, sideburns, or a beard that extends outward between the face and the sealing surface of the respirator will prevent a proper fit.

- Spectacle temple bars or straps that pass between the sealing surface of a full facepiece and the wearer's face prevent a good seal. Special corrective lenses that can be mounted inside the full facepiece are available and should be used by employees who need them.

- Scars, hollow temples, high cheekbones, deep skin creases, and the lack of teeth or dentures may cause respirator sealing problems. Full dentures should be worn when wearing a respirator, but partial dentures may or may not have to be removed.

- Employees with perforated eardrums may not wear respirators.

- Contact lenses must not be worn by a person wearing a respirator because the lenses may fall out or concentrate contaminants under them and cause eye damage.

- An inspector may be deemed medically fit to wear a respirator yet feel claustrophobic in one. The individual should therefore be considered "psychologically" unfit. Prior to using personal protective clothing and a respirator during an actual inspection, inspectors are advised to conduct a "test run".

- Respirator cartridges must be stored properly to ensure they will afford appropriate protection (e.g., HEPA cartridges - dry; organic vapor cartridges - airtight).

- Avoid purchasing respirators which are difficult to decontaminate (e.g., those with Velcro® closures or mesh head harness).

## ROUTINE INSPECTION AND MAINTENANCE

Any organization using respirators on a routine basis must institute a written respirator inspection maintenance and cleaning program. The purpose of this program is to assure that all respirators are maintained at their original level of effectiveness. Most, if not all, equipment manufacturers supply literature which lists the care and cleaning of their respirator's components, including information on servicing. Replacement parts for respirators must be those of the same manufacturer of the equipment. Substitution of parts from a different brand or type of respirator, or unauthorized modification could decrease or cause a total loss of worker protection. Also, such substitution of parts or modification will invalidate the approval of the respirator, leading to violation of applicable regulations.

An important part of a respirator maintenance program is the continual inspection of the devices. If properly performed, inspections will identify damaged or malfunctioning respirators before they can be used. Respirator cleaning presents a good opportunity to examine each respirator thoroughly. Respirators should be checked again after cleaning and reassembly operations have been accomplished.

All respirators must be inspected routinely before and after each use. Inspectors must check the tightness of connections and the condition of the facepiece, headbands, valves, connecting tube, and canisters. Rubber or elastomer parts must be inspected for pliability and signs of deterioration. Stretching and manipulating rubber or elastomer parts with a massaging action will keep them pliable and flexible, and prevent them from taking a set during storage.

**Routine Inspection Requirements**

Whether used on a regular basis or not, all respirators should undergo routine inspection and maintenance at least once a month to ensure that all essential parts are in place and functioning properly. The following provides the minimum requirements for such inspection of stored respirators and is not meant to eliminate the need for equipment checkout immediately prior to use. Since different respirator manufacturers employ various designs, their instructions or guidance should be followed when checking and maintaining respirators.

***Air-Purifying Respirators***

- For air-purifying respirators, thoroughly check all connections for gaskets and "O" rings and for proper tightness. Check the condition of the facepiece and all its parts (connecting air tube, headbands, etc.). Inspect rubber or elastomer parts for pliability and signs of deterioration.

- Maintain a record for each respirator inspection, including date, inspector, and any unusual conditions or findings.

***Supplied-Air Respirators***

- Inspect self-contained breathing apparatus monthly. Make sure air and oxygen cylinders are fully charged according to the manufacturer's instructions. Determine whether the regulator and warning devices function properly.

- Keep a record of inspection dates and findings for respirators maintained for emergency use.

Maintenance of SCBA equipment is more difficult than supplied-air or air-purifying respirators, primarily because of the complexity of the valve and regulator assembly. Because of this, all repairs or adjustments must be done by the manufacturer, by an authorized repair facility, or by a worker who has been trained and certified by the manufacturer. Refer to the manufacturer's instructions for details concerning a specific SCBA model.

### Cleaning and Disinfecting

Respirators should be cleaned after each use in accordance with the manufacturer's instructions. This cleaning is usually done by the wearer if respirators are individually assigned. If such is not the case, it is best to have one person responsible for daily cleaning and inspection of respirators.

OSHA regulations specify that a respirator must be cleaned and disinfected as frequently as necessary to insure that the wearer is provided proper protection. In asbestos abatement operations, it is recommended that respirators be rinsed after each inspection and thoroughly cleaned and inspected at the end of each day's use. Each wearer should be briefed on the cleaning procedure and be assured that a clean and disinfected respirator will always be issued. This is of greatest significance when respirators are not individually assigned.

The following general instructions may be helpful in cleaning and disinfecting the respirator.

- Remove all cartridges, canister, filters and gaskets or seals not affixed to their seats.
- Remove headband assembly, straps, exhalation valve cover and cartridge holders.
- Remove speaking diaphragm or speaking diaphragm/exhalation valve assembly.
- Remove inhalation and exhalation valves.
- Wash components separately from the facemask.
- Wash facepiece and breathing tube in cleaner/sanitizer powder mixed with warm water, preferably at 120° to 140°F. Most respirator manufacturers market their own cleaners/sanitizers which are dry mixtures of a bactericidal agent and a mild detergent. One-ounce packets for individual use and bulk packages for quantity use are usually available. Remove heavy soil from surfaces with a hand brush.
- Remove all parts from the wash water and rinse twice in clean warm water.
- Air dry parts in a designated clean area.
- Wipe facepieces, valves, and seats with a damp, lint-free cloth to remove any remaining soap or other foreign materials. Reassemble respirator.

### Storage

Follow the manufacturer's storage instructions. Instructions are always furnished with new respirators or affixed to the lid of the carrying case. In addition, these general instructions may be helpful:

- After inspection, cleaning, and necessary repair, store respirators where they will be protected from dust, sunlight, heat, extreme cold, excessive moisture, or damaging chemicals. Note: Respirators should be thoroughly dried before being sealed in any container for storage.

- Store respirators in a convenient, clean, and sanitary location. The purpose of good respirator storage is to ensure that the respirator will function properly when used.

- Do not store respirators in clothes lockers, bench drawers, or tool boxes. Place them in wall compartments at work stations or in a work area designated for emergency equipment. Store them in the original carton or carrying case.

- Pack or store respirators so that the facepiece and exhalation valves will rest in the normal position. Respirators should not be hung by their straps since this may stretch the straps and distort the facepiece.

**FIELD INSPECTION AND CHECKOUT PROCEDURES**

Immediately prior to use, a respirator must be thoroughly inspected by the individual who will be using it. As a minimum, OSHA standards require that the respirators be inspected for the following:

- tightness of all connections;

- integrity of the facepiece, valves, connecting tube, and canisters; and

- proper functioning of the regulator and warning devices on an SCBA.

Specific to each respirator type, the following should be performed each time the respirator is used.

**Air Purifying Respirator**

- Examine the facepiece for scratches, cracks, tears, holes, distortion, excessive or residual lint, dirt, etc.

- Examine facepiece seal to ensure that it is flexible and that there are no cracks or tears.

- Examine filter cartridge holders for cracks, badly worn threads or missing gaskets.

- Check head straps and harness for breaks, loss of elasticity, broken or malfunctioning buckles, or excessively worn serrations.

- Determine the existence of inhalation and exhalation valves and examine them for wear, foreign particles, cracks, tears, improper seating or installation, or breaks or cracks in the valve body seating surface.

- Ensure that cartridges are the correct type. Cartridges must be from the same manufacturer as the respirator and must be approved for use in an asbestos atmosphere (type H, high-efficiency filter, magenta color code).

- If the device has a corrugated breathing tube, examine for broken or missing end connectors, gaskets or o-rings, missing or loose hose clamps, or deterioration of the tubing.

- If respirator is a PAPR, determine whether the battery is fully charged, the cartridges are properly connected, the fan is functioning properly, and appropriate amounts of air are being delivered to the facepiece.

- Conduct a negative-pressure test. With the respirator on and adjusted, block the flow into inhalation valves and inhale. The facepiece should collapse inward with no noticeable leaks.

- Conduct a positive-pressure test. With the respirator on and adjusted, block the flow from the exhalation valve and exhale. The facepiece should balloon outward slightly with no noticeable leakage.

**Self-Contained Breathing Apparatus (SCBA)**

- Check the facepiece in a similar fashion as for air-purifying respirators.

- Check the air supply system for:

  - integrity and good condition of air supply lines and hoses, including attachments and end fittings;

  - correct operation and condition of all regulators, valves, and alarms; and

  - sufficient air charge in the high pressure cylinder for the use period. Preferably, the tank should be fully charged.

## ADDITIONAL INFORMATION

EPA's *Health and Safety Guidelines for EPA Asbestos Inspectors* also provides guidance concerning respirator selection for inspections conducted at asbestos manufacturing and fabricating plants and emergency removal operations at Superfund sites. Inspectors should review the Guidelines recommendations prior to conducting such inspections.

# SECTION 9

# PROTECTIVE CLOTHING

Protective clothing is worn during inspections of active asbestos removal projects for a number of reasons including:

- preservation of health;
- comfort; and
- ease of decontamination.

Asbestos is a known cause of asbestosis, mesothelioma, lung cancer and other ailments. Using protective clothing and following proper decontamination procedures help to protect the inspector and his/her family members by preventing asbestos from being brought out of the worksite.

Use of protective clothing can also reduce the occurrence of skin problems associated with ACM contact. In addition to asbestos, ACM commonly contains substances such as mineral wool, fiberglass, plaster, and cement which can produce rashes in sensitive individuals. Long term exposure to ACM can also cause "asbestos warts" which often take months to heal.

Protective clothing can also ease the decontamination process. Following an inspection, an improperly clothed individual will find it very difficult to remove ACM from his/her clothing, skin and hair because the adhesives used to make the ACM stick to the substrate are reactivated by the water applied during the removal process.

The most common protective clothing worn in contaminated environments consists of disposable coveralls, foot and head coverings, and gloves. These items are available in many styles and materials. The advantage of a particular style depends on what type of inspection is being conducted. Table 9-1 provides an approximate cost range for several types of protective clothing.

The use of protective clothing during pre-removal, post-removal and outside inspection situations will be a discretionary decision on the part of the inspector. In general, protective clothing should be worn any time friable ACM is being disturbed or if there is any uncertainty as to the adequacy of cleanup of an area. Protective clothing should be worn whenever asbestos waste storage areas are inspected or if the inspector will be opening bags to determine if the asbestos is adequately wet.

| TABLE 9-1. PROTECTIVE CLOTHING COSTS | |
|---|---|
| **Item** | **Approximate Cost ($)** |
| **Coveralls (each):** | |
| Attached hood and boots, elasticized wrists | |
| Tyvek® | |
| Saranex® (chemical-resistant) | 4.00 - 6.25 |
| Kleenguard® | 18.75 - 25.00 |
| Nomex® (flame/static-resistant) | 7.85 |
| | 110.00 - 126.15 |
| **Expandable back** | |
| Tyvek®/Saranex® 23-P | 83.70 |
| Tychem® 7500 | 35.75 |
| **Boots (pair):** | |
| Latex overboot | 4.95 |
| Steel-toed | 18.20 - 73.00 |
| **Gloves (unpowdered, 100):** | |
| Disposable vinyl | 11.00 - 14.85 |
| Polyethylene | 1.55 - 2.00 |
| Latex, unpowdered | 14.50 |
| PVC, unpowdered | 2.45 (per pair) |

Note: These costs are subject to change.

## RECOMMENDED PROTECTIVE CLOTHING

The following information has been extracted from EPA's *Health and Safety Guidelines for EPA Asbestos Inspectors* which can be found in supplemental materials accompanying this manual.

***Removal, Demolition, and Renovation Inspections.***

Inspectors should be prepared to wear the following protective clothing when entering a removal, demolition, or renovation area:

- disposable, full-body, hooded outer coveralls (e.g., Tyvek® suit or equivalent). Coveralls with an expanded back should be worn with an SCBA. In certain cases, an inspector may be required to use specialty coveralls such as Saranex-coated Tyvek® (chemically resistant) or Nomex® (fire retardant).

- a bathing suit (or equivalent) or inner disposable coveralls. When possible, particularly when a changing or decontamination area is available, all street clothing should be removed before donning protective clothing. When clothing is removed, the inspector may choose to wear a bathing suit under the protective clothing. If it is not possible to remove street clothing, the inspector should roll up pant legs and sleeves and don inner disposable coveralls. Outer coveralls are then worn over the bathing suit or inner coveralls.

- disposable gloves taped to the outer coveralls.
- disposable inner booties (e.g., Tyvek® or equivalent).
- disposable outer booties (water-resistant material) taped to outer coveralls.
- hard hats, safety glasses, safety shoes, hearing protection, when required by the situation or by the owner/operator.

***Collecting Bulk Samples***

Inspectors should wear the following protective clothing over their street clothes when collecting bulk samples whenever there is a significant chance of releasing fibers:

- disposable, full-body, hooded coveralls;
- eye and head protection as needed;
- disposable gloves and shoe coverings.

***Waste Disposal and Storage Site Inspections***

Inspectors should wear the following protective clothing over their street clothes when inspecting asbestos waste disposal and storage sites:

- disposable, full-body, hooded coveralls;
- disposable gloves and shoe coverings.

***Abandoned Building Inspections***

Inspectors should wear, or carry with them, the following protective clothing while inspecting an abandoned building:

- disposable, full-body, hooded coveralls;
- eye and head protection as needed;

- disposable gloves and shoe coverings.

## OPERATIONAL PRACTICES FOR ENTERING AND EXITING SITES

The procedures for entering and exiting sites described in this section include those described in EPA's *Health and Safety Guidelines for EPA Asbestos Inspectors* and have been generalized to cover both the use of an air-purifying respirator and SCBA.

### Entering and Exiting Site with a Three-Stage Decontamination System

A three-stage decontamination system consists of a clean room, shower room, and equipment room (sometimes referred to as a dirty room) contiguous with the active removal area. A detailed description of this type of decontamination system, commonly used in the asbestos abatement industry, can be found in the OSHA Construction Standard, 29 CFR 1926.1101.

***Prior to Entering the Clean Room***

- Examine the respirator thoroughly to determine whether it will function properly.

- Make sure that you have all materials and equipment necessary to conduct the inspection safely (e.g., protective clothing, respirator, duct tape, extra plastic bags, spray bottle, disposable towels, flashlight, camera, etc.). All materials carried into the contaminated area should be sealed in a plastic bag to minimize contamination.

- If you take a camera which is not waterproof into the contaminated area, seal it in an impermeable clear camera box to protect it and facilitate decontamination.

***In the Clean Room***

- Remove all street clothing including socks and underwear and seal them in a clean plastic bag. If desired, wear a bathing suit (or equivalent), appropriate footwear (sneakers, steel-toed shoes, etc.) and inner disposable footcoverings. Tape tops of inner disposable foot coverings to your skin. (Inner footwear and foot coverings are unnecessary if washable, steel-toed boots can be worn.) Any equipment not taken into the contaminated area should also be placed in the plastic bag.

- If an SCBA will be used, don the SCBA with the air flow valve closed; let the respirator facepiece hang from the neck by the strap.

- Don disposable, full-body, hooded coveralls. Do not yet put on the hood or zip up the suit. If using an SCBA, use a coveralls with an expandable back or oversize (XXL) Tyvek®.

- Since Tyvek® booties will rip quite easily once they become wet, wear disposable, reinforced, or steel-toed washable rubber boots over coveralls. Use duct tape to attach boots to coveralls.

- Don respirator facepiece and tighten straps. Perform negative- and positive-pressure field checks for air-purifying respirator. For SCBA, connect hose to regulator and open air valve.

- Fit the hood of the coveralls snugly around the respirator facepiece and zip up the coveralls. Use duct tape to close gap at neck if desired.

- Don disposable gloves. Use duct tape to seal them to the coveralls.

- Proceed to the shower area; leave disposable towels (sealed in a plastic bag), an extra plastic bag and soap near the shower.

- Proceed through the equipment room to the contaminated area and conduct the inspection.

***Before Leaving the Contaminated Area***

- While standing near the exit, HEPA vacuum (if possible) and wet wipe all visible debris from protective clothing, sample containers, sampling equipment, and any other items which are being taken out of the work area. (Use a spray bottle and disposable towels as necessary). Proceed to the equipment room.

***In the Equipment Room***

- If possible, decontaminate all non-disposable equipment including footwear at the site. If decontamination is not possible, seal all contaminated nondisposable materials in a plastic bag and take them with you to decontaminate later.

- While still wearing the respirator, carefully remove the outer boots or booties and gloves and take off the coveralls, rolling them inside out in the process. If a PAPR is worn, remove the belt which supports the motor/filter unit and hold the unit while removing coveralls.

- Place all disposable contaminated protective clothing in a proper waste disposal container and place nondisposable items in the shower.

- Wearing respirator (bathing suit, and taped inner booties, if worn), proceed to the shower.

*In the Shower Area*

- Clean nondisposable items and place them in clean room.

- Thoroughly wet the entire body. Remove respirator. Soak and dispose of HEPA filter cartridges as asbestos-containing waste. (Place them in waste container in equipment room). Clean respirator and place it into the clean room. Remove booties and inner footwear (if worn). Place footwear in clean room.

- If wearing a bathing suit, remove and thoroughly rinse it, put it in a plastic bag, and place it in the clean room. Finish showering, thoroughly washing the entire body with soap and water.

- Proceed to the clean room.

*In the Clean Room*

- Dry off and dress in street clothes.

- Give all disposables (including used towels) to the site operator if permitted and if they will be disposed of in an approved landfill. Otherwise, place disposables in labeled plastic bags and remove them for proper disposal.

**Entering and Exiting Sites Without a Three-Stage Decontamination System**

Inspections are often required at sites where a three-stage decontamination system is not available. When confronted with such a situation, the inspector must use his or her judgment regarding the safest method of conducting the inspection.

*Before Entering the Contaminated Area*

- Examine the respirator thoroughly to determine whether it will operate properly.

- Make sure you have all materials and equipment necessary to conduct the inspection safely (e.g., protective clothing, disposable towels, extra plastic bags, spray bottle, flashlight, camera etc.). Materials carried into the inspection site should be sealed in a plastic bag to minimize contamination.

- If you take a camera which is not waterproof into the contaminated area, seal it in an impermeable clear camera box to protect it and facilitate decontamination.

- Leave all street clothing on. Short-sleeve shirts and short pants are preferable. If you are wearing long pants or long sleeves, roll them up.

- Don inner booties (e.g., Tyvek® or equivalent) and an inner disposable coveralls over street clothes. (Inner footwear and foot coverings will not be necessary if steel-toed, washable boots can be worn.)

- If an SCBA will be used, don the SCBA with the air flow valve closed; let the respirator facepiece hang from the neck by the strap.

- Don an outer disposable coveralls. Wear coveralls with an expandable back or an oversize (XXL) Tyvek® suit if an SCBA is used, but do not zip it up.

- Since Tyvek® booties will rip quite easily once they become wet, wear disposable, reinforced, or steel-toed washable rubber boots over the outer coveralls. Use duct tape to attach boots to the coveralls.

- Fit the respirator facepiece to the face, tighten the facepiece straps and check face seal. If using an SCBA, connect hose to regulator and open the air valve. If using an air-purifying respirator, conduct negative- and positive-pressure field tests.

- Fit the hood of the coveralls snugly around the respirator facepiece and zip up the coveralls.

- Don disposable gloves; use duct tape to seal gloves to the sleeves of the outer coveralls.

- Proceed to the contaminated area and conduct the inspection.

***Before Leaving the Contaminated Area***

- While standing near the exit, HEPA vacuum (if possible) and wet wipe all visible debris from the outer protective clothing. Use a spray bottle containing amended water and disposable towels to wet wipe the suit; use plenty of water. Standing at the doorway inside the work area, remove outer protective clothing and immediately step outside the area. Place all disposable materials in a proper container for disposal.

***Outside the Contaminated Area***

- Once outside, thoroughly wet wipe and mist spray the respirator and inner protective clothing. Move away from the doorway and remove the respirator and inner protective clothing. Place all disposable materials into a proper container for disposal.

- Seal all contaminated nondisposable materials in a plastic bag and take them with you to decontaminate later.

## DISPOSAL OF CONTAMINATED CLOTHING

Contaminated or potentially contaminated protective clothing worn during asbestos inspections should be discarded as asbestos-containing waste. Asbestos-contaminated waste materials include coveralls, disposable boots, disposable gloves, respirator cartridges, and other items such as paper towels or wet wipes. Inspectors can usually discard their contaminated clothing in labeled, sealable waste containers provided by the owner/operator. Since the owner/operator must treat the waste disposed in this container as asbestos-containing, the inspector can assume that the material he or she discards will be disposed of properly. Although this procedure is generally acceptable, it is always a good idea to obtain permission from the owner/operator before discarding contaminated clothing.

There will be cases, however, when disposal of contaminated clothing will present a problem to the inspector. For example, the inspector may be conducting an inspection where the owner/operator is not properly disposing of waste, or where permission to discard inspector waste is not granted. In such cases, proper handling and subsequent disposal of contaminated clothing becomes the responsibility of the inspector. It is important, therefore, that the inspector come to the site prepared for such instances and that policies exist within his/her agency to deal with asbestos-containing waste. Contaminated clothing must be sealed in plastic bags before leaving the site. These bags should be pre-labeled asbestos waste containers; plastic trash bags should not be used. Each agency should provide the inspector with the exact procedures to follow in handling the bagged waste and ultimately disposing of the material.

## SECTION 10

## ASBESTOS NESHAP REGULATION

The Environmental Protection Agency (EPA), under requirements of the *Clean Air Act* (CAA) is required to develop and enforce regulations necessary to protect the general public from exposure to airborne contaminants that are known to be hazardous to human health. EPA's specific authority regarding asbestos is derived from the *National Emission Standards for Hazardous Air Pollutants* (NESHAP) which are listed under Section 112 of the CAA.

The asbestos NESHAP regulation (40 CFR Part 61, Subpart M) has been in existence since 1973 and has been amended several times. Information regarding the asbestos NESHAP may be obtained through EPA's TTN (Technology Transfer Network), a network of electronic bulletin boards providing information and technical support on air pollution control.

COMPLI, (stationary source COMPLIance) is a BBS (Bulletin Board System) on the TTN providing stationary source compliance policy and guidance information. NARS, the National Asbestos Registry System, is one of the databases on the COMPLI BBS. NARS stores the compliance history of owners and operators of asbestos demolition and renovation activities related to the Asbestos NESHAP, and is updated at least quarterly.

EPA's TTN service is free, except for the cost of using the phone, and is available 24 hours a day (except Mon. 8am-noon EST), at 919-541-5742. Help in accessing the network may be obtained by calling 919-541-5384 (1-5pm EST).

### HISTORICAL INFORMATION

The following is a summary relative to demolition/renovation and associated waste-handling and disposal provisions:

- April 6, 1973 - Original promulgation:
  - regulated the demolition of buildings containing friable asbestos-containing fireproofing and insulating material; and
  - restricted spraying of asbestos-containing materials on buildings and structures for fireproofing and insulating purposes.
- May 3, 1974 - Regulations were expanded to include:

- clarification of definitions;
- expansion of demolition provisions; and
- clarification of "no visible emission" standard to exclude uncombined water from regulatory requirement.

- October 14, 1975 - Substantial changes were made including:

  - addition of renovation projects to the list of regulated activities;
  - adoption of provision to prohibit use of wet-applied and molded insulation (e.g., pipe lagging); and
  - expansion of regulatory scope to cover asbestos-containing waste handling and disposal.

- March 2, 1977 - Subtle changes, mostly addressing definitions.

- June 19, 1978 - Important changes made include:

  - expansion of spraying restrictions to prohibit application of asbestos-containing materials for decorative purposes;
  - adoption of a provision to exempt bituminous or resinous-based materials from the spraying restrictions; and
  - repromulgation of certain work practice provisions.

- April 5, 1984 - Repromulgation to ensure existing work practices enforceable.

  The need to repromulgate stemmed from the 1978 Supreme Court decision in the case of *Adamo Wrecking Company of Michigan vs. United States*. The Court held that parts of the asbestos NESHAP, specifically the work practice standards, were not emission standards within the meaning of Section 112 of the *Clean Air Act*. Thus, certain work practice standards were deemed not enforceable at the time of the Adamo Wrecking case.

  To ensure that similar challenges would not be initiated, the CAA was amended (August 7, 1977) to authorize the use of "design, equipment, work practice and operational standards." Since some, but not all, of the work practice standards were repromulgated on June 19, 1978, the April 5, 1984 repromulgation of the entire asbestos NESHAP ensured that all work practice standards were subsequently enforceable. The asbestos NESHAP was also rearranged and parts of it reworded for clarity.

- November 20, 1990 - Repromulgation of the entire asbestos NESHAP regulation to enhance enforcement and compliance. The repromulgated rule:

  - requires daily monitoring for visible emissions, weekly inspections of air-cleaning devices, and recordkeeping and reporting at asbestos milling, manufacturing and fabricating sources;

- revises notification requirements for demolition and renovation activities;
- provides exemptions from the use of wet removal methods;
- clarifies EPA's position regarding the handling and treatment of nonfriable asbestos material;
- requires recordkeeping and reporting regarding asbestos waste disposal; and
- clarifies that operations which convert asbestos-containing waste material into nonasbestos material are regulated by NESHAP.

The following text is a summary of 40 CFR Part 61, Subpart M as it pertains to demolitions/renovations and associated waste handling and disposal. The entire asbestos NESHAP regulation is included in supplemental materials provided with this manual.

## APPLICABILITY (§61.140)

The following activities are regulated by the asbestos NESHAP:

- asbestos mill operations (§61.142);
- surfacing of roadways with asbestos-containing material (§61.143);
- manufacturing products which contain commercial asbestos (§61.144);
- demolition and/or renovation of facilities that contain asbestos material (§61.145);
- spraying of asbestos-containing materials (§61.146);
- fabricating operations involving commercial asbestos (§61.147);
- use of insulating materials that contain commercial asbestos (§61.148);
- waste disposal for asbestos mills (§61.149);
- disposal of asbestos-containing waste generated during manufacturing, fabricating, demolition, renovation, and spraying operations (§61.150);
- closure and maintenance of inactive waste disposal sites for asbestos mills and manufacturing and fabricating operations (§61.151);
- operation of air cleaning devices (§61.152);
- reporting of information pertaining to new and existing sources, filter devices, inactive and active waste disposal sites, etc. (§61.153);
- operation of active waste disposal sites (§61.154); and
- operations involving conversion of asbestos-containing waste material into nonasbestos (asbestos-free) material (§61.155).

## DEFINITIONS (§61.141)

*Adequately wet* - To sufficiently mix or penetrate with liquid to prevent the release of particulates. If visible emissions are observed coming from asbestos-containing material, then that material has not been adequately wetted. However, the absence of visible emissions is not sufficient evidence of being adequately wet.

*Asbestos* - The asbestiform varieties of serpentinite (chrysotile), riebeckite (crocidolite), cummingtonite-grunerite, anthophyllite, and actinolite-tremolite.

*Asbestos-containing waste materials (ACWM)* - Mill tailings or any waste that contains commercial asbestos and is generated by a source subject to the provisions of this subpart. This term includes filters from control devices, friable asbestos waste material, and bags or other similar packaging contaminated with commercial asbestos. As applied to demolition and renovation operations, this term also includes regulated asbestos-containing material waste and materials contaminated with asbestos including disposable equipment and clothing.

*Category I nonfriable ACM* - Asbestos-containing packings, gaskets, resilient floor covering, and asphalt roofing products containing more than 1 percent asbestos as determined using the method specified in Appendix A, Subpart F, 40 CFR Part 763, Section 1, Polarized Light Microscopy.

*Category II nonfriable ACM* - Any material, excluding Category I nonfriable ACM, containing more than 1 percent asbestos as determined using the methods specified in Appendix A, Subpart F, 40 CFR Part 763, Section 1, Polarized Light Microscopy that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.

*Cutting* - To penetrate with a sharp-edged instrument (includes sawing, but does not include shearing, slicing, or punching).

*Demolition* - The wrecking or taking out of any load-supporting structural member of a facility together with any related handling operations or the intentional burning of any facility.

*Emergency renovation operation* - A renovation operation that was not planned, but results from a sudden, unexpected event that, if not immediately attended to, presents a safety or public health hazard, is necessary to protect equipment from damage, or is necessary to avoid imposing an unreasonable financial burden. This term includes operations necessitated by nonroutine failures of equipment.

*Facility* - Any institutional, commercial, public, industrial, or residential structure, installation, or building (including any structure, installation, or building containing condominiums or individual dwelling units operated as a residential cooperative, but excluding residential buildings having four or fewer dwelling units); any ship; and any active or inactive waste disposal site. For purposes of this definition, any building, structure, or installation that contains a loft used as a dwelling is not considered a residential structure, installation, or building. Any structure, installation, or building that was previously subject to this subpart is not excluded, regardless of its current use or function.

***Facility component*** - Any part of a facility including equipment.

***Friable asbestos material (FAM)*** - Any material containing more than l percent asbestos as determined using the method specified in Appendix A, Subpart F, 40 CFR Part 763, Section l, Polarized Light Microscopy (PLM) that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure. If the asbestos content is less than 10 percent as determined by a method other than point counting by PLM, verify the asbestos content by point counting using PLM.

***Glove bag*** - A sealed compartment with attached inner gloves used for the handling of asbestos-containing materials. Properly installed and used, glove bags provide a small work area enclosure typically used for small-scale asbestos stripping operations. Information on glove bag installation, equipment and supplies, and work practices is contained in OSHA's final rule on occupational exposure to asbestos (29 CFR Part 1926.1101).

***Grinding*** - To reduce to powder or small fragments. This includes mechanical chipping or drilling.

***Inactive waste disposal site*** - Any disposal site or portion of it where additional asbestos-containing waste material has not been deposited within the past year.

***In poor condition*** - Means that the binding of the material is losing its integrity as indicated by peeling, cracking, or crumbling of the material.

***Installation*** - Any building or structure or any group of buildings or structures at a single demolition or renovation site that are under the control of the same owner or operator (or owner or operator under common control).

***Leak-tight*** - Means that solids or liquids cannot escape or spill out. It also means dust-tight.

***Natural barrier*** - A natural object that effectively precludes or deters access. Includes physical obstacles such as cliffs, lakes or other large bodies of water, deep and wide ravines and mountains. Remoteness by itself is not a natural barrier.

***Nonfriable asbestos-containing material*** - Any material containing more than one percent asbestos as determined using the method specified in Appendix A, Subpart F, 40 CFR Part 763, Section 1, Polarized Light Microscopy that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.

***Nonscheduled renovation operation*** - A renovation operation necessitated by the routine failure of equipment, which is expected to occur within a given period based on past operating experience, but for which an exact date cannot be predicted.

***Outside air*** - The air outside buildings and structures, including, but not limited to, the air under a bridge or in an open-air ferry dock.

***Owner or operator of a demolition or renovation activity*** - Any person who owns, leases, operates, controls, or supervises the facility being demolished or renovated or any person who owns, leases, operates, controls, or supervises the demolition or renovation operation, or both.

***Planned renovation operation*** - A renovation operation, or a number of such operations, in which some RACM will be removed or stripped within a given period of time and that can be predicted. Individual nonscheduled operations are included if a number of such operations can be predicted to occur during a given period of time based on operating experience.

***Regulated asbestos-containing material (RACM)*** - (a) Friable asbestos material, (b) Category I nonfriable ACM that has become friable, (c) Category I nonfriable ACM that will be or has been subjected to sanding, grinding, cutting, or abrading, or (d) Category II nonfriable 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 this subpart.

***Remove*** - To take out RACM or facility components that contain or are covered with RACM from any facility.

***Renovation*** - Altering a facility or one or more facility components in any way, including the stripping or removal of RACM from a facility component. Operations in which load-supporting structural members are wrecked or taken out are demolitions.

***Resilient floor covering*** - Asbestos-containing floor tile, including asphalt and vinyl floor tile, and sheet vinyl floor covering containing more than 1 percent asbestos as determined using polarized light microscopy according to the method specified in Appendix A, Subpart F, 40 CFR Part 763, Section 1, Polarized Light Microscopy.

***Strip*** - To take off RACM from any part of a facility or facility components.

***Structural member*** - Any load-supporting member of a facility such as beams and load-supporting walls; or any nonload-supporting members, such as ceilings and nonload-supporting walls.

***Visible emissions*** - Any emissions (excluding condensed uncombined water vapor) which are visually detectable without the aid of instruments, coming from RACM or asbestos-containing waste material, or from any asbestos milling, manufacturing or fabricating operation.

***Waste generator*** - Any owner or operator of a source covered by this subpart whose act or process produces asbestos-containing waste material.

***Waste shipment record (WSR)*** - The shipping document, required to be originated and signed by the waste generator, used to track and substantiate the disposition of asbestos-containing waste material.

***Working day*** - Monday through Friday and holidays that fall on any of the days Monday through Friday.

## STANDARD FOR DEMOLITION AND RENOVATION (§61.145)

### APPLICABILITY [§61.145(a)]

Various requirements of this section apply to the owner or operator of a demolition or renovation activity depending on the presence, relative amounts and condition of asbestos (including Category I and Category II nonfriable ACM) found in the facility.

To determine the applicability of the demolition/renovation standard, prior to the commencement of demolition or renovation activities, the owner or operator must thoroughly inspect the affected facility or part of the facility where the demolition or renovation will occur for the presence of asbestos, including Category I and Category II nonfriable ACM.

#### Demolitions ≥260/160/35 [§61.145(a)(1)]

In a facility being demolished, all notification requirements of §61.145(b) and emission control procedures of §61.145(c) (see Tables 10-1 and 10-2) apply if the combined amount of RACM is at least:

- 260 linear feet (80 linear meters) on pipes; or
- 160 square feet (15 square meters) on other facility components; or
- 35 cubic feet (1 cubic meter) off facility components where the length or area could not be measured previously.

*Note:* Future references to these regulated amounts of ACM will be designated: 260/160/35.

#### Demolitions <260/160/35 [§61.145(a)(2)]

In a facility being demolished, if the combined amount of RACM is less than the regulated amounts, **or there is no asbestos in the facility**, only the notification procedures of §61.145(b)(1),(2),(3)(i and iv) and (4)(i-vii, ix and xvi) apply (see Table 10-1). Notification must be received by the EPA for a building that will be demolished even if there is no asbestos in the building; this provides an opportunity for EPA to inspect the facility prior to demolition to verify that it contains less than the regulated quantity of asbestos.

### Ordered Demolitions [§61.145(a)(3)]

If a facility which contains at least 260/160/35 is ordered demolished by a State or local governmental agency because the building is structurally unsound and in danger of imminent collapse, notification requirements of §61.145(b)(1),(2),(3iii),(4, excluding viii) and (5) and emission control procedures of §61.145(c)(4-9) apply (see Tables 10-1 and 10-2).

### Renovations ≥260/160/35 [§61.145(a)(4)]

If the combined amount of RACM to be stripped, removed, dislodged, cut, drilled or similarly disturbed during a renovation (including any individual nonscheduled renovation operation) is at least 260/160/35, notification requirements of §61.145(b) and emission control procedures of §61.145(c) apply (see Tables 10-1 and 10-2).

### Renovations <260/160/35 [§61.145(a)(4)]

If the amount of RACM that will be stripped, removed, dislodged, cut, drilled or similarly disturbed is less than 260/160/35, and the renovation is not a component of *Planned Renovations Involving Individual Nonscheduled Operations* as described in §61.145(a)(4)(iii), the requirements of the asbestos NESHAP do not apply.

### Planned Renovations Involving Individual Nonscheduled Operations [§61.145(a)(4)(iii)]

If the predicted combined additive amount of RACM to be removed or stripped during planned renovation operations involving individual nonscheduled operations during a calendar year of January 1 through December 31 is at least 260/160/35, notification requirements of §61.145(b) and emission control procedures of §61.145(c) apply (see Tables 10-1 and 10-2).

### Emergency Renovations [§61.145(a)(4)(iv)]

If the estimated combined amount of RACM to be removed or stripped as a result of the sudden, unexpected event that necessitated the renovation is at least 260/160/35, notification requirements of §61.145(b) and emission control procedures of §61.145(c) apply (see Tables 10-1 and 10-2)

## NOTIFICATION REQUIREMENTS [§61.145(b)]

*Note:* Notification requirements of §61.145(b) are summarized in Table 10-1.

**Notifying Responsibility [§61.145(b)(1-3)]**

Each owner or operator of a demolition or renovation activity to which this section applies is required to:

- Notify the Administrator, in writing, of the intent to demolish or renovate. (The Administrator is anyone with delegated authority within the EPA asbestos NESHAP program. Inspectors should be aware that where the EPA has delegated authority for the program to a State, in some cases only the State may require notification; in other instances, both the State and EPA must be notified.) Delivery of the notice by U.S. Postal Service, commercial delivery service, or hand delivery is acceptable.

- Update the notice as necessary (e.g., change in start date, 20 percent increase in affected asbestos).

- Postmark or deliver the notice as required.

- Provide necessary information in an appropriate format (see Figure 10-1).

**Notification Submittal [§61.145(b)(3)]**

The asbestos NESHAP has established the following notification submittal requirements concerning demolition and renovation activities. Lead times have been designated in certain circumstances to provide the regulatory agency with sufficient time to determine compliance with the standard.

***Demolitions and Renovations (≥260/160/35)***

Notices must be postmarked or delivered at least 10 working days before asbestos stripping or removal work or any other activity which would disturb asbestos material begins. This notification requirement does not apply to planned renovations involving individual nonscheduled operations involving <260/160/35 or emergency renovations.

***Demolitions (<260/160/35 or No Asbestos)***

Notice must be given 10 working days before demolition begins.

***Planned Renovation Operations Involving Individual Nonscheduled Operations (which total ≥260/160/35 during a calendar year)***

For these renovation operations, notice must be given at least 10 working days before the end of the calendar year preceding the year for which notice is being given.

***Ordered Demolitions (≥260/160/35)***

For demolitions ordered by a governmental agency, notice must be given as early as possible before, but not later than the working day following the demolition.

*Emergency Renovation Operations (≥260/160/35)*

Notice must be given as early as possible before, but not later than the working day following the renovation.

*Renovations (<260/160/35)*

EPA requires no notification for a single renovation involving less than the regulated amount of RACM. However, if the total RACM involved in several nonscheduled renovation projects exceeds 260/160/35, notice must be given as indicated in *Planned Renovations Involving Individual Nonscheduled Operations*.

**Updated Notifications [§61.145(b)(3)(iv)]**

Whenever asbestos stripping or removal in demolition and renovation operations involving at least 260/160/35 (excluding planned renovation operations involving individual nonscheduled operations and emergency renovation operations) or demolitions involving less than 260/160/35 will begin on a date other than the one contained in the original notice, the Administrator must be notified of such a change. In no event shall an operation begin on a date other than the date contained in the written notice of the new start date.

*Later Starting Date*

If the new start date is scheduled **after** the date contained in the original notice, the Administrator must be:

- notified by telephone as soon as possible before the original start date; and
- provided with a written notice of the new start date as soon as possible before, and no later than, the original start date.

Delivery of the updated notice by U.S. Postal Service, commercial delivery service, or hand delivery is acceptable.

*Earlier Starting Date*

If the new start date is scheduled **before** the date contained in the original notice, EPA must be notified of the change:

- in writing; and
- at least 10 working days before asbestos stripping or removal work or demolition begins.

Delivery of the updated notice by U.S. Postal Service, commercial delivery service, or hand delivery is acceptable.

**Contents of Notification [§61.145(b)(4)]**

Whenever notification is required, the following information must be included:

- an indication of whether the notice is the original or revised notification;
- names, addresses and telephone numbers of the facility owner and operator, asbestos removal contractor owner or operator, and waste transporter;
- type of operation: demolition or renovation;
- description of the facility or affected part of the facility (size, number of floors, age, present and prior use, etc.);
- procedure employed to detect the presence of RACM and Category I and Category II nonfriable ACM (including analytical methods);
- estimate of the approximate amount of RACM to be removed from the facility;
- estimate of the approximate amount of Category I and Category II nonfriable ACM in the affected part of the facility that will not be removed before demolition;
- facility address and location of work site in the facility;
- scheduled starting and completion dates of asbestos removal work or other activity that would disturb asbestos material in a demolition or renovation (for planned renovation operations involving individual nonscheduled operations, January 1 to December 31 should be reported);
- scheduled starting and completion dates of demolition or renovation;
- description of planned demolition/renovation work to be performed, method(s) to be employed, and description of affected facility component;
- description of work practices and engineering controls to be used (includes asbestos removal and waste-handling emission control procedures);
- name and address of the waste disposal site to be used;

NOTIFICATION OF DEMOLITION AND RENOVATION

| Operator Project # | Postmark | Date Received | Notification # |
|---|---|---|---|
| | | | |

| | | | | | |
|---|---|---|---|---|---|
| I. TYPE OF NOTIFICATION ( O=Original R=Revised C=Cancelled ): | | | | | |
| II. FACILITY INFORMATION ( Identify owner, removal contractor, and other operator ) | | | | | |
| OWNER NAME: | | | | | |
| Address: | | | | | |
| City: | | State: | | Zip: | |
| Contact: | | | | Tel: | |
| REMOVAL CONTRACTOR: | | | | | |
| Address: | | | | | |
| City: | | State: | | Zip: | |
| Contact: | | | | Tel: | |
| OTHER OPERATOR: | | | | | |
| Address: | | | | | |
| City: | | State: | | Zip: | |
| Contact: | | | | Tel: | |
| III. TYPE OF OPERATION ( D=Demo O=Ordered Demo R=Renovation E=Emer.Renovation ): | | | | | |
| IV. IS ASBESTOS PRESENT? ( Yes/No ) | | | | | |
| V. FACILITY DESCRIPTION ( Include building name, number and floor or room number ) | | | | | |
| Bldg Name: | | | | | |
| Address: | | | | | |
| City: | | State: | | County: | |
| Site Location: | | | | | |
| Building Size: | # of Floors: | | | Age in Years: | |
| Present Use: | | Prior Use: | | | |
| VI. PROCEDURE, INCLUDING ANALYTICAL METHOD, IF APPROPRIATE, USED TO DETECT THE PRESENCE OF ASBESTOS MATERIAL: | | | | | |

| VII. APPROXIMATE AMOUNT OF ASBESTOS, INCLUDING:<br>1. Regulated ACM to be removed<br>2. Category I ACM Not Removed<br>3. Category II ACM Not Removed | RACM To Be Removed | Nonfriable Asbestos Material Not To Be Removed | | Indicate Unit of Measurement Below | |
|---|---|---|---|---|---|
| | | Cat I | Cat II | UNIT | |
| Pipes | | | | LnFt: | Ln m: |
| Surface Area | | | | SqFt: | Sq m: |
| Vol RACM Off Facility Component | | | | CuFt: | Cu m: |

| | | |
|---|---|---|
| VIII. SCHEDULED DATES ASBESTOS REMOVAL (MM/DD/YY) | Start: | Complete: |
| IX. SCHEDULED DATES DEMO/RENOVATION (MM/DD/YY) | Start: | Complete: |

Continued on page two

**Figure 10-1. Notification of Demolition and Renovation**

NOTIFICATION OF DEMOLITION AND RENOVATION (continued)

| | | |
|---|---|---|
| X. DESCRIPTION OF PLANNED DEMOLITION OR RENOVATION WORK, AND METHOD(S) TO BE USED: | | |
| XI. DESCRIPTION OF WORK PRACTICES AND ENGINEERING CONTROLS TO BE USED TO PREVENT EMISSIONS OF ASBESTOS AT THE DEMOLITION AND RENOVATION SITE: | | |
| XII. WASTE TRANSPORTER #1 | | |
| Name: | | |
| Address | | |
| City: | State: | Zip: |
| Contact Person: | | Telephone: |
| WASTE TRANSPORTER #2 | | |
| Name: | | |
| Address: | | |
| City: | State: | Zip: |
| Contact Person: | | Telephone: |
| XIII. WASTE DISPOSAL SITE | | |
| Name: | | |
| Location: | | |
| City: | State: | Zip: |
| Telephone: | | |
| XIV. IF DEMOLITION ORDERED BY A GOVERNMENT AGENCY, PLEASE IDENTIFY THE AGENCY BELOW: | | |
| Name: | Title: | |
| Authority: | | |
| Date of Order (MM/DD/YY): | Date Ordered to Begin (MM/DD/YY): | |
| XV. FOR EMERGENCY RENOVATIONS | | |
| Date and Hour of Emergency (MM/DD/YY): | | |
| Description of the Sudden, Unexpected Event: | | |
| Explanation of how the event caused unsafe conditions or would cause equipment damage or an unreasonable financial burden: | | |
| XVI. DESCRIPTION OF PROCEDURES TO BE FOLLOWED IN THE EVENT THAT UNEXPECTED ASBESTOS IS FOUND OR PREVIOUSLY NONFRIABLE ASBESTOS MATERIAL BECOMES CRUMBLED, PULVERIZED, OR REDUCED TO POWDER. | | |
| XVI. I CERTIFY THAT AN INDIVIDUAL TRAINED IN THE PROVISIONS OF THIS REGULATION (40 CFR PART 61, SUBPART M) WILL BE ON-SITE DURING THE DEMOLITION OR RENOVATION AND EVIDENC THAT THE REQUIRED TRAINING HAS BEEN ACCOMPLISHED BY THIS PERSON WILL BE AVAILABLE FOR INSPECTION DURING NORMAL BUSINESS HOURS. (Required 1 year after promulgation) | | |
| | (Signature of Owner/Operator) | (Date) |
| XVII. I CERTIFY THAT THE ABOVE INFORMATION IS CORRECT. | | |
| | (Signature of Owner/Operator) | (Date) |

Figure 10-1. Notification of Demolition and Renovation (Continued)

- a certification that an appropriately trained person will supervise the stripping and removal operation; and
- a description of the procedures to be followed in the event that unexpected RACM is found or generated.

When a **facility has been ordered to be demolished,** notification must also include:

- the name, title and authority of the government representative who ordered the demolition;
- the date the order was issued;
- the date the demolition was ordered to begin; and
- a copy of the order.

For **emergency renovations**, notification must include:

- 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.

## PROCEDURES FOR ASBESTOS EMISSION CONTROL [§61.145(c)]

Because an acceptable, safe, ambient source concentration of asbestos is unknown, the standard sets forth requirements to prevent emissions of particulate asbestos material to the outside air.

Table 10-2 provides a summary of emission control requirements.

### Removal of ACM [§61.145(c)(1)]

Remove 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.

### Exceptions from Removal [§61.145(a)(3) and (c)(1)(i-iv)]

RACM need not be removed prior to demolition if it:

- is located in a facility ordered demolished by a governmental agency because the facility is structurally unsound and in danger of imminent collapse. (The portion of the facility containing the RACM must be adequately wet during wrecking.);

- is Category I nonfriable ACM that is not in poor condition and is not friable;

- is on a facility component that is encased in concrete or other similarly hard material and is adequately wet whenever exposed during demolition;

- 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-contaminated debris must be treated as ACWM and adequately wet at all times until disposed of;

- is Category II nonfriable ACM and the probability is low that it will become crumbled, pulverized, or reduced to powder during demolition.

**Removal of Units or Sections [§61.145(c)(2)]**

When a facility component that contains, is covered with, or is coated with RACM is being taken out of the facility as a unit or in sections:

- adequately wet all RACM exposed during cutting or disjoining operations; and

- carefully lower each unit or section to the floor and to ground level. (Do not drop, throw, slide or otherwise damage or disturb the RACM.)

**Stripping RACM from an In-place Facility Component [§61.145(c)(3)]**

Adequately wet RACM while it is being stripped from in-place facility components.

**Techniques for Wetting**

Wetting may be accomplished in a variety of ways:

- portable garden sprayer;
- faucet tap/hose;
- water barrel and pump; or
- hose and nozzle connected to a hydrant.

Workers should apply the wetting agent as a fine mist or spray to ensure adequate wetting of the RACM. Depending on the type of RACM being removed, repeat or continuous application of the wetting agent may be necessary.

## TABLE 10-1. §61.145(b) NOTIFICATION REQUIREMENTS SUMMARY

(1) Provide written notice.

(2) Update notice as necessary.

(3) Postmark
- (i) planned demo/reno - 10 working days before activity
- (ii) planned reno involving nonscheduled operations - 10 working days before end of calendar year
- (iii) ordered demo or emergency reno - ASAP before, not later than following working day
- (iv) provide notice of new start date
  - (A) later start date
    - (1) telephone ASAP before original start date
    - (2) written notice ASAP, no later than original start date
  - (B) earlier start date
    - (1)(2) written notice 10 working days before reno or demo work begins
  - (C) work cannot commence on other than new start date

(4) Notification information
- (i) original or revised notification?
- (ii) owner, operator, removal contractor owner or operator name, address, telephone
- (iii) demolition or renovation?
- (iv) facility description (size, # floors, age, present, prior use)
- (v) procedures employed to detect RACM, Category I and II nonfriable ACM
- (vi) approximate amount of RACM to be removed; approximate amount of Category I and II to remain (demo only)
- (vii) facility address and location of worksite in facility
- (viii) starting/completion dates of asbestos removal work which **would** disturb asbestos material (Jan 1 - Dec 31 for planned but nonscheduled renos)
- (ix) starting/completion dates of demo or reno
- (x) description of planned demo/reno work, methods to be used, facility component description
- (xi) work practices/engineering controls to be used
- (xii) waste disposal site name/address
- (xiii) certification that trained individual will supervise
- (xiv) name, title, authority of individual ordering demolition; date order issued and demo to begin; attach copy to notification
- (xv) date/hour/description of emergency and explanation re: unsafe condition, equipment damage, or financial burden
- (xvi) procedures to be followed if unexpected RACM is found or generated
- (xvii) waste transporter name, address, telephone number

(5) Report information on appropriate form.

High-pressure power washers are not recommended for use in wetting RACM because the force of the water stream (measured in thousands of pounds per square inch) dislodges RACM so quickly that adequate wetting of the material cannot take place.

Although not specifically required by the asbestos NESHAP, surfactants, chemicals which reduce the surface tension of water, are commonly added to the water used for wetting RACM. Surfactants aid in the penetration and wetting of RACM and reduce the amount of water required.

EPA guidance recommends using a mixture of 50 percent polyoxyethylene ester and 50 percent polyoxyethylene ether, or the equivalent, in a 0.16 percent solution (1 oz. per 5 gallons) of water (Purple Book - EPA 560/5-85-024).

**Wetting Exemptions [§61.145(c)(3)(i-iii), (6)(iv), (7)(i-iii)]**

Wetting is not required where the wetting operation would damage equipment or present a safety hazard, where RACM being handled is contained in leak-tight wrapping, or where the abatement is taking place below freezing temperatures. Detailed information concerning these situations is provided below.

***Equipment Damage or Safety Hazards [§61.145(c)(3)(i-iii)]***

Wetting is not required if the owner or operator:

- has obtained prior *written approval* from the Administrator based on a written application that wetting to comply would unavoidably damage equipment or present a safety hazard; and

- uses one of the following *emission control methods* during the renovation activity:

  - an appropriately designed and operated **local exhaust ventilation and collection system** for particulate asbestos; or

  - a **glove-bag system** designed and operated to contain particulate asbestos material; or

  - **leak-tight wrapping** to contain all ACM prior to dismantlement; or

  - **another equivalent wetting or emission control method** approved, in writing, by the Administrator; and

- keeps a copy of the written approval at the worksite and makes it available for inspection.

***Wrapped RACM [§61.145(c)(6)(iv)]***

Wetting is not required when RACM has been contained in leak-tight wrapping prior to the facility component's dismantlement, or after a facility component has been removed as a unit or in sections.

***Below Freezing Temperatures [§61.145(c)(7)]***

When the temperature at the point of wetting is below 32°F (0°C), wetting is not required. The owner or operator must, however:

- remove facility components containing, coated with, or covered with RACM as units or in sections to the maximum extent possible;
- record the temperature in the area containing the facility components at the beginning, middle and end of each workday;
- keep daily temperature records available for inspection by the Administrator during normal business hours at the demolition or renovation site; and
- retain temperature records for at least 2 years.

**Treatment of Facility Components Taken Out as Units or Sections [§61.145(c)(4)]**

Facility components, except those described in §61.145(c)(5), which have been taken out of a facility as a unit or in sections must be *stripped or contained in leak-tight wrapping.* If they are to be stripped:

- adequately wet the RACM during stripping; or
- use an appropriately designed and operated local exhaust and ventilation and collection system for particulate asbestos.

**Exemptions from Stripping [§61.145(c)(5)]**

RACM does not have to be removed from large facility components such as reactor vessels, large tanks, and steam generators, ***but not beams***, if the following requirements are met:

- the facility component is removed, transported, stored, disposed of, or reused without disturbing or damaging the RACM; and
- the component is encased in a leak-tight, appropriately-labeled wrapping (see Figure 10-2) during all loading and unloading operations and during storage.

DANGER
ASBESTOS DUST HAZARD
CANCER AND LUNG DISEASE
HAZARD

**Figure 10-2. EPA Asbestos Warning Label**

**Handling of RACM [§61.145(c)(6)]**

For all RACM, including material that has been removed or stripped:

- adequately wet the material and ensure that it remains wet until collected and contained or treated in preparation for disposal;

- carefully lower the material to the ground and floor (Do not drop, throw, slide or otherwise damage or disturb the material.); and

- transport the material to the ground via leak-tight chutes or containers if it has been removed or stripped more than 50 feet above ground level and was not removed as units or in sections.

**NESHAP Training Requirements [§61.145(c)(8)]**

No RACM shall be stripped, removed, or otherwise handled or disturbed at a facility unless at least one on-site representative, such as a foreman or management-level person or other authorized representative, trained in the provisions of this regulation and the means of complying with them is present. Every 2 years this individual must receive refresher training in the provisions of this regulation. Evidence that the required training has been completed must be posted and made available for inspection by the Administrator at the demolition or renovation site.

**Ordered Demolitions [§61.145(c)(9)]**

For facilities ordered to be demolished, the portion of the facility that contains RACM must be kept adequately wet during the wrecking operation.

**Intentional Burning [§61.145(c)(10)]**

If the facility is demolished by intentional burning, all RACM, including Categories I and II nonfriable ACM, must be removed before burning.

## WASTE DISPOSAL REQUIREMENTS (§61.150)

Section 61.150 of the NESHAP asbestos standard addresses collection, processing, packaging, transport, deposition, and recordkeeping requirements pertaining to asbestos-containing waste material (ACWM). Table 10-3 provides a summary of these requirements.

ACWM is defined as any waste that contains commercial asbestos and is generated by a source subject to the provisions of the standard. ACWM includes:

- filters from control devices;
- friable asbestos waste material;
- bags or other similar packaging contaminated with commercial asbestos;
- RACM waste material; and
- materials contaminated with asbestos (disposable equipment, clothing, plastic sheeting, cleanup equipment waste, shower water, excess water from wetting procedures, etc.).

### VISIBLE EMISSIONS [§61.150(a)]

***Note:*** §61.150(a) does not apply to Category I nonfriable ACM waste and Category II nonfriable ACM waste that is not RACM.

Each owner or operator of any source covered under the provisions of the NESHAP asbestos standard must **either discharge no visible emissions (VE)** to the outside air during the collection, processing (including incineration), packaging or transporting of any ACWM generated by the source, **or use one of the following emission control and waste treatment methods:**

- adequately wet ACWM;
- process ACWM into nonfriable forms;
- use emission control alternatives.

### Adequately Wet ACWM [§61.150(a)(1) and (3)]

Owners/operators who choose this option must:

- Adequately wet ACWM.

- Discharge no VE.

- After wetting, seal ACWM in leak-tight containers while wet. For materials that will not fit into containers without additional breaking, enclose them in leak-tight wrapping.

## TABLE 10-2. §61.145(c) ASBESTOS EMISSION CONTROL SUMMARY

(1) Remove RACM before demo/reno unless:
  - (i) Category I nonfriable (not in poor condition, not friable)
  - (ii) encased in concrete; adequately wet during demo
  - (iii) not accessible for testing; adequately wet, treat as ACWM
  - (iv) Category II nonfriable ACM (low probability of becoming RACM)

(2) Removal of facility components in units/sections with asbestos intact
  - (i) adequately wet (cutting or disjoining)
  - (ii) carefully lower

(3) RACM stripping
  - (i) adequately wet unless:
    - (A) written approval (equipment damage, safety hazard) **and**
    - (B) one of following emission control methods:
      - (1) LEVC or
      - (2) glove bag or
      - (3) leak-tight wrapping
  - (ii) where (1), (2), or (3) cannot be used, written approval for an alternative method.
  - (iii) keep copy of written approval at worksite.

(4) Strip or wrap facility component (units/sections) or handle per (5). If stripped:
  - (i) adequately wet RACM or
  - (ii) use LEVC

(5) Large facility components (but not beams) - no need to strip if:
  - (i) RACM not disturbed/damaged **and**
  - (ii) leak-tight wrapping **and**
  - (iii) labeled

(6) All RACM (including removed or stripped material)
  - (i) adequately wet and maintain wet
  - (ii) carefully lower
  - (iii) leak-tight chutes/containers (>50′ and not units/sections)
  - (iv) wetting not required for RACM wrapped leak-tight

(7) Temperature <0°C (32°F)
  - (i) wetting not required
  - (ii) remove RACM as units/sections
  - (iii) record temperature beginning, middle, end of workday; keep records available at site; retain records ≥2 years.

(8) Trained on-site representative; refresher training every 2 years; post evidence of required training at site

(9) Ordered demos - adequately wet RACM during demo

(10) Intentional burning - remove all RACM and Category I and II nonfriable ACM before burning

- Label containers of ACWM or wrapped ACWM using warning labels specified by OSHA 29 CFR 1910.1001 or 1926.58 (now 1926.1101 - see Figure 10-3).

- Label ACWM destined for off-site transport with the name of the waste generator and the location where the waste was generated.

- Keep ACWM generated during ordered demolitions (or demolitions where RACM is not required to be removed) adequately wetted at all times after demolition and during handling and loading for transport to a disposal site. Such ACWM does not have to be sealed in leak-tight containers or wrapping, but may be transported and disposed of in bulk.

| |
|---|
| DANGER<br>CONTAINS ASBESTOS FIBERS<br>AVOID CREATING DUST |

**Figure 10-3. OSHA Asbestos Warning Label**

**Process ACWM into Nonfriable Forms [§61.150(a)(2)]**

Owners/operators may choose to form all ACWM into nonfriable pellets or other shapes while discharging no visible emissions to the outside air.

**Use Emission Control Alternatives [§61.150(a)(4)]**

Owners/operators may use an alternative emission control and waste treatment method that has received prior approval by the Administrator.

*Note:* In a 1989 court ruling in Rhode Island (*Hugo Key vs. EPA*), the judge ruled that debris on the ground outside a building was a violation of the "No VE" requirement. In this case, the evidence consisted of pieces of friable asbestos material that had come off an asbestos-covered tank as it was dragged out of a building into a parking lot. The court's interpretation of this part of §61.150 provides greater enforcement flexibility of the "No VE" requirement and, hence, a need for inspectors to collect samples of ACWM found outside a facility.

## DEPOSITION OF ACWM [§61.150(b)]

Deposit, as soon as is practical, all ACWM (excluding Category I ACM that is not RACM) at a waste disposal site operated in accordance with §61.154, or at an EPA-approved site that converts RACM and ACWM into nonasbestos (asbestos-free) material according to §61.155.

## VEHICLE MARKING [§61.150(c)]

Vehicles used to transport ACWM must be marked during the loading and unloading of waste so that the signs are visible and markings in conformation with §61.149(d)(1)(i-iii) (see Figure 10-3).

## OFF-SITE TRANSPORT OF ACWM [§61.150(d)]

Each owner or operator of a demolition/renovation operation must:

- Maintain appropriate waste shipment records (WSRs) (see Figure 10-4).
- Provide a copy of the waste shipment record to the disposal site owners or operators when the ACWM is delivered to the site.
- Contact appropriate personnel to determine the status of the waste shipment if a copy of the waste shipment record, signed by the owner or operator of the waste disposal site, is not received by the waste generator within 35 days of the date the waste was accepted by the initial transporter.
- Report in writing to the agency responsible for administering the asbestos NESHAP program for the generator if a signed copy of the WSR has not been received by the waste generator within 45 days of the date the waste was accepted by the initial transporter.
- Retain a copy of all waste shipment records, including the signed copy of the waste shipment record. for at least 2 years.

## RECORD AVAILABILITY [§61.150(e)]

Each owner or operator of a demolition/renovation operation must furnish upon request. and make available for inspection by the Administrator, all records required under this section.

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## AIR CLEANING (§61.152)

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## APPLICABILITY [§61.152(a)]

Under certain conditions detailed in §61.145 *(Standard for demolition and renovation)* and §61.150 *(Standard for waste disposal...)*, an owner or operator may choose to control asbestos emissions by using fabric filter collection devices. The device must be properly installed, used, operated, and maintained. In addition, for fabric filter collection devices installed after January 10, 1989, provisions must be made for easy inspection for faulty bags. If a source cannot meet the air-cleaning requirements when it has elected to use fabric filter collection devices, it defaults to the "No Visible Emission" component of the standard.

## EXCEPTIONS [§61.152(b)]

### Fabric Filters [§61.152, (b)(1)]

Fabric filters may be used; however, if the use of fabric creates a fire or explosion hazard, or if the Administrator determines that a fabric filter is not feasible, use of wet collectors may be authorized.

*Note:* Fabric filters are uneconomical and therefore rarely, if ever, used at demolition or renovation sites.

### HEPA Filters [§61.152(b)(2)]

HEPA filters certified to be 99.97 percent efficient for 0.3 micron diameter particles may be used.

*Note:* HEPA filters are commonly used at demolition/renovation worksites. They are components of local exhaust ventilation units, respirator cartridges, and vacuum cleaners.

### Other Filtration Devices [§61.152(b)(3)]

Other filtering equipment may be authorized for use if the owner or operator demonstrates to the Administrator that it is equivalent to the described equipment in filtering particulate asbestos material.

| | | | |
|---|---|---|---|
| Generator | 1. Work site name and mailing address | Owner's name | Owner's telephone no. |
| | 2. Operator's name and address | | Operator's telephone no. |
| | 3. Waste disposal site (WDS) name, mailing address, and physical site location | | WDS phone no. |
| | 4. Name, and address of responsible agency | | |
| | 5. Description of materials | 6. Containers No. Type | 7. Total quantity $m^3$ ($yd^3$) |
| | | | |
| | | | |
| | 8. Special handling instructions and additional information | | |
| | 9. OPERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and government regulations. | | |
| | Printed/typed name & title | Signature | Month Day Year |
| Transporter | 10. Transporter 1 (Acknowledgment of receipt of materials) | | |
| | Printed/typed name & title<br>Address and telephone no. | Signature | Month Day Year |
| | 11. Transporter 2 (Acknowledgment of receipt of materials) | | |
| | Printed/typed name & title<br>Address and telephone no. | Signature | Month Day Year |
| Disposal Site | 12. Discrepancy indication space | | |
| | 13. Waste disposal site owner or operator: Certification of receipt of asbestos materials covered by this manifest except as noted in item 12. | | |
| | Printed/typed name & title | Signature | Month Day Year |

(Continued)

**Figure 10-4. Waste Shipment Record**

## TABLE 10-3. §61.150 WASTE DISPOSAL SUMMARY

(a) No visible emissions **or** use one of emission control and waste treatment methods of paragraphs (1) through (4):
- (1) adequately wet
  - (i) control device (slurry); adequately wet ACWM **and**
  - (ii) no visible emissions; **and**
  - (iii) leak-tight containers while wet, or leak-tight wrapping; **and**
  - (iv) OSHA label; **and**
  - (v) generator identification label (off-site transport only)
- (2) process into nonfriable forms
  - (i) pellets or other shapes
  - (ii) no visible emissions
- (3) for facilities demolished where RACM has not been removed, or in ordered demolitions, adequately wet ACWM at all times after demolition (leak-tight containers or wrapping not required)
- (4) approved alternative emission control and waste treatment method
- (5) paragraph (a) does not apply to demo/reno Category I nonfriable ACM waste and Category II nonfriable ACM waste that did not become RACM

(b) Deposit ACWM as soon as practical at:
- (1) appropriate waste disposal site
- (2) EPA-approved asbestos conversion site
- (3) paragraph (b) does not apply to Category I nonfriable ACM that is not RACM

(c) Mark vehicles (loading and unloading)

(d) For ACWM transported off the site:
- (1) waste shipment records
  - (i) generator name, address, telephone
  - (ii) asbestos NESHAP program agency name, address
  - (iii) quantity ACWM ($m^3$, $yd^3$)
  - (iv) waste disposal site (WDS) operator name, telephone
  - (v) disposal site name, physical location
  - (vi) transport date
  - (vii) transporter name, address, telephone
  - (viii) certification
- (2) provide WSR to disposal site owner/operator at time of delivery
- (3) if signed copy of WSR is not received by generator from WDS within 35 days, contact transporter and WDS to determine status
- (4) submit report to asbestos NESHAP program agency (for generator) if signed WSR not received from WDS within 45 days
  - (i) copy of WSR
  - (ii) cover letter re: efforts
- (5) retain WSRs $\geq$2 years

(e) Furnish records to Admin. upon request.

## SOURCE REPORTING REQUIREMENTS (§61.153)

Note: Waste disposal site, but not demolition and renovation owners/operators, are subject to these provisions.

### NEW AND EXISTING SOURCES [§61.153(a)]

Waste disposal site owners and operators must supply the following information to the Administrator within 90 days of the effective date of the regulation (for existing sources) or within 90 days of the date of initial startup (for new sources):

- brief description of the waste disposal site;
- description of the method(s) or alternative procedures to be used to comply with the asbestos NESHAP.

### ACTIVE WASTE DISPOSAL SITES [§61.153(b)]

Active waste disposal site owners and operators must also provide the following information (as required by §61.10) when submitting information required by §61.153(a):

- name and address of owner or operator;
- location of the source;
- type of hazardous pollutants emitted;
- brief description of the nature, design, and method of operation of the stationary source; and
- the average weight per month of asbestos being processed by the source over the last 12 months preceding the date of the report.

*Note:* Changes in the information required by §61.153 must be reported to the Administrator within 30 days of their occurrence.

## ACTIVE WASTE DISPOSAL SITES (§61.154)

When the asbestos NESHAP regulation was revised on November 20, 1990, waste disposal site operators became subject to new reporting and recordkeeping requirements. These and other applicable components of the regulation are discussed below.

## SITE OPERATION [§61.154(a-d)]

To be an acceptable site for disposal of ACWM, an active waste disposal site must meet the following requirements:

- **§61.154(a)** - Produce no visible emissions to the outside air where ACWM has been deposited [or meet the requirements of §61.154(c) or (d)];

- **§61.154(b)** - Unless a natural barrier adequately deters access by the general public, install and maintain warning signs and fencing [or meet the requirements of §61.154(c)(1)];

- **§61.154(c)** - At the end of each operating day, or at least once every 24-hour period while the site is in continuous operation, cover the ACWM that has been deposited at the site during the operating day or previous 24-hour period with:

  - at least 6 inches (15 centimeters) of compacted nonasbestos-containing material [§61.154(c)(1)], or

  - a resinous, petroleum-based, or other dust suppression agent, approved by the Administrator, that effectively binds dust and controls wind erosion. (Waste oil is not considered a dust suppression agent.) [§61.154(c)(2)].

- **§61.154(d)** - Rather than meet the no visible emission requirement of §61.154(a), use an alternative emissions control method that has received prior written approval from the Administrator.

Figure 10-5 illustrates waste disposal site requirements.

## SITE OPERATION RECORDKEEPING AND REPORTING REQUIREMENTS [§61.154(e)]

For all ACWM received, the owner or operator of the active waste disposal site must:

- Maintain properly completed waste shipment records (WSRs) (see Figure 10-4).

- Report in writing to the Administrator for the waste generator (and, if different, the Administrator for the disposal site), by the next working day, the presence of a significant amount of improperly enclosed or uncovered waste. Submit a copy of the WSR along with the report.

- Send a copy of the signed WSR to the waste generator as soon as possible, and no longer than 30 days after receipt of the waste.

- Upon discovering a discrepancy between the quantity of waste designated on the WSR and the quantity actually received, attempt to reconcile the discrepancy with the waste generator. (If the issue is not resolved within 15 days after receiving the waste, report this in writing to the governmental agency responsible for administering the asbestos NESHAP program for the waste generator and, if different, the governmental agency responsible for administering the asbestos NESHAP program for the disposal site.).

- Retain a copy of all required records and reports for at least 2 years.

**SITE CLOSURE RECORDKEEPING AND REPORTING REQUIREMENTS [§61.154(f-h)]**

Waste disposal site operators must:

- Maintain, until closure, records of the location, depth and area, and quantity ($m^3$ or $yd^3$) of ACWM within the disposal site on a map or diagram of the disposal area.

- Upon closure, comply with the provisions of §61.151 (*Standard for Inactive Waste Disposal Sites*).

- Upon closure, submit a copy of records of asbestos waste disposal locations and quantities to the Administrator.

**RECORD AVAILABILITY [§61.154(i)]**

Owners or operators of waste disposal sites must furnish upon request, and make available during normal business hours for inspection by the Administrator, all records required under §61.154.

**EXCAVATION NOTIFICATION [§61.154(j)]**

The Administrator must be notified in writing at least 45 days before disturbing any deposited ACWM. (Notification regarding a **later** start date must be received by the Administrator at least 10 working days before excavation; an **earlier** start date is not permitted.)

The notice must indicate:

- scheduled starting and completion dates;
- reason for disturbing the ACWM;

- emission control methods to be used; and
- locations of temporary/final disposal sites.

## INACTIVE WASTE DISPOSAL SITES (§61.151)

### SITE OPERATION [§61.151(a)]

Each owner or operator of any inactive waste disposal site that was operated by an asbestos mill, manufacturer, or fabricator, or received ACWM from demolition, renovation, spraying or conversion operations, must follow **one** of the following procedures:

- Discharge no visible emissions from the site.

- Cover the ACWM with at least 6 inches of compacted nonasbestos-containing material and maintain a vegetative cover on it.

- Cover the ACWM with at least 2 feet of compacted nonasbestos-containing material and maintain it.

- Use a resinous or petroleum-based dust suppressant agent or other Administrator-approved agent (for asbestos tailings).

### SITE DEMARCATION [§61.151(b)]

If no natural barrier exists which adequately deters access by the general public, and the ACWM has not been covered with nonasbestos-containing material as described above, warning signs and fencing must be used.

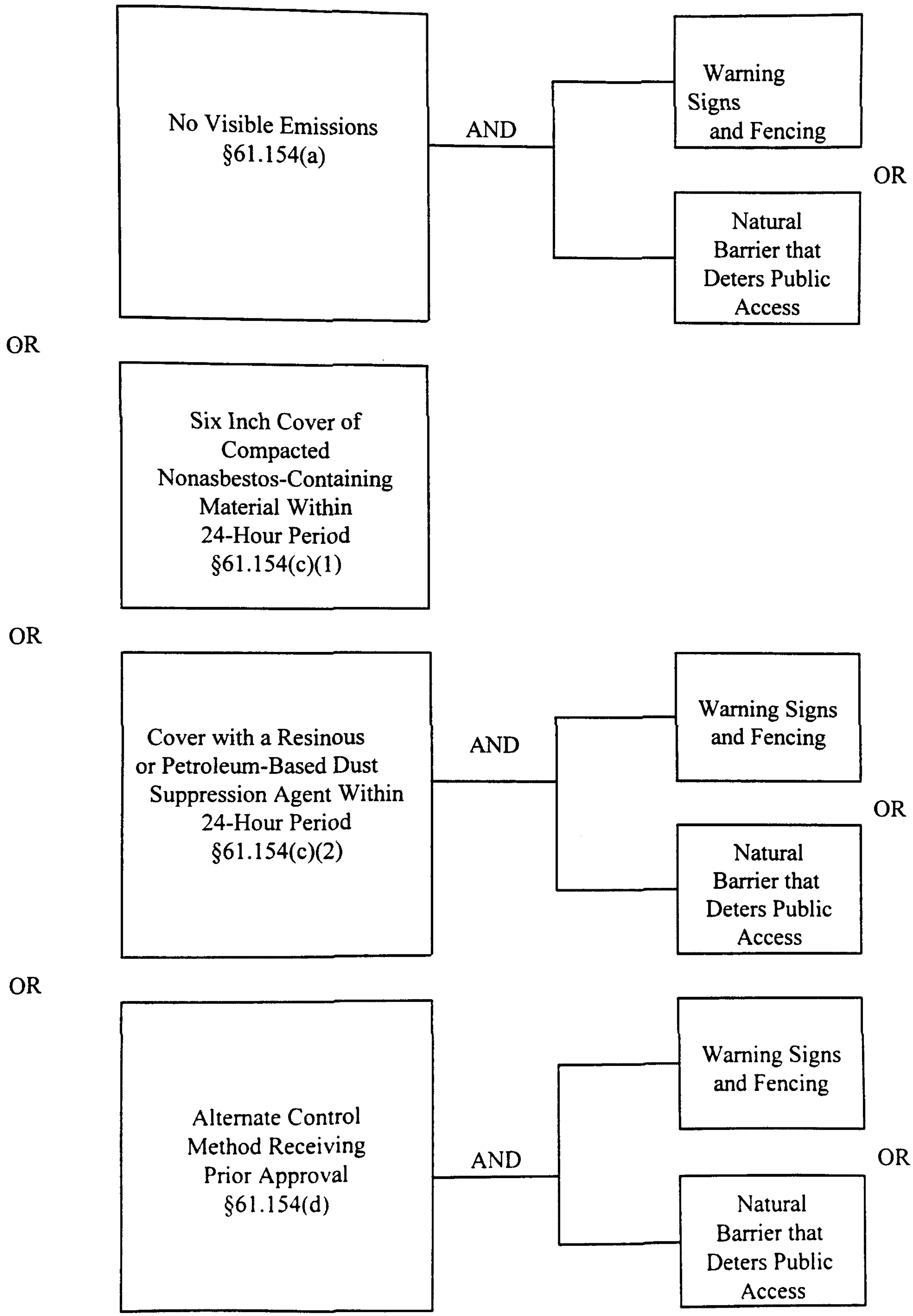



**Figure 10-5. Waste disposal site requirements.**

## CONTROL ALTERNATIVES [§61.151(c)]

Alternatives to the site operation/demarcation methods described above may be used if approved by the Administrator.

## EXCAVATION NOTIFICATION [§61.151(d)]

The Administrator must be notified in writing at least 45 days before disturbing any deposited ACWM. (Notification regarding a **later** start date must be received by the Administrator at least 10 working days before excavation; an **earlier** start date is not permitted.)

The notice must indicate:

- scheduled starting and completion dates;
- reason for disturbing the ACWM;
- emission control methods to be used; and
- locations of temporary/final disposal sites.

## DEED NOTATION [§61.151(e)]

Within 60 days of a site's inactivation, the owner or operator must record on the deed and any other instrument normally examined during a title search that:

- The land was used for ACWM disposal.

- The survey plot and record of location and quantity of ACWM have been filed with the Administrator.

- The site is subject to 40 CFR Part 61 Subpart M (asbestos NESHAP).

# SECTION 11

# PRE-INSPECTION PLANNING AND PREPARATION

Pre-inspection planning and preparation help ensure that an inspection is conducted smoothly, efficiently, and professionally. The following describes both generalized pre-planning activities and those specific to the conduction of high-quality asbestos NESHAP compliance inspections.

## INSPECTOR RESPONSIBILITIES

During pre-inspection planning, an inspector should:

- Gain an understanding of the objectives of the inspection and the specific areas to be investigated.
- Arrange logistics, including travel to and from the site, any special travel needs, and hotel accommodations.
- Assemble materials and equipment.
- Coordinate with supervisors, attorneys, States, or others as appropriate.
- Review pertinent regulations.
- Gain an understanding of the Agency's:
    - standard operating procedures (SOPs);
    - health and safety plan;
    - quality assurance/quality control program.
- Acquire appropriate credentials.
- Make arrangements with the laboratory for the analysis of samples.
- Conduct an agency file and compliance data systems review.

## REVIEW NOTIFICATION

Each notification received should be reviewed relative to the requirements of §61.145(b). Conducting such a review will assist the inspector in determining whether the asbestos

NESHAP regulation applies to the facility/activities reported and will help determine what type of personal protective equipment may be needed. Particular attention should be paid to the:

- location of the facility;
- schedule for demolition or renovation;
- planned work practices; and
- types and quantity of ACM involved in the demolition or renovation project.

When a notification regarding asbestos removal operations at a school is received, an inspector should contact the Regional Asbestos Coordinator for information regarding the site's compliance with AHERA and WPR regulations.

## IDENTIFY NON-NOTIFIERS

The worst violation of the notification requirements of §61.145(b) is complete failure to notify. The following techniques can be used by inspectors to identify non-notifiers:

- Respond to complaints from the general public, employees, or competitors who may have recognized a very low bid award. Also, use cross-referral information from other federal, State and local agency inspectors.
- Note locations where demolition or renovation activities appear to be in progress. The presence of a roll box for disposal of construction debris is strong evidence of such activities.
- Observe trucks entering a landfill and question their origin if suspected asbestos debris is on board. Regularly review asbestos receiving records at landfills since these can provide information on contractors who may not have notified.
- Review demolition or renovation permits written by the local building department.
- Review trade journals, newspapers, etc., for ongoing or past projects.

## PREPARE INSPECTION EQUIPMENT/MATERIALS

In order to ensure the most efficient and complete inspection possible, an inspector must gather and pack all equipment necessary for the inspection. A detailed list of equipment and explanations of the purpose of each item follows. An equipment checklist is included in this manual as Appendix A.

- *Copy of notification* - The notification should be brought to the worksite so that the information provided can be compared to on-site conditions.

- *Protective equipment* - The following equipment should be available:

  - respirator (full-face negative-pressure; PAPR; SCBA)
  - respirator cartridges (HEPA, HEPA combination cartridges for ammonia, organic vapors, acids)
  - respirator disinfectant
  - disposable, full-body, hooded coveralls
  - disposable gloves
  - steel-toed rubber boots or safety shoes
  - latex overboots
  - hard hat
  - duct tape
  - liquid soap
  - disposable towels
  - bathing suit (or equivalent)
  - climbing harness
  - disposable underwear
  - hearing protection

  *Note:* Inspectors should use only agency-supplied respiratory protection that they have been specially trained and fit-tested to use.

- *Employee identification* - Proper credentials (to prove authority for performing the inspection) and any certification cards of respiratory fit-testing or medical monitoring should be brought to the worksite.

- *Copy of asbestos NESHAP regulation* - The inspector can use this to resolve disagreements if the owner/operator is unfamiliar with regulations; a copy should be given to the owner/operator.

- *Inspection checklists* - Checklists are useful as a reminder of the baseline information needed for all inspections. See Appendices to this manual for copies of representative checklists.

- *Bound notebook and writing implements* - Inspectors should take notes and fill out checklists to every extent possible before entering the removal area. Notebooks and checklists should be left outside the contaminated area. Plastic clipboards, plastic transparency sheets, and waterproof pens can be used to record worksite observations. Following the inspection, the inspector can complete appropriate checklists.

*Note:* In some situations it may be critical to enter the work area quickly to assess potential violations; in these cases the checklist and notebook entries can be made after the inspection.

- ***Camera (with flash)*** - Take photographs of sample locations and visible emission sources. Waterproof cameras are convenient when wet removal is occurring and decontamination is required. Bring extra batteries and film to the site.

- ***Flashlight*** - Work may be conducted in areas with inadequate lighting such as basements, above drop ceilings, and in buildings where the electricity has been turned off. Waterproof, intrinsically-safe flashlights are recommended. Bring extra batteries/bulbs to the site.

- ***Binoculars*** - For off-site observations.

- ***Tape measure*** - Although tape measures can be used to accurately quantify the amounts of RACM, they are difficult to decontaminate. As an alternative, an inspector may pace off distances and estimate distance based on a previously-measured pace. Building diagrams can also prove useful in determining amounts of RACM seen.

- ***Chain-of-custody forms and labels*** - These forms and labels allow inspectors to properly distinguish each sample and to maintain a record of sample possession and transfer.

- ***Shipping supplies*** - Samples may be sent to a laboratory from the field.

- ***Sampling equipment*** - The following equipment and materials are used for bulk sample collection:

    - sample containers
    - water spray bottle
    - tamperproof tape or labels
    - tools (needle-nose pliers, slotted and Phillips head screwdrivers, locking-blade penknife, laboratory spatula)
    - drop cloth
    - wet wipes
    - plastic bags
    - glove bag (for those situations where waste bags are opened outside the containment area)
    - disposable towels

- bathroom caulking
- labeled waste disposal bag
- diver's bags

- ***Extra fresh batteries*** - for camera and flashlight

- ***Business cards***

- ***Building diagrams (if available)***

- ***Office supplies***

    - Manila folders/envelopes
    - Rubber bands
    - Paper clips

- ***Waterproof watch***

## SECTION 12

## FACILITY INSPECTIONS

On-site facility inspections provide the foundation for all asbestos NESHAP enforcement actions for substantive violations and therefore are critical to enforcing the regulation. On-site inspections are also used to determine whether potential AHERA, ASHARA (MAP) or WPR violations exist.

Inspectors typically try to visit sites undergoing active removal; however, since all asbestos NESHAP inspections are intended to be unannounced, inspectors may discover that removal has not yet begun or has been completed ahead of schedule.

Inspectors should examine the renovation worksite no matter what the current status of the operation is, for useful information regarding compliance/noncompliance with the provisions of the asbestos NESHAP regulation may be gathered. Where violations of the regulation are suspected, the inspector must gather evidence to prove his/her suspicions. Proper acquisition and maintenance of evidence enhances the chances of success in bringing an enforcement action against a facility and ensuring future compliance.

### EVIDENCE

To run an effective asbestos NESHAP program (i.e., one that prevents asbestos air pollution), one must be successful in bringing enforcement actions against violators of the regulation. The severity of an enforcement action (and ultimately its deterrent effect) that can be brought against a violator is often directly related to the amount of evidence the agency can produce regarding the violations. For this reason, the gathering of evidence during on-site inspections is a crucial component to the potential success of an asbestos NESHAP program.

The *American Heritage Dictionary of the English Language* defines evidence as *"the data on which a judgment or conclusion may be based, or by which proof or probability may be established."*

The law recognizes five types of evidence:

- **testimonial** - a person's reported sense impressions and the opinions the person formed based on them (e.g., the inspector's testimony);
- **real** - the object, item or thing itself (e.g., ACM sample);
- **documentary** - a "document" having significance and effect due to its content (e.g.,

discrepancy reports, messages, logs, stationary source reports);

- **demonstrative** - something other than the above which is prepared or selected to illustrate or otherwise make some relevant fact clearer or easier to understand (e.g., photographs, diagrams, maps, summaries, videotapes); and

- **judicially noticed** - matters about which there could be no dispute and become evidence by virtue of their being so noticed by a judge (e.g., asbestos analytical procedures, film development procedures, geographic locations, matters of common knowledge).

Unless these forms of evidence are gained in an appropriate manner and maintained properly, they may not be considered admissible in enforcement proceedings.

**Field Logbook**

The inspector's field logbook is the core of all inspection documentation. It should contain accurate and inclusive documentation of all inspection activities. The logbook is used as the basis for preparing the inspection report and to refresh the inspector's memory regarding the specifics of sample collection and other inspection procedures should the inspector be called upon to testify. Logbooks become part of the official inspection file.

Language in the logbook should be objective, factual, and free of personal feelings and conclusions of law. The logbooks can be provided to the opposing side during the discovery process of an enforcement case and can be entered as evidence in court.

Since an inspector may be called to testify in an enforcement proceeding long after the inspection was conducted, it is imperative that each inspector keep detailed notes on every aspect of the inspection, including interviews, visual observations, records assessments, and sample collection and handling.

Entries in the logbook should correlate readily with particular samples and photographs taken, and copies of records or other documentation collected by the inspectors. Use of assigned identification numbers will allow tracing back to the exact time, place, conditions, and procedures employed for gathering each piece of evidence.

***General Procedures***

Inspectors should:

- Use only bound field logbooks, preferably with consecutively numbered pages. Bound surveyors' logbooks may be acceptable.

- Use a different logbook for each inspection.

- Make entries using waterproof ink.
- Write legibly.
- Line out (do not obliterate!) incorrect entries and initial them.
- Write in the date and time of each entry.
- At the end of an entry on a particular event, draw a diagonal line at the conclusion of the entry and initial it. This will facilitate review of notes by the inspector and case development staff.

*Important Information*

In the field logbook inspectors should provide information regarding the following:

- **Sampling procedures.** Note that standard operating procedures have been followed in the taking of physical samples.
- **Documents.** Record all documents taken or prepared (e.g., photographs) and relate them to specific inspection activities (such as sample taking).
- **Unusual conditions and problems.** Describe in detail any unusual conditions or problems.
- **Interview notes.** Record the names, titles, and duties of facility personnel with notes from the statements they make.
- **General information.** Note the names and titles of facility officials, size of facility, description of operations, number of employees, and other general information, such as how the facility keeps its records, since this information may be useful in case development or future inspections.
- **Other incidents.** Keep detailed notes about any other incidents that occurred during the inspection, such as an electrical power failure or tampering with government vehicles or equipment.
- **Administrative data.** Record entries regarding inspection travel and fiscal data in accordance with Regional and/or program policy.
- **Identification numbers.** Key each piece of evidence collected (document, physical sample, photograph) to an entry in the field logbook.
- **Observations.** Note conditions or practices that may be useful in inspection report preparation or will contribute to valid evidence.

- **General procedures.** List all procedures followed involving entry, records inspection, and document preparation. Such information will help avoid damage to case proceedings on procedural grounds.

**Statements**

Since statements by site personnel can constitute important evidence in the determination of violations of the asbestos NESHAP, it is essential for inspectors to develop good interviewing techniques and record statements accurately. Inspectors should record the name, title (and address, if possible) of all persons interviewed during the inspection. An inspector should:

- Conduct the interview in a comfortable, private location.
- Behave in a considerate, nonthreatening, friendly manner.
- Take notes as unobtrusively as possible.
- Make no promises of confidentiality or protection.
- Avoid leading or complex questions.
- Ask questions from the general to the specific, and known to the unknown.
- Keep time sequencing consistent.
- Allow the interviewee to think and answer questions without interruption.

During the course of a site inspection, personnel may admit to or describe illegal activities that have taken place on site. Such statements may be made because of health concerns or ignorance of the regulations. While admissions or descriptions may not constitute conclusive proof of a violation, they may be used to question the credibility of defendant(s) who make subsequent contradictory statements. Proper elicitation and documentation of such statements, therefore, is extremely important.

**Bulk Samples**

The taking of bulk samples is an essential component of an asbestos NESHAP inspection. Without analytical results proving the existence of asbestos-containing materials on site, an inspector will find it difficult, if not impossible, to prove that the asbestos NESHAP regulation was applicable to the facility visited.

Bulk sample locations should be recorded on a site diagram (see Figure 12-1) and pertinent information recorded in a sample collection log (see Appendix E).

Although the *Clean Air Act* does not specifically state whether samples should be split with the site owner or operator, when requested to do so, inspectors should split samples in order to maintain good relations between the agency and the source.

Inspectors must be able to testify that the samples:

- accurately represent conditions at the site;
- were maintained using proper chain of custody; and
- were acquired and analyzed using proper methodology.

**Observations**

Since enforcement cases may not be resolved for years, an inspector must record accurately, and in sufficient detail, all pertinent observations made. Observations of noncompliance should be detailed in field notes and supported by personnel statements, photographs, and drawings as needed (see Figure 12-1).

**Photographs**

To be admissible as evidence, photographs must accurately and truthfully represent site conditions at the time in question. Photographs must be taken in sufficient number, be of high quality, and contain appropriate identification. Although use of a video camera can provide excellent documentation of an asbestos site inspection, decontamination is a concern.

Inspectors should become familiar with the operation of the camera well before its use becomes necessary; failure to do so can prove to be exceedingly troublesome, as significant documentation can be lost (and considerable embarrassment incurred!).

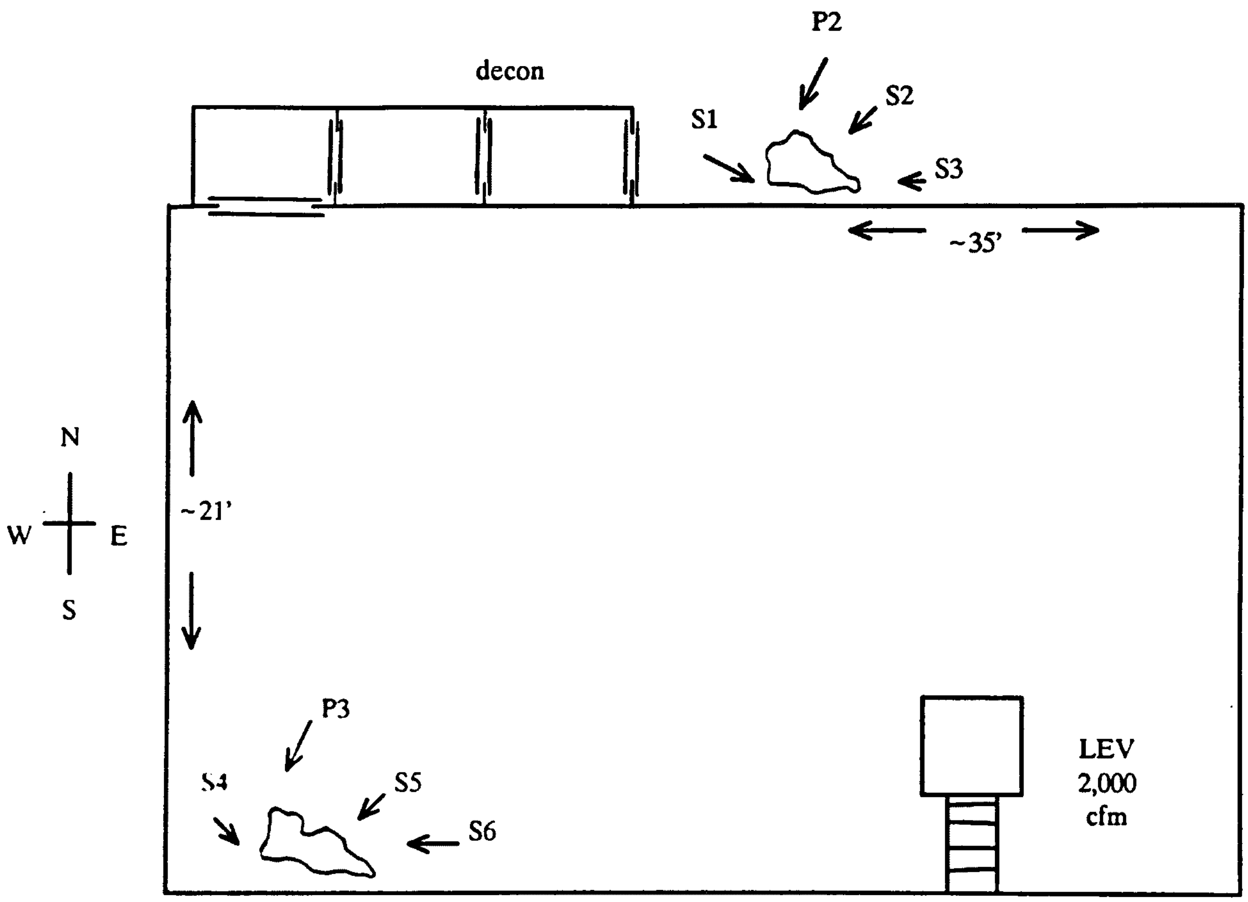
Inspectors should pay particular attention to the following:

- focal distance of the lens;
- flash distance;
- film type and batteries needed; and
- how to load the film and batteries.

Photographic documentation should tell the story with as little need for narrative as possible. This is done by shooting a series of shots which provide general to specific information. "Establishing shots" are taken from a distance and show not only the subject but one or several permanent landmarks which can be used for reference in establishing the exact location. "Subject" shots emphasize a specific object or event. Subject shots may be shot in sequence to show all sides of a subject. "Tight" or "detail" shots are closeup shots which provide very specific information concerning the subject.

All photographs taken should be noted on a site diagram (see Figure 12-1) and in a photograph log. This log includes site identification information and picture/frame numbers, detailed descriptions of the photographic subjects, and dates/times when the pictures were taken. The log will become part of the inspection report. A sample photograph identification log sheet is provided as an appendix in this manual.

**Rm. 1305**




S sample
P photograph

Site Code: __________ Location at site: __________

Date: __________ Inspector's initials: __________

**Figure 12-1. Abatement area diagram**

Once the photographs have been developed, the inspector should **immediately** record in indelible ink the following information on the back of each print:

- site name;
- date of inspection;
- photograph number (as noted in the photograph log);
- subject of photograph; and
- photographer (inspector) initials.

**Records**

Inspectors may need to review a variety of records during the conduction of asbestos NESHAP inspections. These include building and worksite diagrams, as well as waste shipment records, discrepancy reports, exception reports, stationary source reports, etc. Required records should be checked for completeness and accuracy, and retention times assessed.

If copies of pertinent documents are acquired by the inspector, they should be marked with the inspector's initials and a code, such as "Attachment A", and detailed in the field log book. The log book should indicate:

- what the document is;
- who provided the document; and
- the actual physical location of the original document.

## PRE-ENTRY OBSERVATIONS

Pre-entry observations (which may be conducted remotely using binoculars) can help determine the location(s) and type(s) of activities in progress and aid in the selection of appropriate safety equipment.

Upon arriving at the site, an asbestos inspector should:

- Drive around the site and try to establish the magnitude and location of the asbestos project within the facility.

- Make note of areas to visit (office trailers, waste storage sites, waste load-out areas, etc.).

- Look for visible emissions to the outside air (from windows, doors, etc.) and suspect ACWM debris outside the facility.

- Draw a diagram of (see Figure 12-2) and record on film, land use surrounding the site (residential, industrial, recreational, etc.).

## GAINING ENTRY

To help ensure the admissibility of evidence gathered during an inspection, inspectors must be able to testify that proper entry was made. Inspectors should:

- Visit the facility at a reasonable time (whenever abatement is ongoing).

- Enter through the main gate or office.

- Locate the person in charge (facility representative, site supervisor) as soon as possible.

- Present identification (credentials) to the person in charge. (State and local inspectors may need to present specific licenses or certificates to gain entry.)

- Explain the purpose of the inspection (compliance with the asbestos NESHAP).

- Describe the legal basis for the inspection [Section 114(a)(2) of the *Clean Air Act* states that EPA inspectors *"have a right of entry to, upon, or through any premises in which an emission source is located..."*].

- Describe the scope of the inspection (site inspection, records' review, interviews, photographs, samples, etc.).

Once these conditions are met, the inspector should begin the inspection. (The facility representative need not express consent to conduct the inspection. Absence of expressed denial constitutes consent to proceed.)

On occasion, inspectors will be unable to adhere precisely to recommended entry procedures. For example, if an unmarked transport vehicle is noticed being loaded with suspect ACWM, and the inspector suspects that the vehicle may soon leave the property, the inspection should begin at that location. Such deviations from typical entry procedures must be documented and justified in the field notes and inspection report.

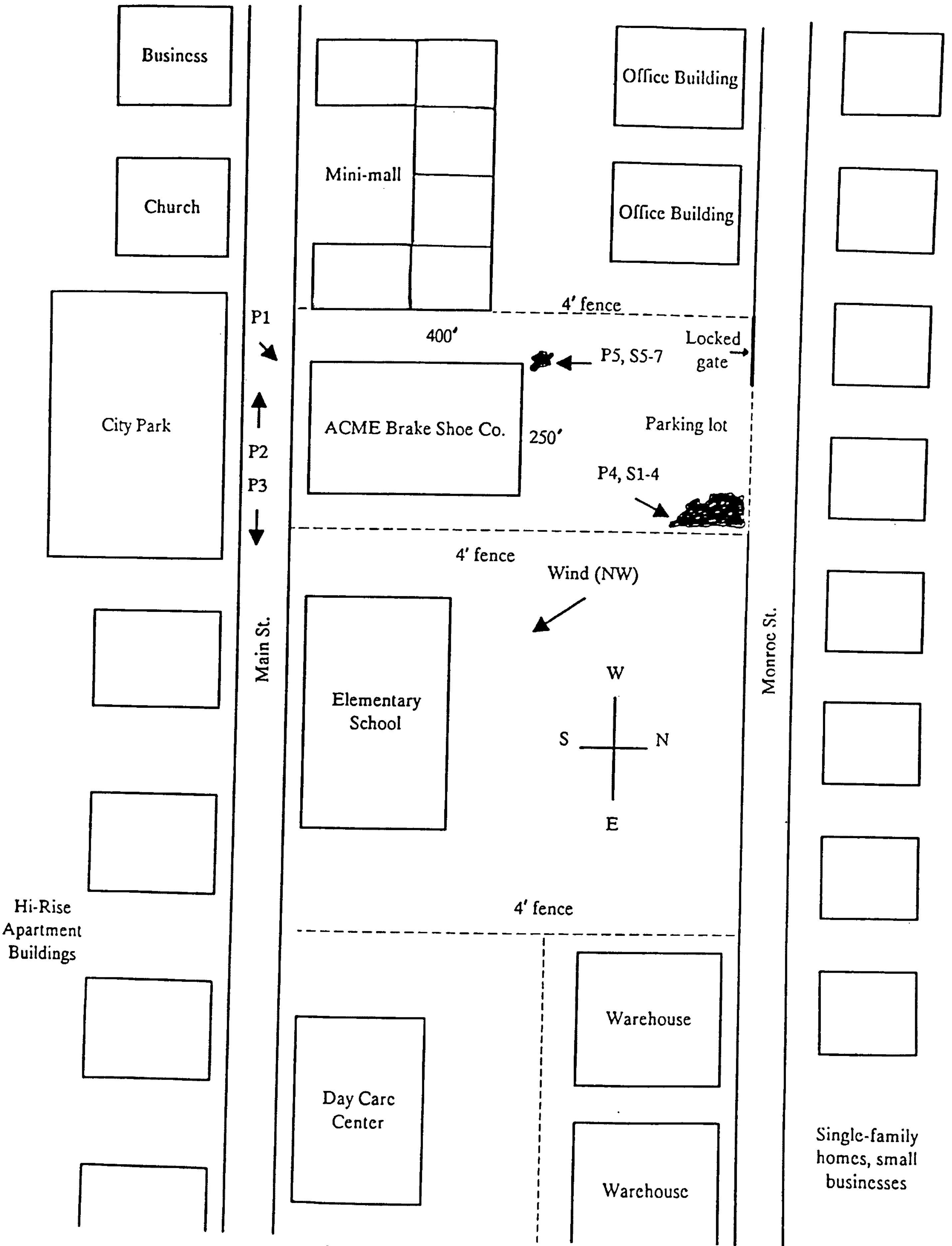



**Figure 12-2. Land Use Diagram**

**Denial of Entry**

Denial of entry to a site may take several forms: refusal of access to the site, unreasonable delays, changes in the conditions of inspection, or threats to the safety of the inspector.

***Verbal Refusal***

An inspector may occasionally be verbally denied access to the facility. Should this happen, the purpose and authority of the inspection should again be explained to the site representative. If this proves unsuccessful, the inspector should tell the representative that the agency's regulatory attorney will be informed and, if necessary, a warrant to gain entry will be sought.

***Unreasonable Delays***

If the requested facility representative does not appear after a reasonable amount of time (10-15 minutes), inspectors should make known to the person in charge (secretary, receptionist, abatement worker, etc.) that continued delay will be considered denial of entry.

***Change in Conditions***

Any change in conditions of the inspection clearly understood in the opening conference (use of photography, gathering of samples, etc.) which compromises the inspector's ability to conduct or document the inspection constitutes denial of entry.

***Threats***

Verbal or implied threats of bodily harm are considered denial of entry.PRE-ENTRY INTERVIEW

In addition to the activities described for gaining proper entry, inspectors should:

- **Determine the applicability of the regulation to the site.**

  In order for the asbestos NESHAP regulation to apply, the following must be true:

  - the site is a "facility" as defined in the regulation;

  - activities occurring at the site are regulated (demolition, renovation, waste disposal, etc.); and

- regulated amounts of RACM are being disturbed.

- **Present evidence of medical monitoring.**

  In some instances a facility representative may demand to see proof that an inspector is meeting the requirements of the OSHA medical monitoring program. This is a reasonable request, for even though EPA personnel are not specifically subject to the requirements of the OSHA standard, they must comply with the provisions of EPA's health and safety guidelines which are very similar.

- **Establish the identities of all responsible individuals.**

  These include the abatement contractor supervisor, building owner, hygienist, etc. Collecting business cards from these individuals is a good practice.

- **Determine whether a notification exists; if it does, review all information with the facility representative.**

  Although the asbestos NESHAP regulation requires owners/operators to update notifications when changes occur, this may not happen. An inspector, therefore, may have an inaccurate notification form when visiting a facility and should review the form with the on-site representative to correct inaccuracies. (In some circumstances very little of the original notification still applies - the contractor, transporter and waste disposal site may all be different!)

- **Sign no liability waivers.**

  It is EPA's policy that liability waivers never be signed. Other inspectors should follow the specific policies of their State or local agencies. Inspectors should sign entry logs (which document their presence on site) when requested to do so.

- **Determine a logical sequence for the site inspection.**

  Preplanning which areas to visit will promote the overall efficiency of the inspection.

- **Discuss safety considerations.**

  The inspector should ask the on-site representative to describe the type of asbestos being abated (amosite, chrysotile), work practices being employed (wet or dry removal, use of amended water) and types of potential hazards in the facility (overhead obstacles, active chemical lines, etc.). The inspector should use this information to make a preliminary determination regarding the type of personal protective equipment to use.

- **Determine the expertise of the owner/operator of the abatement project.**

The inspector should ask questions regarding the owner's/operator's previous experience, training, and understanding of the NESHAP requirements for the handling of asbestos during removal.

## PRE-ENTRY WORKSITE OBSERVATIONS (OSHA/NESHAP/MAP COMPLIANCE)

Inspectors should examine the worksite area and make a preliminary assessment of the project's compliance with the OSHA and NESHAP regulations and other pertinent standards (e.g., AHERA, ASHARA (MAP), etc.). The project may be in compliance if:

- There are records that show that all employees have been trained as required.
  - **OSHA** - Individuals who are conducting work subject to the OSHA Construction Standard must be trained as specified in the Standard. Records must be kept by the employer for one year beyond the last date of employment by that employer (29 CFR Part 1926.1101 - *Occupational Exposure to Asbestos*).
  - **NESHAP** requires that one on-site representative at a demolition or renovation site be trained in the provisions of the asbestos NESHAP regulation and that evidence of such training be posted and made available for inspection at the site (40 CFR Part 61).
  - **AHERA** - For individuals subject to the provisions of the AHERA regulation (public and private schools K-12), training records must be kept in a centralized location in the administrative office of both the school and the local education agency as part of the management plan (40 CFR Part 763 - *Asbestos-Containing Materials in Schools*).

    *Note:* A sample AHERA Compliance Referral Form is included as an appendix to this workshop manual.
  - **ASHARA** - Individuals conducting work subject to the ASHARA (MAP) regulation (public and commercial buildings) must have their initial and current accreditation certificates at the location where they are conducting work [40 CFR Part 763, Subpart E, Appendix C - *Asbestos Model Accreditation Plan*].

    *Note:* A sample ASHARA Compliance Referral Form is included as an appendix to this workshop manual.

    Individuals performing abatement work in facilities other than schools, public, or commercial buildings need not be accredited under the MAP; they may, however, be subject to State and/or local training requirements.

- Amended water is being used to wet ACM. (Note whether amended water is on-site outside the envelope.).

- No power tools are being used to remove ACM.

- The envelope is secure and no dust or debris appears to be coming from the removal area.

- Warning signs are posted and adequately labeled containers are being used.

- Decontamination accommodations, including shower facilities, are in place.

- Existing monitoring data indicate that asbestos fibers in the work area do not exceed 2.0 f/cc as an 8-hour TWA.

- A reduced-pressure enclosure has been established. HVAC systems, excluding LEV systems, should be inoperative. Envelope entrances should have a double barrier seal.

- Materials removed from the envelope have been cleaned and the pathway for removal of bags and equipment is clear and clean.

- Waste shipment records are available for review.

- Generator labels are present at the worksite.

**PRE-REMOVAL INSPECTION**

Facility inspections conducted prior to commencement of asbestos removal do not enable the inspector to fully evaluate the owner/operator's compliance with the asbestos NESHAP. However, if an inspector does arrive prior to the onset of removal activities, useful information still can be gathered. In this case the principal objectives are to verify that the asbestos NESHAP is applicable and that the owner/operator has the ability to remove the asbestos properly.

As with any inspection, safety must be considered before the inspection begins. The type of personal protection used is determined by the inspector. As a general rule, however, if any friable ACM or nonfriable ACM in poor condition is being disturbed, the inspector should treat the inspection as an active removal situation and follow appropriate suit-up procedures.

The following summarizes inspection activities relative to NESHAP requirements. The entire NESHAP text can be found in supplemental materials accompanying this manual.

**Applicability [(§§61.141, 61.145(a)]**

Examine the area to be abated to verify that 260/160/35 will be met.

**Notification [§61.145(b)]**

Determine the accuracy of information conveyed during the pre-inspection interview.

- Is the worksite location accurate?

- Are the amounts and types of RACM designated for removal accurate relative to what the inspector thinks will potentially be disturbed during the demolition or renovation?

**Planned Emission Controls [§61.145(c)]**

Observe equipment on site and elicit verbal explanations of planned emission control procedures to ascertain whether the owner/operator is sufficiently equipped and knowledgeable to meet the wetting and handling requirements of §61.145(c). Consider the following:

- Will water and wetting agents be available for wetting ACM before removal and for maintaining it in a wet condition until it is collected for disposal?

- If wet methods will not be used, what emission control methods are planned?

- Will RACM be removed or stripped more than 50 feet above ground level? If so, how will it be brought down?

Be aware that the asbestos NESHAP allows exemptions from *removal, stripping, wetting, and packaging* of RACM in certain situations. A detailed description of these exemptions can be found in **"Emission Control"** of the **"ACTIVE REMOVAL INSPECTIONS"** portion of this section.

**Disposal Techniques (§61.150)**

Although several waste disposal options are delineated by the asbestos NESHAP, most owner/operators choose to remove RACM and package it for off-site transport. Inspectors should determine the following:

- Are leak-tight containers or wrapping available to package RACM?

- Do these containers or wrappings exhibit the required OSHA warning label?

- If the RACM to be removed is destined for off-site transport, are labels containing the name of the waste generator and the location at which the waste was generated available for use?

*Note:* Either the owner's or operator's name is acceptable for identification of the waste generator, but many regulators prefer the operator's name be used.

- Where will the ACWM be deposited and how often will it be removed from the worksite?
- Has a permit for disposal been obtained? (not required by NESHAP)
- Are waste shipment record (WSR) forms available for use?
- Is the owner/operator aware of the NESHAP requirements regarding use of WSRs? (e.g., required information, delivery to waste disposal site, verification of disposal, recordkeeping, etc.)

**Evidence Collection**

In addition to the general information conveyed by the owner/operator, the following evidence should be collected by an inspector during a pre-removal inspection:

- **Measurements** of area, linear footage or volume of suspect RACM that will be disturbed during the project.

  Document technique of measurement - tape measure, pre-measured pace, etc.

- **Samples of materials which were stated in the notification to be RACM.** Collect these samples and document (using sketches and photographs) their specific locations within the facility. If the owner/operator later states that the notification was inaccurate (e.g., that the material removed did not contain asbestos), these samples may provide legal evidence to the contrary.

- **Samples of friable and nonfriable suspect ACM which is likely to be disturbed during the demolition or renovation but which was not listed by the owner/operator in the notification.**

  Collect these samples and document (using sketches and photographs) their specific locations within the facility.

## ACTIVE REMOVAL INSPECTIONS

To fully evaluate compliance of the asbestos NESHAP, an inspector must be prepared to enter the active removal area. The inspector should follow the procedures discussed previously for pre-inspection observations and interview. The information gathered during pre-inspection activities will enable the inspector to select appropriate safety equipment and procedures to follow.

The inspector's principal objectives in entering the active asbestos removal area are to: (1) make first-hand observations of the adequacy of wetting and maintaining wetness until RACM is collected for disposal; (2) take samples of any suspect RACM to serve as evidence that a violation involved asbestos-containing material; and (3) accurately determine whether the quantity of suspect ACM meets the minimum regulated quantity of 260/160/35.

**Removal Area Entry Preparation**

- If a three-stage decontamination unit is available, enter the clean room, remove street clothes (except bathing suit), and suit-up appropriately. Store street clothes in a plastic bag to keep them dry and clean.

- If there is no 3-stage decontamination unit, suit-up with double disposable coveralls over street clothes.

- Gather up inspection and sampling tools. Take into the active removal area only items that are disposable or can be cleaned in the shower. See Appendix A for a comprehensive checklist of inspection materials.

**Applicability [§§61.141, 61.145(a)]**

- Has 260/160/35 been met?

**Notification [§61.145(b)]**

- Is the worksite location accurate?

- Are the amounts and types of RACM being disturbed accurately noted on the notification form?

**Emission Control [§61.145(c)]**

- Has all RACM been removed 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? [§61.145(c)(1)]

- For facility component unit/section removal [§61.145(c)(2)]:

  - Has RACM exposed during cutting or disjoining operations been adequately wetted?

  - Are the units/sections carefully lowered to the floor or ground level and not dropped, thrown, slid or otherwise damaged or disturbed?

- Is RACM adequately wetted while being stripped from in-place facility components [§61.145(c)(3)]

- Has a facility component which has been removed in units/sections been stripped or contained in leaktight wrapping? [§61.145(c)(4)]

- Has the RACM, including material that has been removed or stripped [§61.145(c)(6)]:

  - been adequately wetted and maintained wet until collected and contained or treated in preparation for disposal?

  - carefully lowered to the ground and floor without dropping, throwing, sliding or otherwise damaging or disturbing it?
    (If the RACM has been removed or stripped more than 50 feet above ground level and it was not removed as units or in sections, has it been transported to the ground in leak-tight chutes or containers?

- Is there evidence posted at the site that at least one on-site representative has been trained in the provisions of this regulation and the means of complying with them? [§61.145(c)(8)]

- During an ordered demolition, is the portion of the facility containing RACM adequately wetted during the wrecking operation? [§61.145(c)(9)]

- Has all RACM, including Categories I and II nonfriable ACM been removed before intentionally burning a facility? [§61.145(c)(10)]

***Determination of Adequately Wet***

"Adequately wet" (as defined in §61.141) means to:

> *"sufficiently mix or penetrate with liquid to prevent the release of particulates. If visible emissions are observed coming from asbestos-containing material, then that material has not been adequately wetted. However, the absence of visible emissions*

*is not sufficient evidence of being adequately wet."*

The inspector is responsible for the overall determination of "adequately wet" relative to the above listed citation from the asbestos NESHAP. It is important for an inspector to document whether or not material has been adequately wetted and how this determination was made. (Refer to EPA's *Asbestos/NESHAP Adequately Wet Guidance* document found in the supplemental materials accompanying this manual.)

The following questions and procedures will help document compliance with this provision of the asbestos NESHAP:

- Is there a water supply in place?

- Is water or a wetting agent observed being sprayed onto the RACM or ACWM both during stripping or removal and afterwards while the material awaits proper disposal? If yes, carefully note the method of application used (e.g., misting, fogging, spraying of surface area only, or drenching to penetrate the ACM throughout).

- Does the equipment used to apply the wetting agent appear to be operating properly?

- If an aqueous solution is not being used, determine why it is not and document the reason. Possible (although not necessarily valid) reasons include:

  - prior permission obtained from the Administrator (safety hazard, potential equipment damage);
  - no water source at the facility;
  - temperature at the point of wetting below 32 degrees F;
  - portable water supply ran out and contractor continued to work; or
  - contractor prepared the area earlier, etc.

- Examine a stripped or removed piece of suspect ACWM or RACM which wets readily. Does it appear to be wetted throughout? If it does not, adequately wet the sample. Describe and photograph how the physical characteristics of the material change upon wetting (e.g., color, weight, texture, etc.). Take samples, as necessary, to document the presence of asbestos in the suspect material.

- When examining materials that do not readily absorb a wetting agent (e.g., premolded thermal system insulation, ceiling tiles, floor tiles), inspectors should note whether all exposed surfaces of these materials have been wetted as required.

- Is there visible dust (airborne or settled) or dry suspect ACWM debris in the immediate vicinity of the operation? Collect samples of such materials and analyze them to determine their asbestos content.

**Emission Control Exemptions [§§61.145(a, c), 61.150(a)]**

If the owner/operator is not following standard work practices relating to removal, stripping, wetting and packaging of RACM, the inspector must carefully evaluate whether activities seen are justified by the following exemptions in the asbestos NESHAP:

***Removal*** of ACM is not required before demolition if it:

- §61.145(a)(3)] - is located in a building which has been ordered by a government authority to be demolished. Wetting of the portion of the facility that contains RACM is required during the wrecking operation per §61.145(c)(9), and ACWM must be handled in accordance with waste disposal requirements of §61.150.

- §61.145(c)(1)(i) - is Category I nonfriable ACM that is not in poor condition and not friable.

- §61.145(c)(1)(ii) - is on a facility component encased in concrete or other similarly hard material and is adequately wet whenever exposed during demolition. (Doubled concrete-block walls with risers inside do not meet the "encased in concrete" definition.)

- §61.145(c)(1)(iii) - was not discovered until after demolition began and therefore cannot be safely removed. The exposed RACM and any asbestos-contaminated debris must be treated as ACWM and must be adequately wet at all times until disposed of.

- §61.145(c)(1)(iv) - is Category II nonfriable ACM and the probability is low that the material will become crumbled, pulverized, or reduced to powder during demolition.

***Stripping*** of ACM from facility components is not required:

- §61.145(c)(4) - if the components have been taken out of the facility as a unit or in sections contained in leak-tight wrapping.

- §61.145(c)(5) - if large facility components (excluding beams) are handled without disturbing or damaging the RACM, are wrapped leak-tight, and are appropriately labeled.

***Wetting*** is not required in renovation operations if:

- §61.145(c)(3)(i) - it would unavoidably damage equipment or present a safety hazard. Written approval from the Administrator must be obtained (and kept at the worksite) and either a local exhaust ventilation and collection system, glove-bag system, or leak-tight wrapping prior to dismantlement must be employed.

- §61.145(c)(3)(ii) - the Administrator has given written approval to an alternate equivalent method. This approval must be kept at the worksite.

- §61.145(c)(4) - a facility component taken out as a unit or in sections is contained in leak-tight wrapping, or an LEVC system is used while stripping the component.

- §61.145(c)(7) - the temperature at the point of wetting is below freezing. Facility components must be removed as units or in sections to the maximum extent possible and temperature records maintained.

***Packaging*** of ACWM prior to disposal is not required if:

- §61.150(a) - no visible emissions are discharged to the outside air during the collection, processing (including incineration), packaging, or transporting of any ACWM generated by the source.

- §61.150(a)(3) - the ACWM results from a government-ordered demolition. (Wetting requirements still apply.)

**Disposal Techniques (§61.150)**

Although several waste disposal options are delineated by the asbestos NESHAP, most owner/operators choose to remove RACM and package it for off-site transport. During an active removal inspection inspectors should determine whether:

- There are visible emissions to the outside air during the collection, processing (including incineration), packaging, or transporting of any ACWM.

  The inspector must determine the source of the visible emission and sample the source to verify that the emission contains asbestos material. It is not necessary to be a certified visible emission observer to legally document whether a visible emission exists. The presence of asbestos in such dust constitutes a violation of §61.150.

- ACWM is being adequately wetted.

- ACWM generated during ordered demolitions or demolitions where RACM is not required to be removed is kept adequately wet at all times after demolition and kept wet during handling and loading for transport to a disposal site. (Sealing in leak-tight containers or wrapping is not required; ACWM may be transported and disposed of in bulk.)

- Leak-tight containers or wrapping are being used to package removed RACM.

- Containers or wrappings exhibit the required OSHA warning label.

- Containerized RACM destined for off-site transport is labeled with the name of the waste generator and the location at which the waste was generated.

- Vehicles used to transport ACWM are appropriately marked during loading and unloading.

- The ACWM will be deposited at an appropriate waste disposal site as soon as is practical (excluding removed or stripped Category I nonfriable ACM that is not RACM).

  Inspectors should verify ACWM destination information reported in the notification. This information can provide the inspector with an opportunity to visit a disposal site and conduct an inspection while deposition of ACWM is taking place.

**Inspection of Waste Containers**

The presence of a regulatory inspector often causes the owner/operator to quickly and vastly improve wetting procedures. Inspectors can determine typical wetting procedures, however, by evaluating the contents of waste containers found both inside containment and in other waste storage areas. The following protocol should be followed:

- Randomly select bags or other containers for inspection.

- Lift the bag or container to assess its overall weight. A bag of dry ACWM can generally be lifted easily with one hand, whereas a bag filled with well-wetted material is substantially heavier.

***If waste material is contained in a transparent bag:***

- Visually inspect the contents of the unopened bag for evidence of moisture (e.g., water droplets, water in the bottom of the bag, change in color of the material due to the presence of water, etc.).

- Without opening the bag, squeeze chunks of debris to ascertain whether moisture droplets are emitted.

  *Note:* Squeezing cannot be used to determine adequate wetting of materials such as ceiling tiles, floor tiles, or premolded TSI, etc. which do not readily absorb a wetting agent. For these materials, determine whether exposed surfaces have been adequately wetted, document information, and take samples as needed.

- If the material appears dry or not penetrated with water or a wetting agent, open the bag using steps described below and collect a bulk sample of each type of suspect material in the bag. Document variations in size, patterns, colors, and textures of adequately- and inadequately-wetted materials seen.

***If the waste material is contained in an opaque bag or other container, or if the material in a transparent bag appears to be inadequately wetted:***

- Carefully open the bag or other container (in the containment area, if possible). If there is no containment area, use a glove bag to enclose the container prior to opening it. This will minimize the risk of fiber release.

- Examine the contents of the container as noted above for evidence of moisture. Document findings, take samples as needed, and carefully reseal the opened container.

  *Note:* If inadequately packaged suspect RACM stored outside is discovered upon arrival at a worksite, don protective gear and take samples before continuing the on-site inspection.

**Waste Shipment Records [§61.150(d)]**

Asbestos inspectors should examine whatever on-site records exist to help determine if the owner/operator is complying with the waste shipment recordkeeping requirements of the asbestos NESHAP. Inspectors should obtain copies (or originals) of documents which indicate potential noncompliance. If originals are acquired, inspectors should leave a receipt with the facility representative and quickly return the originals after making copies for the Agency.

**Evidence Collection**

The following specific evidence should be collected by an inspector during an active removal inspection:

- **Measurements** of area, linear footage, or volume of suspect RACM to accurately document that 260/160/35 is met.

  Document measurement technique (tape measure, pre-measured pace, etc.).

- **Samples of material which were stated in the notification to be RACM.**

Collect these samples and document (using sketches and photographs) their specific locations within the facility. If the owner/operator later states that the notification was misrepresentative (i.e., that the material removed did not contain asbestos), these samples may provide legal evidence to the contrary.

- **Samples of suspect RACM to document violations of the work practice standards.** Document specific sample locations using photographs and sketches.

- **Samples of friable and nonfriable suspect ACM which has been, or is likely to be disturbed during the demolition or renovation and which was not listed by the owner/operator in the notification.**

  Collect these samples and document (using sketches and photographs) their specific locations within the facility.

- **Documents, statements of site personnel, and photographs which illustrate potential noncompliance.**

**TSCA Compliance**

During the inspection the inspector can also check for evidence of apparent violations of the AHERA, ASHARA (MAP) and WPR regulations. AHERA regulates asbestos abatement work conducted at schools. ASHARA (MAP) deals with abatement activities in public and commercial buildings. WPR regulations apply to State and local government employees who conduct asbestos abatement work and are not covered by the OSHA asbestos standard. Abbreviated checklists for the AHERA, ASHARA and WPR regulations are included as appendices to this workshop manual. The appropriate asbestos program personnel should be contacted and informed about the possible violations noted.

**Exiting the Removal Area**

The inspector will leave the active removal area when satisfied that the operation complies with the requirements of the asbestos NESHAP or has collected sufficient evidence (observations, samples, photographs, owner/operator admissions) to document potential violations. It is essential that the inspector properly decontaminate himself/herself and any items taken into the active removal area that will not be disposed of as asbestos-contaminated waste.

- If a 3-stage decontamination unit is available, enter the dirty room, remove disposable clothes (keep the respirator on), move into the shower area, quickly rinse head region and body, and remove respirator. Wet and dispose of filter cartridges. Finish showering and dry off using disposable towels. Move to clean room to dress in street clothes.

- If there is no three-stage decontamination unit, just prior to exiting, spray with water and then remove the outer layer of the doubled disposable coveralls. Spray and remove the second layer just after exiting. Use wet wipes to clean potential asbestos fibers from the respirator and face area before removing the respirator and disposing of cartridges.

## POST-REMOVAL INSPECTION

Inspection of a facility after asbestos removal has been completed is the least preferred option since an improper removal already would have released fibers to the ambient air. An inspector arriving after removal has taken place, however, can still gather useful information.

The inspector will determine whether the use of protective clothing and respiratory protection is necessary. As a general rule, if an inspector has any doubt concerning whether the area is cleared for reoccupancy, he/she should treat the inspection as an active removal situation and follow appropriate suit-up procedures.

The following inspection procedures apply to most post-removal inspections.

### Applicability [§61.141, §61.145(a)]

- Examine the abated site to verify that the amount of RACM disturbed met the 260/160/35 requirement. Document how the area was measured.

### Notification [§61.145(b)]

- Note whether information conveyed during the pre-inspection interview is confirmed by on-site observations.

### Emission Controls [§61.145(c)]

- Verify that all RACM required to be removed has been removed from a facility scheduled for complete demolition. Take samples as needed.

- Verify that *all* RACM, *including Category I and Category II nonfriable ACM,* has been removed from a facility scheduled to be demolished by intentional burning. Take samples as needed.

- Visually inspect all renovated areas from which RACM is said to have been removed to verify that it has been done. No dust or debris should be left behind. Take samples as needed.

- Visually inspect other areas of the facility that will be disturbed during the impending demolition or renovation to determine if any other suspect RACM exists. Determine if 260/160/35 will be met and take samples as necessary.

**Waste Disposal (§61.150)**

If waste is still stored on site at the time of a post-removal inspection, inspect the containers to determine compliance. Use safety equipment and appropriate sampling procedures.

- Inspect for leaking or ripped bags, or other evidence of asbestos contamination.

- Lift bags or containers to assess their overall weight. A bag of dry ACWM can generally be lifted easily with one hand, whereas a bag filled with well-wetted material is substantially heavier.

- Inspect bags as noted in "ACTIVE REMOVAL INSPECTIONS".

**Evidence Collection**

In addition to the general information conveyed by the owner/operator, the following specific evidence should be collected by an inspector during a post-removal inspection:

- Samples of any suspect RACM left behind as dust, debris or residue.

- Measurements of area, length, or volume where RACM was removed, in order to establish that the facility met the applicability requirements.

  ***Note:*** Document technique of measurement - tape measure, pre-measured pace, etc.

- Samples of any dry RACM from the storage area if still available.

  Sketches and photographs are advisable to illustrate specific locations of samples.

- Documents, statements of site personnel, and photographs which illustrate potential noncompliance.

## POST-INSPECTION INTERVIEW

When the inspection is complete, the asbestos NESHAP inspector should conduct a quick, concise wrap-up interview to obtain any additional information necessary to complete the checklist and to convey to the owner/operator the findings of the inspection.

Inspectors should give the owner/operator a copy of the regulation and make note of this in the log book. Using this copy the inspector should discuss with the owner/operator the specific provisions of the regulation which may have been violated at the site and should document how the owner/operator reacted to the items discussed, for this information may prove useful if similar violations are identified during follow-up inspections.

Inspectors should avoid conveying compliance determinations to the owner/operator for several reasons:

- The inspector has not had time to reflect upon and correlate all observations made.

- Laboratory analyses have not been completed.

- The intricacies of EPA-administered statutes/regulations do not lend themselves to "off-the-cuff" assessment.

- The inspection findings may represent only a portion of the enforcement case.

The inspector should **never** say "No violations were seen." or "Everything is OK.", as such statements may create difficulties if the inspector recognizes potential violations after conducting the inspection.

Also, the inspector should not supply a copy of field notes or inspection checklist to the owner/operator at the time of the inspection, for any changes or additions the inspector makes to such documents after leaving the site may be called into question should an enforcement action be pursued.

**EXIT OBSERVATIONS**

As the inspector departs a site, he/she should resurvey the site and complete any site drawings not completed prior to or during the inspection. If possible, the inspector should observe the waste storage area and other areas to determine if any significant changes have occurred since the inspection began. Such changes should be noted as they help to assess whether the inspection observations are representative of operations when a regulatory inspector is not present. Finally, chain-of-custody forms for any samples collected should be completed.

## SECTION 13

## LANDFILL INSPECTIONS

The asbestos NESHAP provides emission control and work practice requirements from the time the asbestos is disturbed (potentially releasing airborne fibers) until it is interred in a landfill or converted into asbestos-free materials. However, since no conversion operations are currently licensed, demolition/renovation ACWM typically is transported to landfills for disposal. Regulatory agents should be prepared to conduct inspections of such sites and should use appropriate personal protective equipment and bulk sampling procedures when doing so.

It is important to recognize that *both* the owner or operator of a demolition or renovation operation and the owner or operator of the active waste disposal site where ACWM is brought are required to meet waste disposal provisions of the asbestos NESHAP.

Generators must comply with §61.150 *(Standard for waste disposal for ..., demolition, renovation ... operations)*, and waste disposal site operators must comply with §61.10 *(Source reporting...)*, §61.153 *(Reporting)*, and §61.154 *(Standard for active waste disposal sites)*. To assist waste disposal site operators, EPA produced and distributed the document *Reporting and Recordkeeping Requirements for Waste Disposal* (EPA 340/1-90-016) which can be found in supplemental materials accompanying this manual.

This section details waste disposal site owner/operator responsibilities and the procedures an inspector should use to ascertain whether a landfill is being operated in compliance with the asbestos NESHAP. A sample inspection form for landfills can be found in Appendix D of this manual.

### TARGETING WASTE DISPOSAL SITES

Waste disposal sites should be selected for inspection based on their size, the amount of asbestos waste accepted for disposal, other enforcement actions (i.e., RCRA), and exception reports, etc. Such information may be obtained from a variety of sources:

- **Landfill lists.** Lists of landfills may be obtained from EPA Regional Offices, and State and local agencies. Only some of these lists indicate whether ACWM is accepted by a particular landfill; however, individuals noted on the lists may be contacted to provide additional information.

- **Notifications.** Information pertaining to landfills not previously known to accept ACWM may be found in generator notifications. Additionally, any landfill noted which is scheduled to receive large quantities of ACWM should be targeted for inspection.

- **Previous inspection reports.** Waste disposal sites identified in inspection reports concerning demolitions or renovations performed out of compliance should be targeted for inspection.

## PLANNING THE WASTE DISPOSAL SITE INSPECTION

A NESHAP inspector who takes the time to properly plan a field inspection will find that the actual inspection will be accomplished more efficiently and will be more productive. To prepare for an asbestos landfill inspection, an inspector should:

- Become familiar with the types of records a facility is required to maintain.

- Review agency files.

  - Determine whether the landfill to be inspected has been identified as the waste disposal site on demolition/renovation notifications received. Make copies of such notifications for comparison to waste shipment records kept by the owner or operator of the waste disposal site.

  - Determine if any reporting or recordkeeping problems have been reported for the site (e.g., an unexpectedly large number of exception reports). If the removal jobs and the disposal site are in the same regulatory jurisdiction, this will be easy to do, since generators are required to inform the regulatory agency in charge if there are problems with the disposition of their ACWM. If the disposal site is located outside the regulatory jurisdiction, however, such information may not be available, for generators are not required to inform the agency responsible for the waste disposal site. Make copies of such information.

  - Examine landfill-generated reports (discrepancy, stationary source, improperly-contained ACWM, closure, and excavation/disturbance reports).

  - Review any complaints submitted.

- Communicate with other agencies or departments. City building departments may issue demolition/renovation and construction permits. Health departments may issue landfill operating permits or have records of complaints. Review any pertinent inspection reports filed by these agencies.

- Acquire the following information:

  - where records are maintained;
  - directions to this location;
  - the business hours where records are kept;
  - who is in charge of maintaining these records;
  - the hours this person works;
  - directions to the landfill;
  - landfill operating hours;
  - how much ACWM is accepted by the landfill;
  - how often the landfill accepts ACWM; and
  - how often records are sent to the central storage area from the landfill.

- Plan for the efficient use of time. Inspectors will probably have to inspect records kept both at the landfill and at an office or storage area elsewhere. Determine the traveling distance/time between the locations and plan accordingly. A full day may be necessary to properly inspect all records and ACWM disposal operations.

- Accumulate necessary inspection materials:

  - copies of applicable notifications, exception reports, etc;
  - employee identification;
  - copy of regulation;
  - bound notebook and writing implements;
  - manila folders;
  - large envelopes;
  - landfill recordkeeping checklist;
  - shipping supplies (if necessary);
  - business cards;
  - personal protective equipment; and
  - sampling equipment.

- Try to plan the inspection for a day when asbestos is being accepted by the landfill so that landfill deposition and recordkeeping operations may be observed first-hand. Bring personal protective equipment, a camera, landfill inspection checklist, and asbestos sampling materials as needed.

- If the landfill records are expected to be too numerous to review individually, devise a sampling strategy which will fulfill the objectives of the inspection.

## RECORDKEEPING REQUIREMENTS

The revised asbestos NESHAP requires waste disposal site operators to maintain both waste shipment and ACWM deposition information.

### Waste Shipment Records (WSRs)

Landfill operators must check the WSR that accompanies each asbestos waste shipment that arrives at the facility to make sure that the information on the WSR accurately describes the waste shipment. The landfill operator must verify that the information in WSR Item 6 (number and type of containers) coincides with the quantities reported in WSR Item 7 (cubic meters or yards) and determine if the load contains a significant amount of improperly enclosed or uncovered waste. Any discrepancy seen must be noted in Item 12 (discrepancy indication space) of the WSR.

Waste disposal site operators need not open bags or other containers to verify that they contain ACWM; the WSR accompanying the load is sufficient verification. Once the load has been examined and discrepancies noted, the waste disposal site operator must complete Item 13 (certification of receipt) of the WSR, return a copy to the generator (within 30 days), and maintain a file copy.

Copies of all WSRs must be kept for at least 2 years. To facilitate future reference, WSRs should be kept in chronological order in a secure, water-tight file. Copies of WSRs must be provided upon request to the agency(ies) responsible for implementation of the asbestos NESHAP program, and the file must be made available for inspection during normal business hours.

### ACWM Deposition Information

Waste disposal site operators are also required to maintain, until closure, accurate records of the location, depth and area, and quantity in cubic meters (cubic yards) of ACWM within the disposal site on a map or diagram of the disposal area.

## REPORTING REQUIREMENTS

The revised asbestos NESHAP also subjects waste disposal site owners/operators to several new reporting requirements. Required reports concern stationary source information, WSR discrepancies, improperly-contained waste, disturbance of disposed ACWM, and disposal site closures.

**Waste Site/Stationary Source Report (§§ 61.153, 61.10)**

Within 90 days of the effective date of the revisions to the asbestos NESHAP (by February 18, 1991) for existing sources, or within 90 days of the initial startup date for sources having a startup date after the effective date, disposal site operators are required to submit the following information about their waste site operations to the agency responsible for administration of the asbestos NESHAP program:

- A brief description of the waste disposal site (location, size, etc.).
- A description of the method or methods that will be used to comply with the asbestos NESHAP, or a description of alternative methods that will be used.

  Methods to be used may include covering asbestos waste daily with six (6) inches of nonasbestos-containing material, or using a dust suppressant. Other information that might be reported includes procedures used to prevent public access to the asbestos waste disposal area, such as the use of warning signs and fencing. This information must be reported using the format in 40 CFR Part 61 Appendix A: *National Emission Standards For Hazardous Air Pollutants Compliance Status Information.*

In addition to the information listed above, the waste disposal site operator also has to report (within the same time period) the following information to comply with the source reporting requirements of 40 CFR Part 61 Subpart A §61.10:

- Name and address of the owner or operator.
- Location of the source.
- Type of hazardous pollutants emitted by the stationary source.
- Brief description of the nature, size, design, and method of operation of the stationary source, including the operating design capacity of the source. Identify each point of emission for asbestos.
- The average weight per month of asbestos being processed by the source over the last 12 months preceding the date of the report.
- Whether the source can/cannot comply with the standard within 90 days of the effective date.

If there is a change in any of the information listed above, the waste disposal site owner operator must report the changes to the appropriate agency within 30 days after they occur as required by 40 CFR § 61.10(c).

**Discrepancy Reports [§61.54(e)(3)]**

If there is a discrepancy between the number of containers shown on the WSR and the number counted in the load, waste disposal site operators must make note of this in Item 12 of the WSR and contact the generator to determine if there is a reasonable explanation for the discrepancy. If the discrepancy is resolved, the waste disposal site operator must note this on the WSR, send a signed copy of the WSR to the generator (within 30 days), and retain a file copy.

If the discrepancy cannot be resolved within 15 days of receipt of the ACWM, the waste disposal operator must send a written discrepancy report immediately to the agency which is responsible for the generator of the waste and, if different, the agency in whose jurisdiction the disposal site is located. The report must describe the discrepancy and steps taken to resolve it. Information provided should include how and when the waste disposal site operator attempted to reach the generator and the results of these efforts. A copy of the WSR in question must be submitted as well.

**Improperly-Contained Waste Report [§61.154(e)(1)(iv)]**

As disposal site operators check asbestos waste shipments that arrive at their facilities, they are required to note whether a significant amount of improperly-enclosed or uncovered waste exists in the load. If such material is discovered, the waste disposal site operator must make note of this in Item 12 of the WSR and send, by the following working day, a written report of the problem to the agency responsible for administering the asbestos NESHAP program for the jurisdiction where the job site is located (identified on the WSR). If the disposal site is in a different jurisdiction than the job site, the written report must also be sent to the agency responsible for the disposal site.

The written report must include a copy of the WSR and a detailed description of the improperly-enclosed or uncovered waste so that the Agency can determine the urgency of the situation and the course of action to pursue.

**Excavation/Disturbance Report [§61.151(d)]**

If an owner or operator of an asbestos landfill plans to excavate or otherwise disturb (e.g., drill methane vents) any ACWM that has been deposited and covered at a waste disposal site, the Administrator must be informed in writing at least 45 days prior to the disruptive activity. The following information must be contained in the notice:

- Scheduled starting and completion dates.
- Reason for disturbing the waste.
- Procedures to be used to control emissions during the excavation, storage, transport,

and ultimate disposal of the excavated ACWM. (If deemed necessary, the Administrator may require changes in the emission control procedures to be used.)

- Location of any temporary storage site and the final disposition site.

If the excavation will begin on a date other than the one contained in the original notice, notice of the new start date must be provided to the Administrator at least 10 working days before excavation begins. In no event shall excavation begin earlier than the date specified in the original notification.

### Closure Report [§61.151(e)]

#### *Agency Notification*

Upon closure of a facility, the owner or operator of the site must submit to the Administrator a copy of records of asbestos waste disposal locations and quantities.

#### *Deed Notation*

In addition, within 60 days of closing a waste disposal site, the owner/operator must record, in accordance with State law, a notation on the deed to the facility property and on any other instrument that would normally be examined during a title search, that:

- The land was used for the disposal of ACWM,
- The survey plot and record of the location and quantity of ACWM disposed of within the disposal site have been filed with the Administrator, and
- The site is subject to the National Emission Standards for Hazardous Air Pollutants: Asbestos (40 CFR Part 61 Subpart M).

## LANDFILL INSPECTION ACTIVITIES

### Preliminary Interview

During the preliminary interview it is critical that discussions be properly documented, for they may later prove useful if violations are detected. The following steps should be followed once an inspector arrives on site:

- Show your identification and request to see the person in charge of ACWM disposal.
- When this person arrives, introduce yourself and give him/her your business card.
- Document the name and title of the person interviewed. Get his/her business card if

possible.

- Explain the authority [Section 114 (a)(2)] of the Clean Air Act, purpose (asbestos NESHAP compliance), and components (landfill inspection, records review) of the inspection.

- Inform the representative that the facility may be required to provide the inspector copies of records of interest.

- If offloading will be observed, discuss safety requirements and emergency procedures and indicate that photographs and/or samples may be taken.

- Determine whether the landfill has a State-required permit to operate. If it does, check the expiration date of the permit and record pertinent information on the inspection form.

- Ask the person to describe the procedures used for verifying information on and maintaining WSRs, and recording locations, depth and quantity of ACWM deposited at the site.

- Complete applicable sections of the Landfill Inspection Checklist.

- If this is the facility's first asbestos NESHAP compliance inspection, explain the waste disposal requirements to the interviewee and answer any questions to the best of your ability.

- Request the files you wish to review. If permission is denied, do not be forceful. Simply explain again the authority of your visit and ask the person to contact his/her supervisor regarding the situation. Either you or your agency's attorney may need to contact the facility's attorney directly to resolve the difficulties.

**Reviewing Records**

The records of most interest at a waste disposal site are 1) WSRs for each shipment of ACWM disposed of at the site, and 2) up-to-date records (on a map or diagram) that indicate the location, depth and area, and quantity of ACWM within the site. Other records which may be of interest include stationary source reports, discrepancy reports, improperly-contained waste reports, excavation/disturbance reports and closure reports.

***Waste Shipment Records***

For all ACWM received, the owner or operator of the active waste disposal site must comply with the following waste shipment recordkeeping provisions:

- Record and maintain the following information on a form similar to that noted in the regulation:

    - waste generator's name, address and telephone number;
    - transporter's name, address and telephone number;
    - quantity of ACWM received (cubic yards or meters);
    - presence of improperly-enclosed or uncovered waste, or any ACWM not sealed in leak-tight containers; and
    - date of receipt.

- Send a copy of the waste shipment record to the waste generator as soon as possible but no longer than 30 days after receipt of the waste.

- Attempt to reconcile differences between the amounts of ACWM received and those recorded on the WSR form brought by the transporter. If the discrepancy is not resolved within 15 days after receiving the waste, immediately submit a discrepancy report (which details both the discrepancy and attempts made to reconcile it) to the governmental agency responsible for administering the asbestos NESHAP program for the *waste generator* (identified in the waste shipment record), *and, if different*, the governmental agency responsible for administering the asbestos NESHAP program for the disposal site.

- Retain a copy of all records and reports required by this paragraph for at least 2 years.

In inspecting the WSR file, note how the file is maintained and if the WSRs have been filled out completely, including all of the required signatures. **All signatures should be hand-written**.

Note any WSRs that have an entry pertaining to discrepancies or improperly-contained waste (See Item 12 on the sample WSR in the revised NESHAP) and ask how those discrepancies were resolved. Ask to see copies of any discrepancy reports or reports of improperly-contained waste submitted to the responsible agency for the WSRs in question.

Attempt to match information obtained during the pre-inspection agency file review (notifications, exception reports, etc.) with records maintained by the waste disposal site.

Pay attention to the dates of shipment of ACWM and acceptance by the landfill. ACWM is often stored by the transporter until a full load is accumulated.

Photocopy WSRs which lack the required information. If a photocopier is not available, either 1) record the necessary information in sufficient detail or 2) remove the records from the facility, photocopy them and return them later. (If records are to be removed from the facility, sign a receipt indicating that they will be returned as soon as possible).

*ACWM Deposition Records*

Ask the site operator for the most recent tally of the total quantity of ACWM deposited at the site. The operator should be able to provide you with a total that includes all but the most recent shipments. Examine the records showing the location, depth and area, and quantity of ACWM within the site to determine that they are up-to-date. Check to see that the proper information is being collected and the backlog of information to be added to the records is only for current waste shipments.

**Site Observations**

Inspectors visit landfills primarily to determine owner/operator compliance with the requirements of §61.154 (*Standard for active waste disposal sites)*. However, while conducting a landfill inspection, inspectors may note a number of other potential violations of the asbestos NESHAP. By asking the right questions and documenting appropriate information (photographs, samples, etc.), inspectors may be able to *identify non-notifiers* or determine other *generator non-compliance* with certain provisions of the NESHAP regulation.

At a landfill, inspectors should:

- Verify that the landfill meets *one* of the following requirements of §61.154:
  - No visible emissions are produced. Warning signs must be posted and fencing is required unless a natural barrier adequately deters access by the public.
  - A 6-inch cover of compacted, non-asbestos material is provided within 24 hours of the time the waste is deposited. No sign posting or fencing is required.
  - An effective resinous or petroleum-based (other than waste oil) dust suppressant is provided within 24 hours of the time the waste was deposited. Warning signs must be posted and fencing is required unless a natural barrier adequately deters access by the public.
  - An alternative method previously approved by the Administrator is used. Warning signs must be posted and fencing is required unless a natural barrier adequately deters access by the public.
- Observe ACWM being offloaded into the landfill. Note how the load is verified, whether improperly-contained waste is present, and whether the vehicle is properly marked during offloading. Take samples as necessary to help assess compliance with the provisions of the waste disposal provisions of the asbestos NESHAP.
- If suspect ACWM is being offloaded and is not accompanied by a waste shipment

record, attempt to determine the following:

- Has the suspect ACWM come from one or multiple sites? (For the NESHAP regulation to be applicable, ACWM must be generated at a site which meets the definition of a **"facility"** and meets the **260/160/35** quantity requirements.)

- Is the vehicle properly marked with an asbestos hazard warning sign?

- Is the suspect ACWM in properly labeled leak-tight containers?

- Is the suspect ACWM adequately wet?

- If the suspect ACWM is not wrapped or contained in leak-tight containers, is there a valid reason for this?

- If offloading cannot be observed, interview the person directly in charge of waste disposal site operations. Ask him/her to describe waste handling, load verification, and recordkeeping activities.

- Inspect the asbestos disposal site; compare your observations with information recorded on the required site map.

- Note the accessibility of the asbestos landfill area to the general public. If the landfill operator claims that a natural barrier or fence is being used to deter access, determine if the Administrator has been informed and has agreed that access is sufficiently restricted.

- If improperly-containerized, inadequately-wetted or unlabeled suspect materials are seen, determine:

  - whether 260/160/35 is met;
  - the source of the material; and
  - whether the source is a "facility."

**Post-Inspection Interview**

Once you have reviewed your inspection activities, conduct a quick, concise wrap-up interview to obtain any additional information necessary and to convey to the owner operator, in general terms, the findings of the inspection. It is extremely important that you do not make and convey a field decision concerning the facility's compliance for a number of reasons which include the following:

- You may later recall items you failed to mention and include them in your inspection report; if an enforcement action is contested, your credibility and integrity could be called into question.

- Individuals other than yourself may make the final determination pertaining to the facility's compliance status.

- You may not be aware of other enforcement actions being taken.

- Samples have not yet been analyzed.

In situations where potential violations have been identified, be sure to note (on your checklist or in your field logbook) any observed or verbally-communicated responses of the owner/operator. This documentation may prove to be of great importance where enforcement actions are considered.

## SECTION 14

## POST-INSPECTION ACTIVITIES

No matter how blatant a violation appears to be or how thorough an inspection has been done, a case cannot be supported without proper records and documentation. It is imperative, therefore, that each delegated program office set up and implement a system whereby supporting documentation is properly acquired, controlled, and maintained. Generated reports, checklists and sample analysis results must be clear and concise and accurately support the observations of the inspector. Finally, all records must be organized, properly maintained, and readily available for future access. The purpose of this section is to outline inspection follow-up procedures and to provide general guidance regarding document control, report preparation, and record maintenance and storage.

### INSPECTION FOLLOW-UP

Once an inspection is completed, a decision will be made regarding how many and how quickly samples should be analyzed. When there are serious violations, it may be necessary to have analysis completed within a day or less. Arrangements should be made ahead of time with an in-house laboratory or a commercial laboratory to facilitate such a request. Those samples which will provide the greatest proof of asbestos NESHAP violations should be analyzed; other samples taken need not be. However, samples should not be destroyed; they should be stored in a locked facility pending future enforcement action.

When violations are suspected, the inspector should brief his/her supervisor and/or attorney to initiate the decision-making process concerning the (1) need for reinspection; (2) need for information request under Section 114 of the CAA; (3) enforcement options available, etc.

### DOCUMENTATION

Since checklists and reports generated by an inspector may be the basis for civil or criminal enforcement actions, they must be precise and legible. NESHAP inspections ultimately involve the actions of several people: one or more inspectors, laboratory personnel, administrative, legal and clerical staff. Information must be collected and maintained within a system that allows for processing and expedient access. Additionally, this system must protect all records or potential evidence that may be required for enforcement actions. It is imperative that a comprehensive document control system be implemented during all phases of an investigation.

## Document Control

The purpose of document control is to make certain that all project documents issued or generated during a NESHAP investigation are accounted for when the project is complete. A system which accounts for all investigation documents should include serialized document numbering, document inventory procedures, and an evidentiary filing system. Examples of accountable documents include:

- inspection checklists;
- inspection reports;
- field data sheets;
- sample tags;
- chain-of-custody records and seals;
- laboratory notebook and reports;
- credentials;
- warrants;
- subpoenas;
- internal memoranda;
- phone memoranda;
- external written communications;
- photographs, drawings, maps; and
- quality assurance plans.

Under ideal circumstances each document is given a serialized number which is listed in a Document Inventory Logbook.

## Corrections to Documentation

All documents generated during the course of an inspection are considered part of the permanent evidentiary file and should not be destroyed or thrown away, even if they become illegible or if inaccuracies are discovered. This is particularly important if serialized documents are used, for any gaps in the numbering system will be noted by legal staff. Errors in documents should be noted. If a document requires replacement, it should be noted, or corrections made to the original document. Corrections may be made by simply drawing a line through the error, entering the correct information, and initialing and dating the correction.

If documents are lost or missing (e.g., sample tags, field notes), a written statement should be prepared detailing the circumstances. The statement should include all pertinent available information that may be used to support an observation or sample. This statement becomes part of the permanent case file.

## RECORDS MAINTENANCE

Records need to be properly filed and maintained to allow for quick and easy access of all case documents. Records also need to be retained under storage conditions which minimize deterioration or loss of data files. With the widespread use of micro- and personal computers, data-management capabilities have improved handling, tracking, and manipulation of large quantities of information. These systems do not, however, replace physical evidence such as tags, forms, and checklists. They do alleviate tedious record searching and sorting tasks and can provide quick and easy retrieval of information and cross-referencing capability.

Regardless of whether computer-based data management systems or manual procedures are used, responsible individuals within a program office must be able to access and trace the destination of project files. The inspector must be familiar with and use all filing procedures. Files should be signed out in such a manner as to indicate to others that the file is in the possession of an inspector. When returning the file to storage, the inspector should take care to return it to its proper place.

## INSPECTION REPORTS

The purpose of the inspection report is to present a factual record of an inspection, from preplanning stages through the analysis of samples and other data collected during the inspection. An inspection report must be complete and accurate because it is an important piece of evidence for potential enforcement actions. The length and format of inspection reports may vary based on program and individual office policy and practice.

The objective of an inspection report is to organize and coordinate all evidence gathered in an inspection in a comprehensive, usable manner. To meet this objective, information in an inspection report must be:

- **Accurate.** All information must be factual and based on sound inspection practices. Observations should be the verifiable result of first-hand knowledge. Enforcement personnel must be able to depend on the accuracy of all information.

- **Relevant.** Information in an inspection report should be pertinent to the subject of the report. Irrelevant facts and data will clutter a report and may reduce its clarity and usefulness.

- **Comprehensive.** The subject of the report (i.e., any suspected violations) should be substantiated by as much factual, relevant information as is feasible. The more comprehensive the evidence, the better and easier the prosecution task.

- **Coordinated.** All information pertinent to the subject should be organized into a complete package. Documentary support (photographs, statements, sample documentation, etc.) accompanying the report should be clearly referenced so that anyone reading the report will get a complete, clear overview of the subject.

- **Objective.** Information should be objective and factual; the report should not draw conclusions.

- **Clear.** The information in the report should be presented in a clear, well-organized manner.

- **Neat and Legible.** Adequate time should be taken to allow the preparation of a neat, legible report.

Reports should be completed soon after the inspection. If there is too long a time interval between the inspection and completion of the report, the report may not be admissible as evidence or used to refresh the memory of the inspector. Reports must be prepared routinely and contemporaneously with the inspection.

**Elements of an Inspection Report**

No single standard EPA asbestos NESHAP inspection report format exists. While the format and exact contents of an inspection report may vary, the report should always allow the reader to determine:

- the specific reason for the inspection;

- who participated in the inspection;

- that all notice, receipt, and other legal requirements were complied with;

- what actions were taken during the inspection, including the chronology of these actions;

- what statements, records, physical samples and other evidence were obtained during the inspection;

- what observations were made during the inspection; and

- the results of sample analyses related to the inspection.

Although the specific information requirements in a given inspection report will depend on the type of inspection and what was found, most reports will contain the same basic elements:

- Inspection Report Forms
- Narrative Report
- Documentary Support

### *Inspection Report Forms*

Individual inspection report forms are designed to collect standard, reviewable information about an inspection. Inspection report forms are only one aspect of a complete report and should by no means be considered to be sufficient documentation of the inspection by themselves. They function as guides to ensure that all basic data are being collected, and are generally completed as the inspection progresses. Individual items on these forms often need clarification and elaboration; inspectors normally use the field logbook for this information.

Asbestos NESHAP field inspection checklists are provided as appendices in this manual. Agencies may use these forms, alter them to suit their needs, or develop their own checklists.

### *Narrative Report*

The narrative portion of an inspection report should be a concise, factual summary of observations and activities, organized in a logical manner, supported by specific references to accompanying evidence (documentary support), and legibly written. Basic steps involved in writing the narrative report include:

- reviewing the information;
- organizing the material;
- referencing accompanying material; and
- writing the narrative.

*Reviewing the Information*. The first step in preparing the narrative is to collect all information gathered during the inspection. The inspector's field logbook and all inspection report forms should be reviewed in detail. All evidence should be reviewed for relevancy and completeness. Gaps may need to be filled by a phone call or, in unusual circumstances, a follow-up visit.

*Organizing the Material*. The narrative should be organized so that it will be understood easily by the reader.

*Referencing Accompanying Material*. All evidence (e.g., copies of records, analytical results, photographs) that accompanies a narrative report should be clearly referenced so that the reader will be able to locate items easily. All support documents should be checked for clarity prior to writing the report.

*Writing the Narrative Report*. Once the material has been reviewed, organized, and referenced, the narrative can be written. The purpose of the narrative report is to record factually the procedures used in, and findings resulting from, the evidence-gathering process. In this report the inspector should refer to routine procedures and practices used during the inspection, but should describe in detail facts relating to potential violations and discrepancies. The field logbook is a guide for preparing the narrative report.

Inspectors should:

- Use a single writing style; avoid stilted language.
- Use an active, rather than passive approach (e.g., "He said that ..." rather than "It was said that...").
- Keep paragraphs brief and to the point.
- Avoid repetition.
- Proofread the narrative carefully.

## Important Considerations

### *Standard Operating Procedures*

When the inspector has followed standard operating procedures (SOPs) precisely in gaining entry, taking samples, etc., this can be easily noted in the report (e.g., "following standard procedures, Joe Smith gained entry to..."). If there were any unusual circumstances or deviations, however, these should be included in the report in more detail.

### *Confidentiality Considerations and Procedures*

All documents and other materials that have been declared confidential business information by facility officials must be handled according to the security measures that have been established for such materials. Confidential information includes not only the materials themselves, but also any report -- such as an inspection report -- generated on the basis of confidential information. Generally, this will involve limiting access to the report to the fewest number of people possible.

In preparing the inspection report, it may be possible to reference confidential material in a non-confidential way, such as by providing a general description of the information and a reference number to the confidential documents. An alternative is to include the information in the inspection report but treat the entire report as a confidential document.

### *Conclusions Regarding Compliance*

Inspection reports should contain only the facts about the inspection. Clearly, however, the inspector's conclusions and opinions about the compliance of the facility are the critical factors (and often, the <u>only</u> factors) in the Agency's decision as to whether a violation did or did not exist. It is essential, however, that the inspection report itself not include the inspector's conclusions regarding compliance.

In writing the inspection report, inspectors should avoid using the word "violation," since this means a conclusion of law has been drawn. It is acceptable to state facts, such as "The suspect ACM which had been scraped off the ceiling was dry.", rather than "A violation of §61.145(c)(3) of the asbestos NESHAP occurred."

If necessary, conclusions should be contained in a separate cover memorandum or other format that is clearly separate from the inspection report and passed up the management chain along with the factual inspection report. The principal reason for this is that if an enforcement case is pursued, the entire inspection report is subject to discovery by the opposing side. If conclusions of law and opinions are in the report, the opposing side might be able to weaken the inspector's credibility by suggesting bias. In addition, the inspector may have been wrong about one or more counts and the Agency did not pursue them; this would be revealed through discovery, again weakening the inspector's credibility. A separate "findings" or "conclusions" memorandum will usually be protected from discovery based on attorney-client privilege or another "exception" rule.

In some agencies, it may be the inspector who determines whether a violation occurred and if an enforcement action is warranted. In these situations, the inspector is no longer performing an inspector function; he or she has actually "changed hats" into a different job -- that of a case development officer. The line between the two jobs should be clearly drawn, with the person staying in a fact-finder role while carrying out inspector functions -- including inspection report writing.

## Tips for Writing an Effective Inspection Report

In general, three rules apply to preparation of good inspection reports.

- *Write to express, not to impress.* Just relate the facts and evidence that are relevant to the compliance situation.

- *Keep it simple.* Organize complicated matters and state them in simple, direct terms.

- *Keep the reader in mind.* Relate your writing to the reader's experience and use words that are likely to be familiar.

The following sections provide a summary of the essential elements of good reports and organizing the writing process.

***Essentials of Good Reports***

Fairness, accuracy, completeness, conciseness, clarity, and organization are all essential characteristics of well-written and effective inspection reports.

- **Fairness.** Inspection reports must be entirely objective, unbiased, and unemotional.

- **Accuracy.** Be exact. Say precisely and accurately what you mean to say in plain language. Precision depends on diction, phrasing, and sentence structure. Avoid exaggerations. The report should present facts so clearly that there is not need for conclusions or interpretations.

  Avoid superlatives. Any attempt to strengthen a report in this way actually weakens it, as reviewers tend to doubt its objectivity.

  Accuracy means truthfulness. The accuracy of all findings must be verified before the final report is submitted. A typographical error in date or time may cast doubt on other facts in a report.

- **Completeness.** Include all information that is relevant and material. Completeness implies that all the known facts and details have been reported, either in the text of the report or in an exhibit, so that no further explanation is needed and the reviewer will be convinced that the inspection was thorough and comprehensive.

- **Conciseness.** Conciseness does not mean omission. It is the avoidance of all that is elaborate or not essential. Conciseness is not what you say, but how you say it. Conciseness means omitting unnecessary words; it does not mean omitting facts, detail and necessary explanation. It is not the same as brevity. If clarity and completeness require a detailed explanation, do not hesitate to use it.

- **Clarity.** Inspection reports must be written clearly to avoid misinterpretations. Clear writing leads to clear thinking and vice versa. Order your thoughts; select those most useful to the reader, arrange them logically; and select the words that will best convey your thoughts to the reader.

The careless use of personal pronouns is a frequent cause of ambiguity. If the use of a pronoun may result in ambiguity, use a noun. Avoid the use of the pronoun "It" and the word "There" as substitutes for precise word selection. For example, say "We should do ...", rather than "It should be done ...", and "Changes have been made ...", rather than "There have been changes."

Punctuate to make the meaning easy to understand. For example, consider the different meanings of the following three sentences:

- The employee said the foreman is a blockhead.
- The employee said, "The foreman is a blockhead."
- "The employee," said the foreman, "is a blockhead."

In presenting a series of thoughts or actions, parallel construction helps clarify meaning. For example, write "collect**ing**, deposit**ing**, and report**ing** revenue", instead of "collect**ion**, deposit**ing**, and **the** report**ing** of revenue."

- **Organization.** An inspection report should be structured to allow a logical order and coherence in the presentation of facts. This means that the relation of each event to the main idea and to the events immediately preceding it in the report must be unmistakable. Otherwise, it is quite likely that the reader will not understand the significance of the event.

## Narrative Report Outline

Inspectors should provide detailed narration for any of the following components not sufficiently described in the field inspection checklist.

### *Introduction*

The introduction should briefly present all relevant background information about the conduct of the inspection and summarize the findings of the inspection.

- *General Information*

    - State the purpose of the inspection and how the facility came to be inspected (i.e., neutral scheme, follow-up, for cause).

    - State the facts of the inspection (i.e., date, time, location, name of the agent-in-charge, etc.).

- Participants in the inspection.

- *Summary of Findings*

  - Give a brief, factual summary of the inspection findings.

- *History of Facility*

  - List the status of the facility (i.e., corporation, proprietorship, partnership, State agency, non-profit organization, etc., and where incorporated).

  - Give the size of the organization based on inspector observations or agency records.

  - List any related firms, subsidiaries, branches, etc.

  - List the type of operations performed at the facility under inspection.

  - List names and titles of facility officials interviewed. List the name(s) of official(s) responsible for day-to-day operations at the facility.

***Inspection Activities***

The body of the report should present the chronology of the inspection in the same order that the inspection was conducted. Be certain to insert all observations when appropriate and to cover the following topics when appropriate.

- *Entry/Opening Conference*

  - Describe the procedures used at arrival, including presentation of credentials and to whom they were presented.

  - Describe any special problems or observations if there was reluctance on the part of facility officials to give consent, or if consent was withdrawn or denied.

  - If special procedures were necessary, such as obtaining a warrant, describe the procedures.

  - Summarize the topics discussed during the opening conference.

  - Note if duplicate samples were requested.

- *Records*
  - List the type of records reviewed, noting the reasons for their review, and referencing documents that were borrowed or copied.
  - Describe any inadequacies in recordkeeping procedures, or if any required information was unavailable or incomplete.
  - Note if recordkeeping requirements were being met.
- *Evidence Collection*
  - Note and reference any statements taken during the inspection.
  - Describe and reference photographs taken during the inspection if they were relevant.
  - Reference any drawings, maps, charts, or other documents made or taken during the inspection.
- *Physical Samples*
  - Describe the purpose for which samples were obtained.
  - Describe the exact location from which they were obtained.
  - Describe sampling techniques used. They may be referred to as standard operating procedures (SOPs) if SOPs were followed exactly. If there were deviations from SOPs, explain why and what was done.
  - Describe the physical aspects of the sample (color, texture, viscosity, etc.).
  - Describe chain-of-custody procedures used in sample handling.
  - Summarize results of laboratory analyses (include actual data as an attachment).
- *Closing Conference*
  - Note and reference receipts for samples and documents given to facility officials.

- Note procedures taken to confirm claims of confidentiality and issuance of receipts for Confidential Business Information.

- Note any recommendations, referrals, etc., made to facility officials.

*Attachments*

Supporting information should be attached to the report to ensure that reviewers have all of the data needed to fully evaluate the compliance situation. All of these attachments should be fully referenced in the body of the report.

- **List of Attachments**

  - Prepare a list of all documents, analytical results, photographs, and other supporting information attached to the report. A general index list, rather than detailed descriptions, will aid case- development personnel in locating specific documents.

- **Documents**

  - Attach copies of all documents and other evidence collected during the inspection. All documents should be clearly identified.

  - In cases where documentary support items cannot be included easily with the report, it may be possible to substitute descriptive information.

- **Analytical Results**

  - Attach sample data and quality assurance data. These may be presented as tables, with pertinent information summarized in the body of the report.

# SECTION 15

# ASBESTOS BULK SAMPLING AND ANALYSIS

## IMPORTANCE OF SAMPLING

The asbestos NESHAP regulates only those materials containing greater than one percent asbestos. For this reason, the taking of bulk samples is an essential component of an asbestos NESHAP inspection. Without bulk samples an inspector may find it difficult, if not impossible, to prove that violations of the asbestos NESHAP regulation occurred at the facility visited.

Appropriate analysis of bulk samples will reveal both the type and percentage of asbestos they contain. If the amount of asbestos in bulk samples does not exceed one percent, the materials are not RACM and therefore are not subject to the requirements of the asbestos NESHAP.

Samples should be collected whenever feasible, and especially where violations are suspected or an enforcement action anticipated. Written standard operating procedures should be followed and only accredited laboratories used for the analysis of bulk samples. Use of improper sampling techniques or nonaccredited laboratories may jeopardize an agency's ability to take an enforcement action against a violator of the asbestos NESHAP.

Inspectors must be able to testify that the samples:

- accurately represent conditions at the site;
- were maintained using proper chain of custody; and
- were acquired and analyzed using proper methodology.

## PROTECTIVE EQUIPMENT

EPA's Safety, Health and Environmental Management Division's (SHEMD's) *Health and Safety Guidelines for EPA Asbestos Inspectors* recommends that the following personal protective equipment be used by EPA inspectors when collecting bulk samples under the Asbestos-In-Schools Rule, the Worker Protection Rule, and the asbestos NESHAP:

### Protective Clothing

Unless samples can be taken without any significant chance of releasing fibers, EPA inspectors should wear the following protective clothing when collecting bulk samples:

- a disposable, full-body, hooded coverall (e.g., a Tyvek® suit or equivalent);
- eye protection (if a full-face respirator is not used);
- disposable shoe coverings;
- hard hat (if applicable); and
- disposable gloves.

Inspectors should use safety shoes, hearing protection and other safety equipment as needed.

**Respiratory Protection**

EPA inspectors collecting bulk samples should wear full-face air-purifying respirators with HEPA filter cartridges (this includes NIOSH-approved, tight-fitting PAPRs equipped with HEPA filters).

## SAMPLING EQUIPMENT/MATERIALS

The following items are recommended for use during bulk sampling procedures:

- ***Sample containers*** - any dry, sealable and clean container (such as a 35-mm film canister; washed before use), plastic vial, or sealable plastic bag (preferably with a write-on label). **(Always wash film canisters before use and never reuse containers that have contained asbestos.)**
- ***Spray bottle*** - for wetting a surface prior to sampling to prevent generation of dust (use amended water or encapsulant) and for decontamination purposes.
- ***Duct tape*** - 1001 uses!
- ***Bathroom caulking*** - to temporarily repair a sampled area in a noncontaminated environment.
- ***Tamperproof tape/labels***- to seal sample containers, evidence envelopes.
- ***Tools*** - forceps, locking-blade penknife, coring device, screwdrivers, needle-nose pliers, laboratory spatula.
- ***Wet wipes*** - to clean tools between samples and to decontaminate equipment, sample containers.

- ***Plastic bags*** - to store equipment, supplies, samples, waste materials.

- ***Documentation materials*** - field logbook, plastic clipboard, inspection checklist, watch, sample labels, chain-of-custody forms, waterproof pens, overhead transparency sheets.

- ***Plastic drop cloth*** - to protect area beneath sampling point from contamination.

- ***Glove bags*** - for sampling sealed waste bags when a containment area is not present.

- ***Labeled waste disposal bags*** - for the disposal of contaminated materials.

The above items are considered essential and should be included in every sampling kit. Other items, such as specialty corers, hammer and chisel, and vinyl tile knives may also be used. A comprehensive inspection equipment checklist is provided as an appendix to this manual.

## PROCEDURAL GUIDELINES

The asbestos NESHAP regulation does not address the taking of bulk samples. Information regarding sample collection can be found, however, in several EPA and ASTM (American Society for Testing and Materials) publications:

- ***Guidance for Controlling Asbestos-Containing Materials in Buildings*** (EPA 560/5-85-024, June 1985) ("Purple book")

- ***Asbestos in Buildings: Simplified Sampling Scheme for Friable Surfacing Material*** (EPA 560/5-85-030a, October 1985) ("Pink book")

- ***Health and Safety Guidelines for EPA Asbestos Inspectors*** (EPA, March 1991)

- ***Test Method - Method for the Determination of Asbestos in Bulk Building Materials*** (EPA/600/R-93/116)

- ***Asbestos Sampling Bulletin*** (EPA, 9/30/94)

- ***Standard Test Method for Microvacuum Sampling and Indirect Analysis of Dust by Transmission Electron Microscopy for Asbestos Structure Number Concentrations*** (ASTM D 5755-95)

- ***Standard Test Method for Microvacuum Sampling and Indirect Analysis of Dust by Transmission Electron Microscopy for Asbestos Mass Concentrations*** (ASTM D 5756-95).

The Purple and Pink books are geared towards environments which are neither contaminated nor disturbed, such as those encountered during asbestos school inspections, pre-abatement inspections, and pre-demolition inspections. The *Health and Safety ...* document describes protective equipment and procedural guidelines for collecting bulk samples and the *Test Method ...* details preferred sample sizes for various asbestos-containing materials. The *Asbestos Sampling Bulletin* provides detailed information regarding the collection and analysis of bulk samples of multi-layered materials and the ASTM documents describe settled dust sampling techniques.

**Pre-sampling Procedures (Non-contaminated Areas)**

EPA's *Health and Safety ...* document provides the following procedural guidelines for inspectors (e.g., Asbestos-in-Schools inspectors) taking bulk samples in non-contaminated areas (i.e., areas where the asbestos-containing materials have not been disturbed).

- Discuss with building officials how the samples will be obtained and the rationale for selecting the sampling locations and the number of samples. Also discuss the advisability of notifying employees and/or their representatives prior to the inspection.

- Determine the equipment needed during the inspection to adequately access the area (e.g., ladders, scaffolding).

- Determine the best time to obtain the samples in each area selected (i.e., times when few people are normally in the vicinity or passing through).

- Limit access to the area while samples are being collected. Post area(s) with appropriate signs or construct barricades, if necessary. **Under no circumstances should samples be taken when school children or other unprotected individuals are present.**

- Determine the minimum number of people needed in the affected area during sample collection, and limit access to that number. (These individuals may need to use personal protective equipment, depending on the asbestos inspector's assessment of the potential for asbestos fiber release.).

- Determine how the area will be decontaminated should there be an accident (e.g., a piece of asbestos comes loose and drops to the floor). Be prepared to isolate the area and to damp wipe/mop the area, and/or have access to a HEPA vacuum.

- Based on the best information available, determine what personal protective equipment would be required in the event of an accident, under what conditions it will be worn, and by whom.

## Sampling Procedures

Asbestos inspectors may need to collect bulk samples of suspect RACM in pre-, active, and post-abatement areas and from other sites such as roll-off waste containers, trailers, abandoned buildings, waste disposal sites, demolished sites, etc.

Bulk samples may be taken of stripped, removed, or in-place materials. Although the environments in which these samples are collected may not conducive to formal random sampling approaches, the inspector can ensure the representativeness of samples collected by using proper judgment. Because the main goal of collecting bulk samples is to determine and document whether materials associated with a suspect violation contain greater than one percent asbestos, a subjective approach is warranted and appropriate.

In general, the following procedures should be followed when taking bulk samples.

- Identify homogeneous thermal system insulation, surfacing and miscellaneous materials.

- Select sample sites which will minimize disturbance of the asbestos material (e.g., the upper surface of horizontal thermal system insulation to reduce the possibility of contamination from material falling out of the sampling hole).

- If necessary, place a covering on the floor under the sample collection area.

- Spray the area to be sampled with a water mist or encapsulant mist prior to sampling to minimize release of fibers.

- Collect representative samples (a minimum of three) from each homogeneous area of suspect material associated with a possible violation.

- Collect a complete core or cross-section of suspect materials. In the case of a multi-layered system, if a bulk sample remains intact through all layers and the sample will remain intact until it reaches the analytical laboratory, containerize the sample as is. However, if such a bulk sample crumbles or breaks down at the time of sample collection, take separate samples from discrete layers at the site and carefully identify them and their position in the multi-layered system before sending them for analysis. (See information re: multi-layered systems later in this section.)

- Collect sufficient sample volumes. For samples such as floor tiles, roofing felts, paper insulation, etc., three to four square inches of the layered material are preferred. For materials such as ceiling tiles, loose-fill insulation, pipe insulation, etc., a sample size of approximately one cubic inch is preferred. For samples of thin coating materials such as paints, mastics, spray plasters, tapes, etc., a smaller sample may be obtained.

- Place samples in airtight containers. (Be sure to squeeze excess air out of plastic bags before sealing them.)

- Seal containers so that tampering will be evident.

- Write a unique identification number and your initials on each sample container.

- Clean sampling equipment and wash or change gloves between samples to avoid cross-contamination.

- Record sample information in field notes. If dry material is encountered and a wetting violation suspected, record this information in the field logbook and note in both the logbook and on the chain-of-custody form that the material was wetted during sample collection.

- Photograph the sampling location(s). When necessary, place an item of known size in the picture for reference.

- Make a drawing of the inspection site, noting where samples and photographs were taken. Indicate angles of photographs and written descriptions of materials sampled.

- When sampling is completed, decontaminate the sampling equipment and outsides of sample containers.

- Follow appropriate personal decontamination procedures.

- Dispose of asbestos-contaminated waste properly.

**Post-sampling activities**

- Complete all documentation including checklist entries and chain-of-custody (COC) form. A sample COC form is provided in Figure 15-1.

- Secure samples before conducting another inspection.

- Analyze samples as necessary. It is advisable to collect extra samples and analyze only enough to satisfy the evidence requirements (one sample containing greater than one percent asbestos). Additional samples may be analyzed as needed.

- Maintain original samples until such time as an enforcement action is completed.

**and well-cushioned to prevent breakage.)**

- Retain original samples until such time as an enforcement action is completed.

**Multi-layered Systems**

Asbestos NESHAP inspectors may need to determine the applicability of the asbestos NESHAP to multi-layered systems they encounter. Such systems include plaster wall or ceiling systems, resilient flooring systems (flooring, mastic, underlayment), plaster/stucco systems, and wallboard systems with add-on layers. [***Note***: In its *Asbestos Sampling Bulletin* (September 30, 1994) EPA stated that it does not consider a sheet of "plasterboard" by itself ("sheetrock", "wallboard", "gypsum board") a multi-layered material under either AHERA or NESHAP regulations.

EPA has recommended the use of an "improved" analytical method for the analysis of bulk samples. The Federal Register notice (59 FR 38970, August 1, 1994) directs laboratories to analyze individual layers or strata of a multi-layered sample and to report a single result for each layer. The 1982 "Interim Method" provided that the analytical results for the discrete layers of a multi-layered sample be combined and reported as one result across all layers. As a result, multi-layered systems which may have contained asbestos in a single layer may have been reported by laboratories as non-asbestos-containing.

Asbestos NESHAP inspectors, therefore, cannot rely on previous analysis of multi-layered materials to determine applicability of the asbestos NESHAP, unless results of each layer's analysis are available. Inspectors must sample multi-layered materials and provide necessary information regarding the samples to the laboratory for proper analysis.

Since EPA had received many questions about analyzing multi-layered systems for asbestos content to determine the applicability of the asbestos NESHAP, it published the *Asbestos NESHAP Clarification Regarding Analysis of Multi-layered Systems*, 59 FR 542, January 5, 1994. In this document EPA discussed the following:

- **Plaster/Stucco**

  If the plaster and stucco wall or ceiling systems are layered, and the layers can be distinguished, then the layers must be analyzed separately.

- **Add-on Materials**

  All materials (such as sprayed-on materials, paint, ceiling or wall texture, etc.) "added" to wallboard or other base materials must be analyzed and reported separately if possible.

- **Wallboard**

When joint compound and/or tape is applied to wallboard it becomes an integral part of the wallboard and in effect becomes one material forming a wall system. Therefore, where a demolition or renovation impacts such a wall system, a composite analysis of the wall system (percent of asbestos in the joint compound, tape and wallboard) should be conducted."

Since analytical requirements differ for wallboard systems vs. add-on materials, inspectors need to take samples in a manner which will help distinguish the two. EPA recommends the following sampling procedures be followed:

- ***Joint Compound*** - Sample where joints are expected (take a minimum of three samples):

  - inside or outside corners;
  - at wallboard joint intervals;
  - around nailheads.

- ***Add-on Materials*** - Take a minimum of three samples where joints are not expected (e.g., between corners and wallboard joint intervals).

Since a laboratory cannot distinguish joint compound at joints from the same materials used as a skim coat, the inspector must clearly describe the sample composition so that appropriate analytical results are reported.

At the laboratory all samples with outer layer having >1% asbestos will be noted. When this situation applies, the following must be considered:

- If only joint sampling areas show layers with >1% asbestos, then the material is joint compound and analytical results of the layers are composited. If the result is <1%, no management is necessary. If the result is >1%, the material is RACM and the asbestos NESHAP applies.

- If samples from both joint compound and non-joint areas show layers with >1% asbestos, the material is a "skim coat" or add-on material. In this case the results must not be composited and must be reported for each layer. Material so located must be treated as separate RACM layers according to the asbestos NESHAP.

Inspectors must keep good records of sample locations for later evaluation of results.

## DUST SAMPLING PROCEDURES

***Note***: EPA has no official policy regarding dust sampling or analysis.

In some situations (e.g., a post-removal inspection, or an improperly-run abatement site) inspectors encounter settled dust and would like to determine whether it contains asbestos. Inspectors may choose to use the tape lift, microvac, wipe, or passive sampling technique depending upon the type of analysis desired. The tape lift method selection is used for direct analysis and the microvac, wipe and passive methods are used for indirect analysis of asbestos in settled dust.

Direct analysis is designed to preserve the integrity of the sample as it occurred on the collection surface. Such analysis may allow observation of the material of interest and its associated matrix. If the matrix obscures the fibers of interest, it is necessary to process the sample to remove the interfering material and analyze the sample using indirect procedures. In many cases the indirect analysis will produce a larger analytical result than the direct analysis since more fibers are visible with the indirect preparation. Although direct analysis results may be lower, they offer the advantage of identifying the associated matrix with the sample and that information is valuable in identifying the source of the settled dust. It may be best, therefore, to collect samples for both direct and indirect analysis, so that the amount of asbestos present and its source can be determined.

**Tape Lift Samples**

In the tape lift method, adhesive materials such as transparent tape, self-stick office notes, or forensic tape are used to gather the dust sample. (Duct tape should never be used since recovery of the dust particles for analysis is essentially impossible.)

At the laboratory the sample is prepared directly for TEM or SEM analysis. This method of gathering and analyzing the sample minimally disturbs the asbestos present, but other fibers and matrix material may mask the asbestos fibers.

**Microvacuum Samples**

The American Society for Testing and Materials (ASTM) Subcommittee D22.07 has published two documents regarding settled dust: *Standard Test Method for Microvacuum Sampling and Indirect Analysis of Dust by Transmission Electron Microscopy for Asbestos Structure Number Concentrations* (ASTM D 5755-95) and *Standard Test Method for Microvacuum Sampling and Indirect Analysis of Dust by Transmission Electron Microscopy for Asbestos Mass Concentrations* (ASTM D 5756-95). Asbestos NESHAP inspectors are encouraged to follow the microvacuum techniques described in these documents and summarized below:

- Use only new, unused air monitoring cassettes containing 25 mm or 37 mm diameter mixed cellulose ester (MCE) or polycarbonate (PC) filter membranes with a pore size less than or equal to 0.8 mm.

- Maintain a log of all pertinent sampling information and sampling locations.

- Calibrate sampling pumps and flow indicators appropriately and record all calibration information. The internal diameter of the nozzle and flow rate of the pump may vary as long as the air velocity within the body of the nozzle is 100 (±10) cm/s. This air velocity can be achieved with an internal sampling tube diameter of 6.35 mm (¼ in.) and a flow rate of 2L/min.

- Perform a sampling system leak check at each sampling site.

- Attach the sampling cassette to the sampling pump at the outlet side of the cassette with a piece of plastic tubing. Cut the end of a clean 25.4 mm (10") piece of plastic tubing at a 45° angle and attach this to the intake port of the sample cassette. This tubing will act as the sampling nozzle.

- Delineate a sampling area of 100 $cm^2$ and vacuum it until there is no visible dust or particulate remaining. (Sample smaller or larger areas if needed.)

- When done, invert the cassette so that the nozzle inlet faces up before shutting off the pump. Seal the nozzle and the cassette appropriately.

- Wipe off the exterior surfaces of cassettes and nozzles.

- Label all samples clearly and complete dust sampling information sheets.

- Package cassettes and nozzles for shipment. (Use plastic bubble wrap or other non-fibrous packing material to minimize the potential for contamination.)

- Send samples and a field blank (unused cassette and nozzle) to an analytical laboratory in a sealed container, but separate from any bulk or air samples.

Samples should be analyzed by a NVLAP laboratory. Although no specific accreditation for dust analysis exists, these laboratories have demonstrated knowledge and proficiency in analyzing asbestos by transmission electron microscopy, the analytical technique specified in the ASTM documents. It is also recommended that the NVLAP laboratory chosen to do the analyses be a member of ASTM D22.07 and regularly attend its meetings.

Dust sample results, depending on the test method used, are reported in "asbestos structures per $cm^2$", "asbestos, g/$cm^2$, or "asbestos, weight percent". Results can be used to determine the presence of asbestos in the dust and to compare "suspect" areas to "clean" areas within the same building or different buildings. It is inappropriate to use the results of dust analyses in the determination of whether a suspect material contains "greater than 1% asbestos".

**Wipe Samples**

ASTM recommends the use of an ashless paper filter moistened with particle-free water in the taking of wipe samples. The inspector should wipe the filter over a known area (e.g., 100 $cm^2$), package it appropriately, and deliver it to a National Voluntary Laboratory Accreditation Program (NVLAP)-accredited laboratory for analysis. At the laboratory the sample will be analyzed via transmission electron microscopy (TEM) for its asbestos content.

**Passive Samples**

In passive sampling a clean collection surface of some sort (usually a shallow metal lid) is laid out to collect dust over a measured period of time. The dust is rinsed out of the container and then analyzed via TEM. Since the collection time is usually several or more weeks, this method is not often used by asbestos NESHAP inspectors. Passive samples are useful, however, in determining if dust is being deposited during the sampling period.

## BULK SAMPLE ANALYSIS

General Information

Bulk sample analysis is performed to determine whether the material from which samples have been collected contains greater than 1% asbestos. EPA provides guidance regarding the analysis of asbestos in bulk samples in its publication *Test Method -- Method for the Determination of Asbestos in Bulk Building Materials* (EPA/600/R-93/116, July 1993). This improved analytical method is designed to address certain materials:

- that are known to contain asbestos fibers, but in which the asbestos percentage is "low" (<10%);
- where the percentage of asbestos is obscured by a matrix binder of some kind (e.g., vinyl or asphalt floor tiles);
- in which small, thin fibers are present, but are frequently not detected at the magnification and resolution limits of polarizing light microscopes.

The improved method builds on the previous (1982) "Interim" polarizing light microscope (PLM) method. As before, it begins with a careful examination of the sample using a stereomicroscope, then proceeds (as before) to the examination of sample specimens under a polarizing microscope. In most cases, these steps will be sufficient to characterize a sample as asbestos-containing (asbestos present >1%) or non-asbestos-containing (no asbestos detected, or 1% or less in the sample).

The improved method includes additional procedures required for the reliable analysis of certain bulk building materials, such as steps for the elimination of the obscuring matrix

## Analytical Techniques

### *Stereomicroscopic Examination*

A preliminary visual examination which will help determine homogeneity, texture, friability, color, and the extent of fibrous components of the sample is required for all samples. This information helps guide the selection of further, more definitive qualitative and quantitative asbestos analysis methods.
Since vinyl floor tiles, asphaltic products, etc., contain small asbestos fiber sizes and/or the presence of interfering components, the use of stereomicroscopic analysis may be limited.

### *Polarized Light Microscopy*

Polarized light microscopy (PLM) is used to distinguish the various forms of asbestiform minerals on the basis of their unique optical crystallographic properties (qualitative examination) and is also used to perform a semi-quantitative analysis of bulk samples (i.e., visual area estimation and/or point-counting).

Although PLM analysis is the primary technique used for asbestos determination, it is limited by the visibility of the asbestos fibers. In some samples the fibers may be reduced to a diameter so small or masked by coatings to such an extent that they cannot be reliably observed or identified. For these reasons, PLM analysis is of limited value in analyzing floor tiles, and gravimetric or other procedures may be required.

When PLM is used to quantify asbestos content of a sample, the following conditions should be met:

- The slide sample should be homogeneous in order to be representative of the total sample.
- Particles in the slide preparation should have an even distribution and approach a one particle thickness to avoid particle overlap.
- The thickness relationship between matrix particles and asbestos fibers should be determined if the results based on projected area are to be related to volume and/or weight percent.

#### *Visual Area Estimation*

Visual area estimates are made by comparing the sample to calibration materials that have similar textures and fiber abundance. A minimum of three slide mounts are examined to determine the asbestos content by visual area estimation.

#### *Point Counting*

Point counting is a standard technique used in petrography for determining the relative areas occupied by separate minerals in thin sections of rock. For asbestos analysis this technique is used to determine the relative concentrations of asbestos minerals to nonasbestos sample components. The point-counting analytical method is required to be used when a method other than point counting has determined that the asbestos content of a sample is less than 10 percent.

In the point-counting method, an ocular reticle (cross-line or point array) is used to visually superimpose a point or points on the microscope field of view. A total of 400 points superimposed on either asbestos fibers or nonasbestos matrix material must be counted. Point counting provides a determination of the projected area percent asbestos.

If one or more samples from a homogeneous suspect ACM is determined to contain **more** than one percent asbestos, the entire material is considered to contain asbestos and is thus subject to the asbestos NESHAP.

Materials which are determined to contain **less** than one percent asbestos are not subject to the provisions of the regulation.

***Gravimetry***

Gravimetry, a process in which acids, solvents and ashing (heating the sample to burn off organic materials), can be used to selectively remove the binder components from a sample. Gravimetric procedures:

- isolate asbestos from the sample (allowing weight determination);
- concentrate asbestos (thereby lowering the detection limit in the total sample;
- aid in the detection and identification of fibrous components; and
- remove organic (ashable) fibers optically similar to asbestos.

If the sample is friable and contains organic (ashable) components, the ashing procedure should be followed. If the sample is friable and contains HCl-soluble components, the acid dissolution procedure is followed. If the sample is friable and contains both types of components, or if the sample is nonfriable (e.g., floor tiles), the two procedures can be applied, preferable with acid dissolution following ashing.

Gravimetry is not an identification technique, but is used to aid in qualitative PLM, analytical electron microscopy (AEM), or x-ray diffraction (XRD).

***X-Ray Diffraction***

X-ray diffraction, a technique which reveals a mineral's unique "fingerprint" on film, is typically used in conjunction with PLM or AEM. The technique is more expensive than PLM and cannot distinguish between fibrous and nonfibrous forms of asbestos. However, qualitative, semi-quantitative, and quantitative results may be obtained from XRD.

*Analytical Electron Microscopy (AEM)*

Analytical electron microscopy (AEM) is a reliable although expensive method for the detection and positive identification of asbestos in some bulk building materials. The method is particularly useful in the analysis of floor tiles and plasters, materials that contain a large amount of interfering materials and which contain asbestos fibers that may not be resolved by PLM techniques. The AEM method can also be used to quantify asbestos concentrations.

*Other Techniques*

Scanning Electron Microscopy (SEM) is very useful for observing surface features in complex particle matrices, and for determining elemental compositions. SEM cannot, however, detect small diameter fibers (~<0.2 mm) and cannot determine crystal structure.

Field test kits should never be used to confirm the presence or absence of asbestos since their results are unreliable.

## QUALITY ASSURANCE

### Sample Identification Numbers

A unique sample identification number must be assigned to each sample; this number can be a combination of a site code and the date and time the sample was taken. For example, for a sample taken at St. Joseph's Hospital on December 17, 1992 at 2:17 pm, the identification number could be:

**SJH 12 17 92 14 17.**

Use of such a numbering system can help eliminate a microscopist's potential bias. For example, if the numbering system chosen indicated that seven samples were taken from the same room, a microscopist might not be objective about each individual sample.

### Chain-of-Custody (COC) Forms

In order to ensure that all samples are properly identified and tracked from the point of sample collection through receipt by the analytical laboratory, EPA requires that a COC form be completed and accompany the samples when they leave the possession of the inspector. (See Figure 15-1.)

## CHAIN OF CUSTODY RECORD

| Project Code | Project Name | REMARKS |
|---|---|---|
| SAMPLERS (Signature) | | |

| I.D. NO. | DATE | TIME | LOCATION | | | | | | | | | | REMARKS |
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|---|---|---|---|---|---|
| Relinquished by (Signature) | Date/Time | Received by (Signature) | Relinquished by (Signature) | Date/Time | Received by (Signature) |
| Relinquished by (Signature) | Date/Time | Received by (Signature) | Relinquished by (Signature) | Date/Time | Received by (Signature) |
| Relinquished by (Signature) | Date/Time | Received for Laboratory by (Signature) | Date/Time | Remarks | |

Figure 15-1 Representative chain-of-custody record.

A COC form should contain the following information:

- site name and address;
- date of inspection/sampling;
- sample identification numbers;
- name/signature of sampler and date;
- name/signature of recipient(s) and date;
- type of analysis to be performed; and
- other pertinent information (e.g., use of glove-bag sampling method, use of unusual sample container, dry material wetted by inspector, etc.).

Since some laboratories require the use of their own COC forms, inspectors should contact them ahead of time to learn proper procedures.

A COC form should be completed immediately after the inspection. If mistakes are made in transferring information from field notes or sample containers to the form, a new form should be completed.

The form should not be signed until just before the samples leave the custody of the inspector.

**Quality Control (QC) Samples**

Collection of side-by-side duplicates is recommended at the rate of 1 QC sample per building or 1 QC sample for every 20 samples taken, whichever is larger. Since analyses of QC samples can help determine both sampling and analytical precision, it is important that the laboratory conducting the analysis not know which samples are QC samples.

Inspectors can help ensure nonbiased analysis by collecting a side-by-side sample nonsequentially. The inspector should gather several samples at the facility and then go back to one of the sample locations for the side-by-side duplicate. In this way the side-by-side samples' identification numbers are not consecutive in time.

Side-by-side duplicates are analyzed to determine the consistency of analysis within a laboratory. Significant differences in analytical results should not be seen. Splits of side-by-side duplicates may also be sent to a second laboratory to confirm the results of the first analyses. Any significant disagreements should be investigated; samples should be reanalyzed, or additional samples collected.

### Accredited Laboratories

To diminish the likelihood of challenges to the accuracy of laboratory results during an enforcement action, only laboratories which have participated in and been accredited by the National Institute for Standards and Technology (NIST) National Voluntary Laboratory Accreditation Program (NVLAP) should be used to analyze samples. A list of accredited laboratories is available through the EPA Regional Asbestos Coordinator, the TSCA Hotline (202-554-1404), and the NVLAP of NIST (301-975-4016).

An inspector should contact the laboratory before conducting the inspection and discuss the following:

- type of analysis;
- sampling procedures;
- sample containers;
- chain of custody forms;
- packaging of materials for shipment;
- turnaround time for analysis; and
- cost of analysis.

## BULK SAMPLE SHIPMENT

Inspectors can best maintain chain of custody by personally delivering the samples to the analytical laboratory. If this is not possible, the U.S. Postal Service, Federal Express, United Parcel Service or other courier services may be used. Since packaging and labeling requirements may differ depending on the organization chosen, inspectors should contact these concerns before shipping samples.

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## SECTION 16

## ASBESTOS AIR SAMPLING AND ANALYSIS

This section is designed to provide inspectors general information concerning the equipment, methods and procedures involved in air monitoring and air sample analysis. Although there are no requirements under the asbestos NESHAP for conducting air monitoring at demolition/renovation or asbestos removal sites, such requirements have been issued by OSHA (to monitor worker exposure and determine appropriate respiratory protection) and TSCA (to verify the adequacy of abatement activities at public and private schools, grades K-12), so asbestos NESHAP inspectors will often encounter monitoring equipment and air monitoring data during inspections.

The EPA has published a number of guidance manuals which recommend when and where asbestos air monitoring should be conducted. The most recent guidance can be found in *Measuring Airborne Asbestos Following an Abatement Action*, EPA-600/4-85-049 (Silver book). In addition, procedures for collecting and analyzing asbestos air samples have been published in *Asbestos Containing Materials in Schools (Amended),* 40 CFR Part 763, Subpart E. Additional information pertaining to air monitoring can be found in Appendix J, "List of Available References".

### TYPES OF AIR MONITORING

Asbestos air monitoring is conducted for a number of reasons and in a variety of scenarios. The most often encountered situations are:

- ***Non-abatement monitoring*** - helps determine hazard potential by directly measuring asbestos fiber concentration in the air.

- ***Monitoring during active removal operations*** - determines worker exposure during the time interval the monitoring took place; helps determine efficacy of engineering controls and work practices.

  (Available air monitoring data should be examined by the inspector and considered in the choice of respiratory protection. Inspectors should realize, however, that the data may not represent current conditions.)

- ***Clearance monitoring*** - determines whether airborne levels of asbestos in the containment area are below an acceptable level after the abatement project is completed; clearance monitoring is done before critical barriers are taken down and the contractor is released from the job.

- ***Ambient or background monitoring*** - measures outdoor fiber levels or indoor pre-abatement concentrations.

## MEASUREMENT APPROACH

### Personal Sampling

An air-monitoring device is worn by the worker during his/her normal work schedule. The sampling is used to determine the "breathing zone" fiber levels to which the worker is potentially exposed and is performed to comply with the requirements of the OSHA asbestos standard.

### Area Sampling

A stationary air-monitoring device is placed in an area representative of the overall area under investigation. This technique is used for hazard assessments, ambient and background surveys, and for monitoring during and after abatement actions.

### Aggressive Sampling

A large-volume area sample is taken while an air-moving device (e.g., a fan or leaf blower) dislodges and keeps airborne any remaining fibers during the sample collection period. This technique is performed in the containment area during clearance monitoring.

## SAMPLING EQUIPMENT

### Sampling Pumps

Available from a variety of manufacturers. Usually described as low-volume (personal) and high-volume pumps.

#### *Low-Volume*

Generally light-weight, battery-powered, personal monitoring pumps with a flow rate range of 1 to 5 liters per minute. More sophisticated versions are flow compensating and can be programmed to turn on, shut off, record flow rates, store data and interface with a data logger or personal computer. Used for both personal and area monitoring.

*High-Volume*

Capable of achieving flow rates up to 25 liters per minute. Heavier, bulkier and more obtrusive than the smaller, low-volume types. Allow larger volumes of air to be sampled in a shorter time period. Used for collecting area samples before, during and after abatement actions.

**Filters and Cassettes**

Filters used to collect airborne asbestos fibers are most often 25-mm or 37-mm filters housed in 2- or 3-piece styrene cassettes. Some cassettes, primarily those used for OSHA asbestos monitoring, have been modified with a 50-mm conductive extension cowl to reduce fiber loss on the walls of the cassette.

The two most routinely used filter media are:

- ***Cellulose Acetate Membrane*** - Pore size between 0.8-1.2 µm used for collecting samples to be analyzed via Phase Contrast Microscopy (PCM). If used for Transmission Electron Microscopy (TEM), special collection and preparation techniques must be used.

- ***Polycarbonate*** - Smooth-surfaced filters with pore size of 0.4 µm or used for samples collected for electron microscopy analysis.

## ANALYTICAL TECHNIQUES

Two options exist for analyzing air samples to determine airborne fiber concentrations: Phase Contrast Microscopy (PCM) and Transmission Electron Microscopy (TEM). Each has certain advantages and disadvantages depending on the circumstances in which it is used and the investigator's data requirements. Table 16-1 illustrates a general comparison of these different methods.

**Phase Contrast Microscopy (PCM)**

- Adopted by the Occupational Safety and Health Administration (OSHA) as a standard protocol for measuring airborne asbestos in the industrial work place (OSHA Reference Method).

- Nonspecific for asbestos fibers. Counts all fibers that are greater than 5 µm in length with an aspect ratio of 3:1.

- Limit of resolution is approximately 0.25 µm in diameter.

- Least expensive and most widely available analytical technique.
- Useful in determining worker exposure levels and for clearing abatement projects.

**Transmission Electron Microscopy**

- TEM is the most sensitive and specific of the cited analytical techniques. It is the method of choice when definitive results are needed.
- Due to magnifications of 15,000 - 20,000x, capable of resolving extremely thin asbestos fibers (typically 0.0025 μm in diameter).
- Can be outfitted with EDXS and SAED capabilities to provide definitive information concerning the chemical composition and crystalline structure of the observed fibers.
- Most expensive and least available of all of the cited techniques.

- Exists as a standard protocol. Method most recently published in 40 CFR Part 763, Appendix A to Subpart E - *Interim Transmission Electron Microscopy Analytical Method and Field Sampling Protocol for the Clearance Testing of an Abatement Site*.

TABLE 16-1. COMPARISON OF METHODS FOR MEASURING AIRBORNE ASBESTOS

| | PCM | TEM |
|---|---|---|
| **Standard Methods** | NIOSH 7400 Method* | EPA AHERA method** |
| **Quality Assurance** | Proficiency Analytical Testing Program; no NIST reference materials | NVLAP accreditation; NIST reference materials available |
| **Cost** | $8-28 | $75-250 |
| **Time Requirements** | 1 hour preparation and analysis, less than 6 hours turnaround | 4-24 hour preparation and analysis, 2-7 days turnaround |
| **Sensitivity (Thinnest Fiber Visible)** | 0.15 µm at best; 0.25 µm typical | 0.0002 µm at best 0.0025 µm typical |
| **Specificity** | Not specific for asbestos | Definitive for asbestos (TEM with EDXS & SAED) |
| **Collection Filters** | 0.8-1.2 µm cellulose ester | 0.4 µm polycarbonate, or 0.45 µm cellulose ester with special preparation |

*Revision #2: 3/1/87. OSHA Reference Method (ORM, 1986) is a modification of NIOSH 7400. NIOSH P&CAM 239 (Leidal 1979) may be used in some instances as an alternative.

**U.S. EPA, *Asbestos-Containing Materials in Schools*, 40 CFR 763, Subpart E, Appendix A, 1987

Source: Based on information from the EPA/NBS conference on post-abatement air monitoring (NBS/EPA, 1985), the open literature, and government reports, and on peer review comments (modified). Table updated June 1997.

## CONTINUOUS MONITORS

Continuous monitors provide real time data concerning nonspecific fiber concentrations. They are designed to mimic the NIOSH methodology and count all airborne fibers greater than 5 μm in length and with a 3:1 aspect ratio which pass through the sensor during a preselected time period. At the completion of the sampling period, the monitors electronically compute the fiber concentrations in fibers/cc.

**Advantages**:

- provide real time data;
- have a working range of 0.0001 to 30 f/cc;
- can indicate whether engineering controls and work practices are effective;
- can be used to prescreen prior to conducting more expensive analysis; and
- can be used to monitor preset action levels.

**Disadvantages**:

- not approved by NIOSH/OSHA;
- interferences can occur at high dust loading; and
- high capital cost ($19,750).

## SECTION 17

## LEGAL PERSPECTIVES

The following information describes who is subject to the asbestos NESHAP, the authority for inspections, and various enforcement options. This material was obtained from EPA's national strategy document and from EPA attorneys. Further legal questions should be addressed to Regional Counsels or to counsels for the State or local enforcement agency.

### OWNER OR OPERATOR

In the general provisions of 40 CFR Part 61, *National Emission Standards for Hazardous Air Pollutants (NESHAP)*, "**owner or operator**" is defined as:

> "any person who owns, leases, operates, controls, or supervises a stationary source" ("stationary source" being defined as "any building, structure, facility, or installation which emits or may emit any air pollutant which has been designated as hazardous by the Administrator.").

Within Section 61.141 (*Definitions*) of Subpart M of the NESHAP regulation, the term "owner or operator" is redefined specific to demolition or renovation activities. **"Owner or operator of a demolition or renovation activity"** means:

> "any person who owns, leases, operates, controls, or supervises the facility being demolished or renovated or any person who owns, leases, operates, controls, or supervises the demolition or renovation operation, or both."

Since this definition applies to both the facility owner or operator and demolition or renovation contractors hired by the owner or operator, each party is considered legally responsible in the event of noncompliance with the asbestos NESHAP. Other individuals such as hygienists, electricians, plumbers, transporters, etc., hired either by the facility owner or operator or demolition or renovation contractor, are also subject to the regulation's requirements and may be held legally responsible as well. It has been EPA's policy, however, to cite both the facility owner and the demolition/renovation contractor for violations of the asbestos NESHAP seen at demolition or renovation worksites.

In addition to the above responsible parties, Section 61.154 (*Standard for active waste disposal sites*) of Subpart M notes that "each owner or operator of an active waste disposal site that receives asbestos-containing waste material" from mills, demolition or renovation operations, or conversion operations must comply with the waste disposal provisions of the asbestos NESHAP.

Such owners or operators may thus be cited and held legally responsible for violations seen at active waste disposal sites.

## AUTHORITY FOR INSPECTIONS

Statutory authority for inspection is under Section 114 of the *Clean Air Act*. Allowed activities during inspection include sampling, photography, and visual observations. The inspector need not be a certified visible emissions observer to judge whether there is an emission.

If denied access to a facility, an inspector may apply for a warrant to perform the inspection. In order to obtain a warrant, the agency should show either that the inspection is scheduled under a "neutral" inspection format, or that there is probable cause to suspect violations at the subject source. The agency must obtain the exact street address of the site and name of the owner in order to have a warrant issued.

An inspector discovering obvious violations of the asbestos NESHAP during an inspection is not empowered by EPA to order a work stoppage to curtail asbestos emissions. This order must be made, when necessary, at the level of a Division Director. Other orders may be feasible under the power of local health agencies.

## ENFORCEMENT OPTIONS

Enforcement options used to remedy ongoing violations and/or deter future violations (previously summarized in Section 2, "Asbestos Demolition and Renovation Enforcement Strategy") include informal, administrative, and judicial actions.

Field citations, although a program authorizing their use is not yet in place, are expected to become another enforcement option available to asbestos NESHAP inspectors. EPA is developing such a program and expects to promulgate final rules regarding field citations sometime in 1994.

A source, due to improper waste disposal, may also be subject to regulation under RCRA and/or CERCLA, so air and hazardous waste enforcement personnel should coordinate their actions whenever possible. (Note that the AHERA legislation of 1986 established interim requirements for transport and disposal by reference to Chapters 4 and 5 of EPA's *Asbestos Waste Management Guidance* EPA/530-SW-85-007).

Other types of relief may be sought besides monetary compensation to enhance future compliance with the regulation. For example, depending on the types of violations seen, consent degrees issued during settlement proceedings may require defendants to:

- Conduct representative sampling of suspect ACM to be disturbed and have samples analyzed at a NVLAP laboratory.

- Develop an asbestos control program which details procedures the defendant will follow to comply with the asbestos NESHAP.

- Develop and implement an asbestos training program and implement it within a certain time frame.

- Train a corporate asbestos program manager who will be responsible for company compliance with the regulation.

- Supply some of the following information with future notifications:

    - date of previous notification;
    - if previous notification was made by telephone, name of Agency contact who received the call;
    - name of on-site supervisor;
    - facility contact and telephone number;
    - survey inspector name and address, date of training, and training provider identification;
    - specific information regarding the types of RACM to be disturbed;
    - working hours at abatement site;
    - definitive description of abatement techniques (wetting, waste handling, etc.) to be employed;
    - name of waste disposal facility contact; and
    - reason for an ordered demolition.

- Examine loads for obvious violations of the asbestos NESHAP (improperly contained ACWM, dry material, lack of labels, etc.) before accepting them for transport.

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## APPENDIX A

## INSPECTION EQUIPMENT CHECKLIST

### General Inspection Materials and Equipment

Copy of notification ____
Employee I.D./credentials
    letter of authorization, ____
    med. monitoring/fit test cert. ____
Business Cards ____
Copy of regulation ____
Field notebook ____
Pens/pencils ____
Highlighting marker ____
Indelible markers
    fine ____
    medium ____
    large ____
Inspection checklist ____
Waterproof camera ____
    extra battery(ies) ____
    film ____
Waterproof flashlight ____
    extra batteries ____
    extra bulb ____
Plastic clipboard ____
Custody tape/labels ____
Overhead projector trans. sheets ____
Chain of custody forms ____
Shipping supplies ____
Waterproof watch ____
Plasticized enlarged bus. card ____
Plain paper ____
Office supplies ____
    lg. envelopes ____
    folders ____
    paper clips ____
    binder clips ____
Binoculars ____
Utility knife ____
Diver's bags ____

**Personal Protective Equipment**

| | |
|---|---|
| Dufflebags | ____ |
| Full-face neg. pres. resp. (NPR) | ____ |
| Respirator cartridges for NPR: | |
| HEPA | ____ |
| HEPA/$NH_3$ | ____ |
| HEPA/Org. vapor | ____ |
| HEPA/Org./Acid | ____ |
| PAPR (tight-fitting) | ____ |
| Respirator cartridges for PAPR | ____ |
| Backup battery for PAPR | ____ |
| Spectacle kit | ____ |
| SCBA (pressure-demand type) | ____ |
| Resp. disinfectant (pads, powder) | ____ |
| Disposable full-body coveralls | ____ |
| Duct tape | ____ |
| Latex overboots | ____ |
| Hard hat | ____ |
| Safety glasses (clear/tinted) | ____ |
| Steel-toed rub. boots/safety shoes | ____ |
| Hearing protection | ____ |
| Asbestos waste bags (6 mil) | ____ |
| Bathing suit/disposable underwear | ____ |
| Disposable gloves | ____ |
| Paper towels | ____ |

**Personal Protective Equipment (Continued)**

| | |
|---|---|
| Glove bags | _____ |
| Liquid soap | _____ |
| Safety harness/lanyard | _____ |
| Shower thongs | _____ |

**Sampling Equipment**

| | |
|---|---|
| Sample containers | _____ |
| Spray bottle | _____ |
| Tools: | |
| needle-nose pliers | _____ |
| locking blade knife (2) | _____ |
| screwdrivers (slotted, Phil.) | _____ |
| laboratory spatula | _____ |
| coring tool | _____ |
| metal forceps | _____ |
| Plastic dropcloth | _____ |
| Wet wipes | _____ |
| Resealable plastic bags (qt., gal.) | _____ |
| Bathroom caulking | _____ |

## ASBESTOS DEMOLITION AND RENOVATION (D/R)
## FIELD DATA COLLECTION CHECKLIST

### A. GENERAL INFORMATION

Site name: ____________________

Location: ____________________

____________________

Site code: __________

Date of inspection: __________ Time of inspection: __________

Weather conditions: ____________________

Inspector(s): ____________________

____________________

Notification received? Yes: __
No: __

Reason for inspection: ____________________

Routine compliance inspection ____ Citizen complaint ____

Suspected non-notifier ____ State oversight/Joint ____

Other (explain) ____________________

### B. REMOTE OBSERVATIONS

Using the space provided, draw a sketch of the facility. Indicate compass directions, waste storage area(s), location(s) of debris, land use surrounding site, vehicles of importance, etc. Estimate and indicate dimensions and distances as accurately as possible on the drawing. Note where photographs/samples were taken.

## REMOTE OBSERVATION SKETCH

Referring to the above sketch, describe any visible emissions to the outside air or suspect ACM debris seen.

## C. PRE-INSPECTION INTERVIEW

| | Yes | No |
|---|---|---|
| 1. Credentials shown: | | |
| Agency identification | _____ | _____ |
| Medical monitoring certification | _____ | _____ |

2. Name(s) and position(s) of person(s) being interviewed (include company name):

______________________________________________

______________________________________________

______________________________________________

______________________________________________

3. Review the entire notification form with the on-site representative and note below any changes in the information provided.

______________________________________________

______________________________________________

______________________________________________

______________________________________________

______________________________________________

4. Subcontractors [Provide the following information for each subcontractor or any other party on site (e.g., hygienist, consultant, etc.) who controls or supervises the D/R project.]

a. Company name: ______________________________

b. Main contact person and title: ______________________________

c. Mailing address: ______________________________

______________________________________________
City State Zip Code

d. Telephone number: ______________________________
(area code)

e. Name/title of on-site representative: ______________________

f. Responsibilities at job: ______________________________

5. Activity Description

| | Yes | No |
|---|---|---|
| a. Is more than one project occurring at the facility? | ___ | ___ |

(If "yes", complete a separate checklist for each or differentiate accordingly.)

b. Describe each project and indicate its current phase. ____________________

______________________________________________________

______________________________________________________

______________________________________________________

______________________________________________________

______________________________________________________

______________________________________________________

______________________________________________________

______________________________________________________

______________________________________________________

## D. PRE-ENTRY OBSERVATIONS

1. Abatement workers present:

a. Number ___

Yes No

b. Training records available? ______ ______

| | | Yes | No |
|---|---|---|---|
| c. | State licenses on site? | _____ | _____ |
| d. | Medical exam records available? | _____ | _____ |
| 2. | Amended water in evidence? | _____ | _____ |
| 3. | Power tools in use? | _____ | _____ |
| 4. | Dust/debris (VE?) outside removal area? | _____ | _____ |
| 5. | Warning signs posted? | _____ | _____ |
| 6. | Containers properly labeled with asbestos hazard warning? | _____ | _____ |
| 7. | Waste disposal permit on site? | _____ | _____ |
| 8. | Worksite properly contained? | _____ | _____ |
| 9. | Functional decontamination facility available? | _____ | _____ |
| 10. | Personal air monitoring data indicate $\leq$2.0 f/cc 8 hour TWA | _____ | _____ |
| 11. | Written respiratory protection program? | _____ | _____ |
| 12. | Respirators in use? | _____ | _____ |
| 13. | Removal plan available for review? | _____ | _____ |
| 14. | Evidence of on-site representative's NESHAP training posted? | _____ | _____ |

15. Name of on-site representative/affiliation:

______________________________________________

______________________________________________

Comments: ______________________________________________

______________________________________________

______________________________________________

## E. WORKSITE INSPECTION

| | | Yes | No |
|---|---|---|---|
| 1. | Is the site a "facility"? | ______ | ______ |
| 2. | Are regulated amounts of suspect RACM being handled? | ______ | ______ |

| QUANTIFICATION OF SUSPECT RACM | | |
|---|---|---|
| **Facility Component** | **Quantity Suspect RACM to be Disturbed (ft, ft$^2$, ft$^3$)** | **Measurement/Estimation Technique** |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

| TOTAL AMOUNT SUSPECT RACM PRESENT | |
|---|---|
| Pipes | ______ linear feet |
| Other facility components | ______ square feet |
| Off facility components (components no longer present) | ______ cubic feet |

| | | Yes | No |
|---|---|---|---|
| 3. | Is the material friable? | ____ | ____ |

Describe how friability was determined. ______________________________
______________________________________________
______________________________________________

| | | | |
|---|---|---|---|
| 4. | Is the material likely to become friable during demolition or renovation? | ____ | ____ |

Explain: ______________________________________
______________________________________________

5. Which of the following types of suspect RACM are involved in the project?

***Category I Nonfriable ACM***

Asphalt roofing products ____
Gaskets ____
Mastic ____
Packings ____
Resilient floor coverings (vinyl/asbestos tile, asphalt/asbestos tile, linoleum) ____

***Insulation***

Block insulation ____
Pipe insulation (felt, air-cell, premolded, asbestos-cement) ____

***Miscellaneous***

Acoustical tiles ____
Ceiling tiles ____

***Surfacing Materials***

Joint compound ____
Plaster ____
Spackling compound ____
Sprayed-on (acoustical, decorative or insulative) ____
Stucco ____

*Category II Nonfriable ACM*

| | | | |
|---|---|---|---|
| Boiler fire brick | ____ | Pegboard | ____ |
| Clapboards/shingles | ____ | Putties | ____ |
| Concrete/asbestos board | ____ | Sealants | ____ |
| Concrete/asbestos pipe | ____ | Textiles (fire blankets, laboratory aprons,theater and welding curtains, gloves) | ____ |
| Extrusion panels | ____ | | |
| Laboratory benchtops` | ____ | | |
| Millboard | ____ | Vinyl wallpaper | ____ |
| Paints and coatings | ____ | | |

*Other (specify)*

______________________________________________________________________

______________________________________________________________________

______________________________________________________________________

______________________________________________________________________

6. If necessary, draw a diagram of the worksite. Indicate dimensions and amounts, locations of samples/photographs, etc.

Comments: ______________________________________________
______________________________________________
______________________________________________
______________________________________________
______________________________________________

## F. NOTIFICATIONS

1. What type of activity is described on the notification?

   a Demo/reno (≥260/160/35) _____

   b Demolition (<260/160/35 or no asbestos) _____

c. Planned renovation involving individual non-scheduled operations ($\geq$260/160/35) ______

d. Ordered demolition ______

e. Emergency renovation ______

2. When was the notification received? ________________________________

3. When did work that disturbed RACM begin? ____________________________

| | Yes | No | N/A |
|---|---|---|---|
| 4. Did the notification require updating? | __ | __ | |
| If "yes", the reason for updating was: | | | |
| a. change in notification information ______ | | | |
| b. later start date ______ | | | |
| c. early start date ______ | | | |
| If there was a **later** start date, did the owner/operator: | | | |
| a. telephone before original start date? | __ | __ | __ |
| b. provide written notice by original start date? | __ | __ | __ |
| If there was an **earlier** start date, did the owner/operator: | | | |
| a. notify in writing? | __ | __ | __ |
| b. notify at least 10 days before RACM disturbance? | __ | __ | __ |
| **G. DEMOLITION?** | __ | __ | |
| 1. Ordered demolition? | __ | __ | |
| a. Copy of order accompany notification? | __ | __ | |
| b. Reason for order justified by on-site observations? | __ | __ | |
| c. Portion of facility containing RACM kept adequately | | | |

| | | | |
|---|---|---|---|
| | wet during wrecking? | ___ | ___ |
| d. | ACWM kept adequately wet at all times after demolition? | ___ | ___ |

Comments: ______________________________________________

______________________________________________

| | | Yes | No |
|---|---|---|---|
| 2. | ACM left in facility during demolition? | ___ | ___ |
| a. | Category I nonfriable (not in poor condition, not friable)? | ___ | ___ |
| b. | Encased in concrete? | ___ | ___ |
| | Adequately wet when exposed? | ___ | ___ |
| c. | Not discovered until after demolition and cannot be safely removed? | ___ | ___ |
| | Adequately wet when exposed? | ___ | ___ |
| d. | Category II with low probability of becoming RACM? | ___ | ___ |
| e. | ACWM kept adequately wet at all times after demolition? | ___ | ___ |
| 3. | Demolition by intentional burning? | ___ | ___ |
| | All ACM removed before burning? | ___ | ___ |

Comments: ______________________________________________

______________________________________________

| | | Yes | No | N/A |
|---|---|---|---|---|
| **H.** | **RENOVATION?** | ___ | ___ | |
| 1. | Unit/section removal? | ___ | ___ | |
| a. | Adequately wet where cut or disjoined? | ___ | ___ | |

| | | Yes | No | N/A |
|---|---|---|---|---|
| b. | Carefully lowered? | ____ | ____ | ____ |
| c. | RACM stripped? | ____ | ____ | |
| 1. | Adequately wetted? (or) | ____ | ____ | |
| 2. | LEVC used? | ____ | ____ | |
| d. | RACM wrapped? | ____ | ____ | |
| 1. | Leak-tight wrapping? (and) | ____ | ____ | |
| 2. | Labeled? | ____ | ____ | |
| 2. | RACM stripping? | ____ | ____ | |
| a. | Adequately wet? (or) | ____ | ____ | ____ |
| b. | Wetting exemption? | ____ | ____ | ____ |
| 1. | Potential equipment damage or safety hazard? | ____ | ____ | ____ |
| a. | Written approval? (and) | ____ | ____ | |
| b. | Emission control? (and) | ____ | ____ | |
| 1. | LEVC? | ____ | ____ | |
| 2. | glove bag? | ____ | ____ | |
| 3. | leak-tight wrapping? | ____ | ____ | |
| 4. | written approval for alternative method? | ____ | ____ | |
| c. | Written approval on site? | ____ | ____ | |
| 2. | Temperature at point of wetting below 32°F (0°C)? | ____ | ____ | ____ |
| a. | Unit/section removal? | ____ | ____ | |

| | | Yes | No | N/A |
|---|---|---|---|---|
| b. | Temperature recorded? | ____ | ____ | |
| | 1. beginning? | ____ | ____ | |
| | 2. middle? | ____ | ____ | |
| | 3. end? | ____ | ____ | |
| c. | Records available for inspection at site? | ____ | ____ | |
| d. | Records retained ≥2 years? | ____ | ____ | |
| 3. | Large facility component not stripped? | ____ | ____ | |
| a. | RACM not disturbed or damaged? (and) | ____ | ____ | |
| b. | Leak-tight wrapping? (and) | ____ | ____ | |
| c. | Labeled? (loading, unloading, storage) | ____ | ____ | |
| 4. | All RACM | | | |
| a. | Adequately wetted and maintained wet? | ____ | ____ | ____ |
| b. | Carefully lowered? | ____ | ____ | ____ |
| c. | Leak-tight chutes/containers (>50′)? | ______ | ________ | _____ |
| d. | Wrapped leak-tight? | ____ | ____ | ____ |

## I. WASTE DISPOSAL

1. Which of the following waste disposal options has the owner/operator chosen to follow?

   a. No visible emissions to the outside air (collection, processing, packaging, transporting). __

(or)

   b. Adequately wet ACWM. __ (or)

   c. Process ACWM into nonfriable forms. __ (or)

d. For ordered demos and demos where RACM has not been removed, adequately wet ACWM all times after demolition and keep wet during handling and loading. ___

e. Approved alternative method. ___

Comments: ______________________________________________

______________________________________________

______________________________________________

| | | Yes | No |
|---|---|---|---|
| 2. | Has adequate wetting of ACWM been chosen? | ____ | ____ |
| a. | Is RACM awaiting containerization adequately wetted? | ____ | ____ |

If "no", describe: ______________________________________________

______________________________________________

| | | Yes | No |
|---|---|---|---|
| b. | Is the ACWM already containerized adequately wetted? | ____ | ____ |

If "no", describe: ______________________________________________

______________________________________________

If necessary, adequately wet the ACWM and describe how it changes (e.g., color, texture): ______________________________________________

______________________________________________

______________________________________________

______________________________________________

| | | Yes | No |
|---|---|---|---|
| c. | Are there visible emissions to the outside air? | ____ | ____ |

If "yes", describe: ______________________________________________

______________________________________________

| | | Yes | No |
|---|---|---|---|
| d. | Are leak-tight containers or wrapping used? | ____ | ____ |
| | Are there any open or ripped bags outside containment? | ____ | ____ |
| | How many? _____ | | |
| | Are the contents adequately wetted? | ____ | ____ |
| | If "no", describe:________________________________ | | |
| | ________________________________ | | |
| e. | Are OSHA labels used? | ____ | ____ |
| f. | If the ACWM will be transported off site, are the containers labeled with the: | | |
| | 1. name of the waste generator? (and) | ____ | ____ |
| | 2. location of ACWM generation site? | ____ | ____ |
| | Comments: ________________________________ | | |
| | ________________________________ | | |
| | ________________________________ | | |
| | ________________________________ | | |

**Note: None of 2 (a-f) above applies to Category I nonfriable ACM waste and Category II ACM waste that is not RACM**

| | | Yes | No |
|---|---|---|---|
| 3. | Is all ACWM (excluding Category I nonfriable ACM that is not RACM) disposed of as soon as practical? (and) | ____ | ____ |
| | a. at a waste disposal site operated per §61.154? (or) | ____ | ____ |
| | b. at an EPA-approved asbestos conversion site? | ____ | ____ |

Comments: ________________________________

________________________________

| | | Yes | No |
|---|---|---|---|
| 4. | Are vehicles used to transport ACWM marked: | | |
| | a. during loading? | ____ | ____ |
| | b. during unloading? | ____ | ____ |
| | c. visibly? | ____ | ____ |
| | d. appropriately? | ____ | ____ |

Comments: ______________________________________________

______________________________________________

| | | Yes | No |
|---|---|---|---|
| 5. | Is ACWM to be transported off site? | ____ | ____ |
| | a. Are waste shipment records maintained? | ____ | ____ |
| | b. Do they contain the following required information? | | |
| | 1. name, address, telephone number of waste generator | ____ | ____ |
| | 2. name, address of agency administering asbestos NESHAP program | ____ | ____ |
| | 3. quantity ($m^3$, $yd^3$) | ____ | ____ |
| | 4. waste disposal site (WDS) operator name, telephone number | ____ | ____ |
| | 5. WDS name, location | ____ | ____ |
| | 6. transport date | ____ | ____ |
| | 7. transporter name, address, telephone | ____ | ____ |
| | 8. certification | ____ | ____ |

Comments: ______________________________________________

______________________________________________

6. Is a copy of the WSR given to the WDS at time of delivery? ____ ____

| | Yes | No |
|---|---|---|
| 7. Has the generator ever failed to receive a copy of the WSR signed by the WDS within 35 days of ACWM transport? | ____ | ____ |
| If "yes", did the generator: | | |
| a. contact the transporter and/or WDS? | ____ | ____ |
| b. determine the status of the waste? | ____ | ____ |
| 8. Has the generator ever failed to receive a copy of the WSR signed by the WDS within 45 days of transport? | ____ | ____ |
| If "yes", has the generator reported this in writing to the agency responsible for the waste generator? | ____ | ____ |
| Did the generator include: | | |
| a. a copy of the WSR in question? (and) | ____ | ____ |
| b. a cover letter explaining attempts at resolution? | ____ | ____ |
| 9. Are required records available for review? | ____ | ____ |

Comments: ____________________________________________

______________________________________________________

______________________________________________________

______________________________________________________

## J. ADDITIONAL INFORMATION

| | | |
|---|---|---|
| 1. Glove bags in use? | ____ | ____ |
| a. small-scale, short duration project? | ____ | ____ |
| b. secondary containment? | ____ | ____ |
| c. reduced pressure inside glove bag? | ____ | ____ |

2. Size of containment area (LxWxH)? ____

3. Number/cfm ratings of LEV units ____________________

## K. SUMMARY OF RECOMMENDATIONS/DISCUSSION WITH OWNER/OPERATOR

## L. ADDITIONAL COMMENTS

## M. ATTACHMENTS

Sample Collection Log ____

Photo Identification Log Sheet ____

AHERA Compliance Checklist ____

Worker Protection Rule Checklist ____

Field Notes ____

Chain of Custody Form ____

Generator Identification Label ____

Waste Shipment Record ____

Notification ____

Photographs ____

Site map/diagram/blueprint ____

Others (list):

________________________________________

________________________________________

________________________________________

________________________________________

**Inspector signature:** ________________________________________________

**Date:** ______________________________

# ASBESTOS NESHAP
# MILLING, MANUFACTURING & FABRICATING OPERATIONS
# FIELD INSPECTION CHECKLIST

## I. GENERAL INFORMATION:

Site name: ______________________________

Location: ______________________________

Date of inspection: ______________________________

Time of inspection: ____________________ am/pm

## II. FACILITY INFORMATION:

Type of facility: Milling _________ Manufacturing _________ Fabricating _____

Material manufactured (if applicable):

1. cloth, cord, wicks, tubing, tape, twine, rope, thread, yarn, roving, lap, or other textile materials __
2. cement products __
3. fireproofing and insulating materials __
4. friction products __
5. paper, millboard, and felt __
6. floor tile __
7. paints, coatings, caulks, adhesives, and sealants __
8. plastics and rubber materials __
9. chlorine (utilizing asbestos diaphragm technology) __
10. shotgun shell wads __
11. asphalt concrete __

Typical operating hours: ______________________________

Date construction of facility commenced: ______________________________

Date facility commenced asbestos-related operations: ______________________________

Date modification of facility commenced: ______________________________

**A. Reason for Inspection:**

Routine compliance __ Citizen complaint __

State oversight/Joint __

**B. Site Conditions:**

Ambient air temperature: ____°C/°F

Wind description:______________________________

Wind direction: ______________________________
Visibility: ______________________________
(e.g., clear, partly cloudy, overcast . . .)
Other conditions: ______________________________
(e.g., drizzle, rain, sleet, snow . . . )

**C. Owner Information:**

Name: ______________________________
Address: ______________________________
______________________________

Phone number: (    ) ______________________________

**D. Operator Information:**

Company name: ______________________________
Address: ______________________________

Phone number: (    ) ______________________________
Contact person: ______________________________
Title: ______________________________

## III. PRE-INSPECTION INTERVIEW:

1. Credentials shown:

| | | Yes | No |
|---|---|---|---|
| a. | agency identification | ___ | ___ |
| b. | medical monitoring certification | ___ | ___ |

2. Name and title of person being interviewed:
______________________________
______________________________

3. Company: ______________________________

4. Principle product produced: ______________________________

5. Process information:

a) Description: ______________________________
______________________________
______________________________
______________________________

b) Amount of asbestos-containing material produced by the facility: ______________
c) Dates of operation: ______________________________

d) Does the source use a spray-on method? Y__ N__
If "yes", was EPA informed of the process 20 days prior to the application? Y__ N__

6. Control equipment/measures: ______________________________
______________________________
______________________________
______________________________
______________________________
______________________________

7. Are HEPA vacuums available on site? Y__ N__

8. Waste handling procedures: ______________________________
______________________________
______________________________
______________________________
______________________________

9. Is there an **active** waste disposal facility on site? ______________________________

10. Is there an **inactive** waste disposal facility on site? ______________________________

11. Disposal procedures: ______________________________
______________________________
______________________________
______________________________
______________________________
______________________________

12. Primary waste transporter:

Name: ______________________________
Address: ______________________________
Telephone: ______________________________

13. Primary ACWM waste disposal site:

Name: ______________________________
Address: ______________________________
Telephone: ______________________________

14. Interview notes/comments: ______________________________
______________________________
______________________________
______________________________
______________________________
______________________________
______________________________
______________________________
______________________________

## IV. INSPECTION:

1. Using the space provided, draw a general location map of the facility. Note land use surrounding site (residential, industrial, recreational). Estimate and indicate dimensions and distances as accurately as possible.

2. Using the space provided, draw a sketch of the process and control equipment locations. Note sample and photograph locations.

3. Which of the following emission control options has the facility selected?

a. Discharge no visible emissions to the outside air _
b. Use a fabric filter collection device _
c. Use an Administrator-approved wet collector _
d. Use a HEPA filter certified to be 99.97% efficient for 0.3 micron particles _
e. Use other Administrator-approved filtering equipment _

4. Describe any visible emissions seen. ____________________________

____________________________________________

____________________________________________

____________________________________________

| | | Yes | No |
|---|---|---|---|
| 5. | Is the facility using a fabric filter collection device? | _ | _ |

If "yes",

a. Is the facility using woven __ or felted fabric __ filters?

b. How does the facility ensure that the airflow specifications for these filters are not exceeded? ________________________

____________________________________________

____________________________________________

____________________________________________

c. What is the current manometer reading of the pressure drop across the fabric filter of the air cleaning device? ____________

____________________________________________

d. Was the fabric collection device installed after January 10, 1989? _ _
If "yes", have provisions been made for easy inspection for faulty bags (61.152(a)(3))? _ _

e. Weight of felted fabric in $g/m^2$: ____________________

6. Visible emission monitoring

a. Is visible emission monitoring performed once per day during daylight operating hours for at least 15 seconds per emission source? _ _

b. Who conducts the visible emission monitoring?
Name: ________________________________
Title: ______________________________________

c. Comments: ____________________________________

____________________________________________

____________________________________________

____________________________________________

| | | Yes | No |
|---|---|---|---|
| 7. | Conduct a walkthrough and identify monitoring sites. Does the facility monitor each potential source? | ___ | ___ |

Comments: ________________________________________
________________________________________
________________________________________
________________________________________

| | | | Yes | No |
|---|---|---|---|---|
| 8. | Are records of the results of visible emission monitoring and air cleaning device inspections maintained? | | ___ | ___ |
| | If "yes", is the following information included? | | | |
| | a. | Date and time of each inspection. | ___ | ___ |
| | b. | Presence or absence of visible emissions. | ___ | ___ |
| | c. | Condition of fabric filters, including presence of any tears, holes, and abrasions. | ___ | ___ |
| | d. | Presence of dust deposits on clean side of fabric filters. | ___ | ___ |
| | e. | Brief description of corrective actions taken, including date and time. | ___ | ___ |
| | f. . | Daily hours of operation for each air cleaning device. | ___ | ___ |

Comments: ________________________________________
________________________________________
________________________________________
________________________________________
________________________________________
________________________________________

| | | | | Yes | No |
|---|---|---|---|---|---|
| 9. | Are the records available for this inspection? | | | ___ | ___ |
| 10. | Are air cleaning devices used on site? | | | ___ | ___ |
| | a. | If "yes", | | | |
| | | i. | Is each air cleaning device inspected at least once per week for proper operations and for changes that signal the potential for malfunction? | ___ | ___ |
| | | ii. | Who conducts the air cleaning device inspections? | | |

Name: ________________________________________
Title: ________________________________________

| | | Yes | No |
|---|---|---|---|
| b. | If "no", | | |
| | i. Has a written maintenance plan been submitted to the Administrator? | ___ | ___ |
| | ii. Does the plan include a: | | |
| | Maintenance schedule? | ___ | ___ |
| | Recordkeeping plan? | ___ | ___ |
| | iii. Has the plan been revised since submission? | ___ | ___ |
| | If "yes", has the administrator been sent the revised plan? | ___ | ___ |
| 11. | Has the facility retained a copy of all monitoring and inspection records for at least two years? | ___ | ___ |
| 12. | Are monitoring and inspection records available for inspection? | ___ | ___ |
| 13. | Have any visible emissions been recorded during visible emission monitoring? | ___ | ___ |
| | If "yes", has the facility submitted a copy of the visible emission monitoring records to the Administrator within 30 days of the end of the quarter when visible emissions occurred? (Quarterly reports are due April 30, July 30, October 30 and January 30). | ___ | ___ |

Comments: ______________________________________________

______________________________________________

______________________________________________

______________________________________________

______________________________________________

______________________________________________

## WASTE DISPOSAL REQUIREMENTS FOR MANUFACTURING AND FABRICATING OPERATIONS

**All asbestos-containing waste material must be deposited at a waste disposal site operated in accordance with the provisions of Sec. 61.154.**

1. Describe waste materials: ______________________________
______________________________
______________________________
______________________________

2. Describe waste handling procedures: ______________________________
______________________________
______________________________
______________________________
______________________________
______________________________
______________________________
______________________________

| | | Yes | No |
|---|---|---|---|
| 3. | Has the source chosen to discharge no visible emissions to the outside air during the collection, processing (including incineration), packaging, or transporting of any ACWM generated? | ___ | ___ |
| | **or** | | |
| | Does it use one of the following emission control and waste treatment methods? | ___ | ___ |
| | a. Adequately wet asbestos-containing waste material as follows: | ___ | ___ |
| | i. Mix control device asbestos waste to form a slurry (Sec. 61.150(a)(1)(i)); | | |
| | Adequately wet other asbestos waste material (Sec. 61.150(a)(1)(i)); **and** | | |
| | ii. Discharge no visible emissions to the outside air from collection, mixing, wetting, and/or handling operations (Sec. 61.150(a)(1)(ii)) or use methods of Sec. 61.152; **and** ___ | | |
| | iii. Seal all asbestos-containing waste material in leak-tight containers while wet (Sec. 61.150(a)(1)(iii)); **or** ___ | | |
| | For materials that will not fit into leak-tight containers without additional breakage, put materials into leak-tight wrapping; **and** ___ | | |

Yes No

iv. Label the containers or wrapped materials as follows:

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

**or**

b. Process asbestos-containing waste material into nonfriable forms as follows: ___ ___

i. Form all asbestos-containing waste into nonfriable pellets or other shapes; **and** ___

ii. Discharge no visible emissions to the outside air from collection and processing operations, including incineration **or**; ___

iii. Use the method specified by Sec. 61.152 to clean emissions containing particulate asbestos material before they escape to, or are vented to, the outside air; ___

**or**

c. Use an alternative emission control and waste treatment method that has received prior approval by the Administrator. ___ ___

4. Is ACWM transported off site to a disposal site? ___ ___

If "yes",

a. Are the containers or wrapped ACWM materials labeled with the ___ ___

i. name of the waste generator; **and** ___ ___

ii. location at which the waste was generated? ___ ___

| | | Yes | No |
|---|---|---|---|
| b. | Is waste deposited as soon as practical? (and) | ___ | ___ |
| i. | at an active waste disposal site operated in accordance with the provisions of Sec. 61.154? | ___ | ___ |
| | **or** | | |
| ii. | at an EPA-approved site that converts asbestos-containing waste into non-asbestos (asbestos-free) material in accordance with Sec. 61.155? | ___ | ___ |

## WASTE DISPOSAL FOR ASBESTOS MILLS

**All asbestos-containing waste material must be deposited at a waste disposal site operated in accordance with the provisions of Sec. 61.154.**

1. Describe waste materials: ______________________________________________

______________________________________________

______________________________________________

______________________________________________

______________________________________________

______________________________________________

2. Describe waste handling procedures: ______________________________________________

______________________________________________

______________________________________________

______________________________________________

______________________________________________

______________________________________________

3. Emission control

   a. Which of the following has the facility chosen to do?

      i. Discharge no visible emissions to the outside air from the transfer of control device asbestos waste to the tailings conveyor ___

      ii. Use a fabric filter collection device ___

      iii. Use an Administrator-approved wet collector ___

      iv. Use a HEPA filter certified to be 99.97% efficient for 0.3 micron particles ___

      v. Use other Administrator-approved filtering equipment ___

| | Yes | No |
|---|---|---|
| b. Is the asbestos waste from control devices handled in accordance with Sec. 61.150(a) (See Item 3 on the checklist for WASTE DISPOSAL FOR MANUFACTURING AND FABRICATING OPERATIONS) or 61.149(c)? (See Item 4 of this checklist). | ___ | ___ |

| | | | | Yes | No |
|---|---|---|---|---|---|
| 4. | a. | Has the facility chosen to discharge no visible emissions to the outside air during the collection, processing, packaging, or on-site transporting of any asbestos-containing waste material? | | ___ | ___ |
| | | **or** | | | |
| | b. | Does the facility use a wetting agent as follows? | | | |
| | | i. | Adequately mix all asbestos-containing waste material with a wetting agent to effectively wet dust and tailings before depositing the material at a waste disposal site. | ___ | ___ |
| | | | Is the wetting agent being used as recommended by the manufacturer? | ___ | ___ |
| | | ii. | Discharge no visible emissions to the outside air from the wetting operation; **or** | ___ | ___ |
| | | | Use the methods specified in Sec. 61.152 to clean emissions containing particulate asbestos material before they escape to, or are vented to, the outside air. | ___ | ___ |
| | | | **or** | | |
| | c. | Does the facility use an alternative emission control and waste treatment method that has received prior written approval from the Administrator. | | ___ | ___ |
| 5. | Are wetting operations conducted at the site? | | | ___ | ___ |
| | If "yes", | | | | |
| | Have wetting operations at the waste disposal site ever been suspended due to temperatures < -9.5°C (15°F)? | | | ___ | ___ |
| | If "yes", | | | | |
| | a. | Has the temperature been recorded at least at hourly intervals, and | | ___ | ___ |
| | b. | Have records been kept in a form suitable for inspection for at least two years? | | ___ | ___ |
| 6. | Record any visible emissions observed. ______________________________ | | | | |

______________________________________________________________
______________________________________________________________
______________________________________________________________

## OFF-SITE TRANSPORT REQUIREMENTS FOR DISPOSAL OF ACWM FROM MILLING, MANUFACTURING AND FABRICATING OPERATIONS

| | | Yes | No |
|---|---|---|---|
| 1. | Are vehicles used to transport ACWM marked as follows during the loading and unloading of waste?<br><br>**DANGER**<br>**ASBESTOS DUST HAZARD**<br>**CANCER AND LUNG DISEASE HAZARD**<br>***Authorized Personnel Only*** | ___ | ___ |
| 2. | Are Waste Shipment Records (WSRs) with the following minimum information maintained? | | |
| | a. Name, address, and telephone number of the waste generator. | ___ | ___ |
| | b. Name and address of the local, State, or EPA Regional office responsible for administering the asbestos NESHAP program. | ___ | ___ |
| | c. The approximate quantity in cubic meters (cubic yards). | ___ | ___ |
| | d. The name and telephone number of the disposal site operator. | ___ | ___ |
| | e. The name and physical site location of the disposal site. | ___ | ___ |
| | f. The date transported. | ___ | ___ |
| | g. The name, address and telephone number of the transporter(s). | ___ | ___ |
| | h. A certification that the contents of the consignment are fully and accurately described by proper shipping name and are classified, packed, marked, and labeled and are in all respects in proper condition for transport by highway according to applicable international and government regulations. | ___ | ___ |
| | Comments: ______________________________________________<br>______________________________________________<br>______________________________________________<br>______________________________________________ | | |
| 3. | Is a copy of the WSR provided to the disposal site owner at the time of delivery of the asbestos-containing waste to the disposal site? | ___ | ___ |

| | | Yes | No |
|---|---|---|---|
| 4. | Have signed WSRs been returned by the waste disposal site within 35 days of the date the initial transporter accepted the waste? | ___ | ___ |

If "no",

a. Was the initial transporter and/or the owner/operator of the waste disposal site contacted to determine the status of the waste shipment? ___ ___

b. If a signed copy of the WSR was not received within 45 days of the date the initial transporter accepted the waste, was the agency which administers the asbestos NESHAP program for the waste generator notified in writing?

If "yes", was the following information submitted?

i. A copy of the WSR for which a confirmation of delivery was not received; ___ ___
**and**

ii. A cover letter signed by the waste generator explaining the efforts to locate the asbestos waste shipment and the results of those efforts. ___ ___

5. Are copies of the WSRs signed by the owner or operator of the waste disposal site maintained for at least two years? ___ ___

Comments: ______________________________________________
______________________________________________
______________________________________________
______________________________________________
______________________________________________

## REPORTING REQUIREMENTS FOR MILLING, MANUFACTURING AND FABRICATING FACILITIES

| | | | | Yes | No | NA |
|---|---|---|---|---|---|---|
| 1. | Has the source submitted information to the Administrator as required by Sec. 61.153 (Reporting)? | | | ___ | ___ | |
| | If "yes", examine the source information submitted and indicate whether the following required items are present: | | | | | |
| | a. | A description of the emission control equipment used for each process. | | ___ | ___ | ___ |
| | b. | Fabric filter information: | | ___ | ___ | ___ |
| | | i. | If the fabric device uses a woven fabric, the airflow permeability in $m^3/min/min^2$ ($ft^3/min/ft^2$). | ___ | ___ | ___ |
| | | ii. | If the fabric is synthetic fabric, whether the fill yarn is spun or not spun. | ___ | ___ | ___ |
| | | iii. | If the fabric filter uses a felted fabric: | ___ | ___ | ___ |
| | | | the density in $g/m^2$ ($oz/yd^2$), | ___ | ___ | |
| | | | the minimum thickness in mm (inches), and | ___ | ___ | |
| | | | the airflow permeability in $m^3/min/m^2$ ($ft^3/min/ft^2$). | ___ | ___ | |
| | c. | A copy of the certified efficiency of the HEPA filter used. | | ___ | ___ | ___ |
| | d. | A brief description of each process that generates asbestos-containing waste material. | | ___ | ___ | |
| | e. | The average volume of asbestos-containing waste material disposed of, measured in $m^3/day$ ($yd^3/day$). | | ___ | ___ | |
| | f. | The emission control methods used in all stages of waste disposal. | | ___ | ___ | |
| | g. | The type of disposal site or incineration site for ultimate disposal. | | ___ | ___ | |

h. Disposal site or incineration site information:

i. Name of operator________________________________________
ii. Name of disposal site______________________________________________
iii. Location______________________________________________

| | | Yes | No |
|---|---|---|---|
| 2. | Is this facility a new source (i.e., construction commenced before 01/10/89)? | ___ | ___ |
| | If "yes", | | |
| a. | Did the source have an initial startup date before November 20, 1990? | ___ | ___ |
| | If "yes", did the source provide source information in Item 1 to the Administrator by February 18, 1991? | ___ | ___ |
| | If "no", | | |
| i. | What was the startup date? _________ | | |
| ii. | Was the information submitted within 90 days? | ___ | ___ |
| 3. | Is the facility an existing source? | ___ | ___ |
| a. | Has the source previously supplied this information to the Administrator? | ___ | ___ |
| | If "no", was the information submitted by February 18, 1991? | ___ | ___ |
| 4. | New/existing sources: | | |
| a. | Have there been any changes in the information submitted? | ___ | ___ |
| | If "yes", has the Administrator been informed in writing within 30 days of these changes? | ___ | ___ |
| b. | For new/existing sources with an initial startup date before November 20, 1990, has the following information been submitted to the Administrator by February 18, 1991? | ___ | ___ |
| i. | Name and address of the owner or operator. | ___ | ___ |
| ii. | The location of the source. | ___ | ___ |
| iii. | The type of hazardous pollutants emitted by the source. | ___ | ___ |

| | | Yes | No |
|---|---|---|---|
| iv. | A brief description of the nature, size, design and operation of the source (include operating design capacity and identify each point of emission for each hazardous pollutant). | ___ | ___ |
| v. | The average weight per month of the hazardous pollutant. | ___ | ___ |
| vi. | A description of the existing control equipment. | ___ | ___ |
| vii. | A statement by the owner or operator as to whether the source can comply with the standards within 90 days of the effective date of the regulation. | ___ | ___ |

## V. POST INSPECTION INTERVIEW:

Summary of facility inspection:

Summary of recommendations/discussion with owner/operator:

Additional comments:

**Inspector signature** **Date**

ASBESTOS WASTE DISPOSAL SITE
INSPECTION CHECKLIST

Site Name: ______________________________

Site Address: ______________________________

Landfill Identification Number (Agency Assigned): ______________________________

Inspector(s): ______________________________

Date of Inspection: ______________ Time of Inspection: ______________

Weather Conditions: ______________________________

## I. PRELIMINARY INTERVIEW

1. Owner Name: ______________________________

2. Site Contact: ______________________________

   a. Title: ______________________________

   b. Affiliation: ______________________________

   c. Mailing Address: ______________________________

   d. Telephone Number: ______________________________

| | YES | NO | NA |
|---|---|---|---|
| 3. Is the landfill approved by the State? | — | — | — |

If yes, Operating Permit No.: ______________

Effective date: ____________ through ____________

## II. RECORDS INSPECTION

| | YES | NO | NA |
|---|---|---|---|
| 1. Are waste shipment records maintained? [§61.154(e)(1)] | — | — | |

Where are WSRs filed? ______________________________

| | YES | NO | NA |
|---|---|---|---|
| Do these records contain the following information? | | | |
| a. Waste generator's information [§61.154(e)(1)(i)]: | | | |
| 1) name | ___ | ___ | |
| 2) address | ___ | ___ | |
| 3) telephone number | ___ | ___ | |
| b. Transporter's information [§61.154(e)(1)(ii)]: | | | |
| 1) name | ___ | ___ | |
| 2) address | ___ | ___ | |
| 3) telephone number | ___ | ___ | |
| 4) signature | ___ | ___ | |
| c. Quantity of ACWM (cubic yards or meters) [§61.154(e)(1)(iii)] | ___ | ___ | |
| d. Presence of improperly enclosed or uncovered waste, or any ACWM not sealed in leak-tight containers [§61.154(e)(1)(iv)]: | ___ | ___ | ___ |
| Has the landfill operator reported to the EPA, in writing, by the following day, the presence of a significant amount of improperly enclosed or uncovered waste? (Record or photocopy WSRs indicating improperly enclosed or uncovered waste.) | ___ | ___ | |
| e. Date of receipt [§61.154(e)(1)(v)] | ___ | ___ | |

f. Comments:________________________________

____________________________________________

____________________________________________

| | YES | NO | NA |
|---|---|---|---|
| 2. Have signed copies of waste shipment records been sent to the waste generator as soon as possible, but no longer than 30 days after receipt of the waste? [§61.154(e)(2)] | ___ | ___ | |

Comments:________________________________

____________________________________________

____________________________________________

| | YES | NO | NA |
|---|---|---|---|
| 3. Has the landfill operator attempted to reconcile differences between the quantity of waste designated on the waste shipment record and the quantity actually received? [§61.154(e)(3)] | ___ | ___ | ___ |

Explain: ______________________________________

______________________________________

______________________________________

______________________________________

| | | | |
|---|---|---|---|
| If the discrepancy is not resolved within 15 days after receiving the waste, has a report been filed immediately with the government agency responsible for administering the asbestos NESHAP program for the *waste generator* | ___ | ___ | |
| *and* | | | |
| if different, the government agency responsible for administering the asbestos NESHAP program for the *disposal site?* | ___ | ___ | |
| 4. Are copies of all required records and reports retained for 2 years? [§61.154(e)(4)] | ___ | ___ | |
| 5. Is a map or diagram of the disposal area being maintained? [§61.154(f)] | ___ | ___ | |
| Does the map or diagram contain the following ACWM information? | | | |
| location | ___ | ___ | |
| depth | ___ | ___ | |
| area | ___ | ___ | |
| quantity (cubic yards or meters) | ___ | ___ | |
| 6. Upon closure, has the disposal site operator informed EPA as to the location and amount of waste? [§61.154(g)] | ___ | ___ | ___ |
| 7. Upon closure, has a notification concerning the presence of asbestos waste been placed on the deed to the property? [§61.154(a)] | ___ | ___ | ___ |

| | | YES | NO | NA |
|---|---|---|---|---|
| 8. | Are records available for inspection? [§61.154(i)] | ___ | ___ | |
| 9. | Has the Administrator been notified in writing at least 45 days prior to excavating or otherwise disturbing any ACWM already deposited and covered? [§61.154(j)] | ___ | ___ | ___ |
| | Does the notice include: | | | |
| | scheduled starting or completion dates? | ___ | ___ | |
| | reason for distributing the waste? | ___ | ___ | |
| | emission control procedures? | ___ | ___ | |
| | location of temporary/final disposal site? | ___ | ___ | |
| | Has notice of a new start date been provided to the Administrator at least 10 working days before excavation begins? (Note: The new start date cannot be earlier than the original date.) | ___ | ___ | ___ |
| 10. | Has a stationary source report been filed with the Administrator or government agency responsible for administering the asbestos NESHAP program? [§§61.153.(a), 61.10] | ___ | ___ | |
| | Does the report include: | | | |
| | brief description of site? | ___ | ___ | |
| | methods used to comply with the asbestos NESHAP? | ___ | ___ | |
| | name/address of owner/operator? | ___ | ___ | |
| | location of source? | ___ | ___ | |
| | type of hazardous pollutant emitted? | ___ | ___ | |
| | description of nature, size, design of stationary source? | ___ | ___ | |
| | average weight/month processed over preceding 12 months? | ___ | ___ | |

| | YES | NO | NA |
|---|---|---|---|

## III. SITE OPERATION

Determine the following at the disposal site. Collect samples and take photographs as necessary to document noncompliance with the provisions of the asbestos NESHAP.

1. Is the disposal site operated in compliance with one of the following site requirements? (§61.154) ___ ___

   a. No visible emissions [§61.154(a)] and ___ ___
   warning signs and fencing, or natural barrier [§61.154(b)] ___ ___

   b. 6-inch cover within 24 hours [§61.154(c)(1)] ___ ___

   c. Dust suppressant within 24 hours [§61.154(c)(2)] and ___ ___
   warning signs and fencing, or natural barrier [§61.154(b)] ___ ___

   d. Administrator approved alternative method [§61.154(d)] ___ ___

   If yes, explain: ______________________________
   ______________________________
   ______________________________

Comments: ______________________________
______________________________
______________________________

2. If necessary draw a diagram of the waste disposal site to illustrate possible violations.

Note compass directions, site entrance and boundaries, roadways, direction of prevailing wind, land use surrounding site, sample and photograph locations, etc.

Comments: ______________________________________________

______________________________________________

______________________________________________

| | YES | NO | NA |
|---|---|---|---|
| 3. Is there any ACWM visible at the site? | — | — | |
| a. Was it deposited within the past 24 hours? [§61.154(c)(2)] | — | — | |

| | | YES | NO | NA |
|---|---|---|---|---|
| b. | Is it sealed in leak-tight containers or wrapping? [§61.150(a)(1)] | _ | _ | |
| | If no, is the ACWM exempt from packaging requirements for one of the following reasons? | _ | _ | |

ordered demolition _
discovered after demolition began _
encased in concrete _
Category I nonfriable (not in poor condition, not friable) _
Category II nonfriable which is not RACM _

| | | YES | NO | NA |
|---|---|---|---|---|
| 4. | Are vehicles seen unloading ACWM? | _ | _ | |
| | If yes, are they marked with the following information? | | | |
| | easy to read legend | _ | _ | |
| | 20" x 14" upright format sign | _ | _ | |
| | asbestos hazard warning | _ | _ | |
| | Does the transporter possess a properly completed waste manifest? | _ | _ | |

If not, determine as many of the following as possible:

transporter company name ______________________________

address ______________________________

telephone no. ______________________________

generator's name ______________________________

address ______________________________

telephone no. ______________________________

location where ACWM is being collected ______________________________

______________________________

## IV. POST INSPECTION INTERVIEW

Summary of Recommendations/Discussions with Site Operator.

______________________________________________

______________________________________________

______________________________________________

______________________________________________

## V. ADDITIONAL COMMENTS

______________________________________________

______________________________________________

______________________________________________

______________________________________________

______________________________________________

Inspector's signature: ______________________ Date: __________

## SAMPLE COLLECTION LOG

**Site Code:** ______________ **Date:** _____________ *Sampler(s)*___________________________

___________________________

| Sample Number | Sample Location | Sample Description | Comments |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
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A92-1495.scl

# PHOTO IDENTIFICATION LOG SHEET

**Site Code:** ______________________ **Date:** ________________

**Inspector/Photographer:** ______________________________________

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# AHERA COMPLIANCE CHECKLIST

## A. LOCAL EDUCATION AGENCY

1. Name: ______________________________

2. Address: ______________________________

______________________________

## B. SCHOOL

1. Name: ______________________________

2. Address: ______________________________

______________________________

## C. DESIGNATED PERSON

1. Name: ______________________________

2. Telephone number: ______________

3. Description of training acquired: ______________________________

______________________________

______________________________

## D. ABATEMENT PROJECT

1. Dimensions of functional space: _____ x _____ x _____.

2. Project description: ______________________________

______________________________

______________________________

## E. PROJECT SUPERVISOR

1. Accredited? Yes __ No __

   a. Accreditation number: ______________________________

   b. Date of accreditation: ______________________________

c. Original certification on site? Yes ___ No ___

d. Refresher certification on site? Yes ___ No ___

2. Was supervisor on site? Yes ___ No ___

## F. PROJECT WORKERS

| Names | State of Accred. | Accred. Number | Date of Accred. | Original Certificate On Site? Yes | Original Certificate On Site? No | Refresher Certificate On Site? Yes | Refresher Certificate On Site? No |
|---|---|---|---|---|---|---|---|
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## G. INITIAL CLEANING

1. Date: ___________________

2. Person(s) who performed initial cleaning: ___________________

3. Locations cleaned: ___________________

4. Cleaning methods used: ___________________

## H. VISUAL INSPECTION BEFORE FINAL CLEARANCE

1. Who will inspect the functional space? ___________________

2. Employer:

a. name: ______________________________

b. address: ______________________________

c. telephone number: ______________________________

**I. AIR CLEARANCE**

1. Was air clearance in progress? Yes __ No __

**If "Yes",**

a. Was the functional space dry? Yes __ No __

b. Were critical barriers in place? Yes __ No __

c. Was the local exhaust ventilation system operating during the sampling period? Yes __ No __

d. Was a 1 H.P. leaf blower used to dislodge fibers from horizontal surfaces? Yes __ No __

e. Were fans in operation during the sampling period? Yes __ No __

**If "Yes",**

1) How many fans were used in each functional space? ________

2) What was the orientation of the fans? ______________________________

______________________________

2. If air clearance was not in progress,

a. Who will conduct the air clearance? ______________________________

b. Employer:

1) name: ______________________________

2) address: ______________________________

3) telephone number: ______________________________

c. When will air clearance begin? ______________

d. When will air clearance end? ______________

**J. AIR SAMPLE ANALYSIS**

1. Analytical Laboratory

   a. Name: ______________________________

   b. Address: ______________________________

   c. Telephone: ______________________________

2. Analytical Method: TEM _____ PCM _____

   If TEM, did the air sampling technician have a sealed blank on site?

   Yes ___ No ___

3. Sampling Procedures

   a. How many samples were collected outside the functional space? ________

   b. How many field blanks were taken? ________

   c. Were sampling pumps randomly located throughout the functional space to be representative of the area? Yes ___ No ___

   d. Where were the outside samples collected? ______________________

   ______________________________________________

**K. MANAGEMENT PLAN**

1. Was the management plan available to review? Yes ____ No ____

2. Location of plan: LEA _____ School _____

Inspector's signature: ______________________ Date: ______________

# WORKER PROTECTION RULE CHECKLIST

Date of Inspection: ______________________________

Inspection Site: ______________________________

1. Is asbestos abatement work being done? (Abatement means activity involving the removal, enclosure or encapsulation of friable asbestos material.)

   Yes _____ No _____

2. Is abatement work performed by State and local public employees not covered by the OSHA asbestos standard?

   Yes _____ No _____

3. Does the work involve more than 3 linear feet or 3 square feet?

   Yes _____ No _____

4. Has the employer notified the EPA Regional Asbestos Coordinator (or other delegated agency) that an abatement project subject to the provisions of the WPR will be performed by public employees?

   Yes _____ No _____

   **If yes,**

   a. When was notification submitted? ______________________

   b. When did the abatement project begin? ______________________

Notes: ______________________________

______________________________

______________________________

______________________________

______________________________

______________________________

______________________________ Inspector's Signature

______________________________ Date



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## GLOSSARY

A new "asbestos abatement" industry has developed over the past two decades in response to the EPA and OSHA regulations concerning demolition and renovation of buildings containing asbestos. With this industry come many unique or unusual terms and acronyms, some derived from the field of medicine, others from equipment names, etc. For convenience, this glossary has been divided into "acronyms", "governmental agencies", "legislation", and "general terms" sections.

### ACRONYMS

| | |
|---|---|
| *ABPO* | Asbestos Ban and Phaseout Rule |
| *ACGIH* | American Conference of Governmental Industrial Hygienists |
| *ACM* | Asbestos-Containing Material |
| *ACWM* | Asbestos-Containing Waste Material |
| *AHERA* | Asbestos Hazard Emergency Response Act |
| *AIA* | Asbestos Information Act |
| *AIS Rule* | Asbestos in Schools Rule |
| *ANSI* | American National Standards Institute |
| *ASHAA* | Asbestos School Hazard Abatement Act |
| *ASHARA* | Asbestos School Hazard Reauthorization Act |
| *ASTM* | American Society for Testing Mate... |
| *CAA* | Clean Air Act |
| *CERCLA* | Comprehensive Environmental Response, Compensation and Liability Act |
| *COC* | Chain of Custody |
| *DHHS* | Department of Health and Human Services. |
| *DOL* | Department of Labor. |

| | |
|---|---|
| *DOT* | Department of Transportation. |
| *EPA* | Environmental Protection Agency |
| *F/CC* | Fibers/Cubic Centimeter |
| *$FEV_1$* | Forced Expiratory Volume in 1 second |
| *FVC* | Forced Vital Capacity |
| *HEPA* | High Efficiency Particulate Air |
| *HVAC* | Heating, Ventilation, and Air Conditioning |
| *LEV* | Local Exhaust Ventilation |
| *MAP* | Model Accreditation Plan |
| *NARS* | National Asbestos Registry System |
| *NESHAP* | National Emission Standards for Hazardous Air Pollutants |
| *NIOSH* | National Institute for Occupational Safety and Health |
| *NIST* | National Institute for Standards and Technology |
| *NVLAP* | National Voluntary Laboratory Accreditation Program |
| *OPTS* | Office of Pesticides and Toxic Substances |
| *OSHA* | Occupational Safety and Health Administration |
| *PAPR* | Powered Air Purifying Respirator |
| *PCM* | Phase Contrast Microscopy |
| *PEL* | Permissible Exposure Limit |
| *PF* | Protection Factor |
| *PFT* | Pulmonary Function Test |
| *PLM* | Polarized Light Microscopy |

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| | |
|---|---|
| *PPE* | Personal Protective Equipment |
| *PVC* | Polyvinyl Chloride |
| *QC* | Quality Control |
| *RACM* | Regulated Asbestos-Containing Material |
| *RCRA* | Resource Conservation and Recovery Act |
| *RQ* | Reportable Quantity |
| *SARA* | Superfund Amendments and Reauthorization Act |
| *SCBA* | Self Contained Breathing Apparatus |
| *SDWA* | Safe Drinking Water Act |
| *SEM* | Scanning Electron Microscopy |
| *SHEMD* | Safety, Health and Environmental Management Division |
| *SOPs* | Standard Operating Procedures |
| *SSCD* | Stationary Source Compliance Division |
| *TEM* | Transmission Electron Microscopy |
| *TLV* | Threshold Limit Value |
| *TSCA* | Toxic Substances Control Act |
| *TWA* | Time-Weighted Average |
| *VE* | Visible Emissions |
| *WPR* | Worker Protection Rule |
| *WSR* | Waste Shipment Record |

## GOVERNMENTAL AGENCIES

*Environmental Protection Agency (EPA)* - The organization within the Federal government which is ultimately responsible for enforcing the asbestos NESHAP in order to protect people who work or live near potential asbestos release areas such as buildings undergoing demolition or renovation.

*National Institute of Occupational Safety and Health (NIOSH)* - Tests respirators and acts as the research arm for OSHA.

*Occupational Safety and Health Administration (OSHA)* - Protects worker health.

*Office of Pesticides and Toxic Substances (OPTS)* - The group within EPA which is responsible for implementing and carrying out programs to enforce the TSCA regulations.

*Safety, Health and Environmental Management Division (SHEMD)* - The group within EPA that is responsible for developing health and safety guidance specific to EPA employees.

*Stationary Source Compliance Division (SSCD)* - The group within EPA that is responsible for implementing and carrying out a program to assure that the regulated community complies with the asbestos NESHAP.

## LEGISLATION

*Asbestos Ban and Phaseout Rule (ABPO)* - Prohibited at staged intervals the future manufacture, importation, processing, and distribution of almost all asbestos-containing products; partially overturned by U.S. Court of Appeals; currently bans new uses of asbestos and products (>7/12/89). 40 CFR Part 763 Subpart I. 1989.

*Asbestos-Containing Materials (ACM) in Schools Rule* - Created in response to AHERA mandate. Often referred to as "AHERA". Requires schools to inspect for asbestos, implement response actions, submit asbestos management plans to states, and re-inspect every three years. Specifies use of accredited inspectors, air sampling methods, and waste disposal procedures. 40 CFR 763, Subpart E. 1987.

*Asbestos Hazard Emergency Response Act (AHERA)* - Required EPA and the states to address the potential problems of asbestos-containing materials in schools. 15 U.S.C. 2641. 1986.

*Asbestos Information Act (AIA)* - Required former and current manufacturers and processors of certain asbestos products to submit information identifying their products to EPA. (1988) Public Law 100-577.

*Asbestos in Schools (AIS) Rule* - Required public and private schools to inspect for friable suspect ACM and provide notification to parents and building occupants. (1979) 40 CFR Part 763 Subpart F.

*Asbestos NESHAP* - Asbestos National Emission Standards for Hazardous Air Pollutants. The specific portion of Section 112 of the CAA that addresses asbestos. (1984) 40 CFR Part 61, Subpart M.

*Asbestos School Hazard Abatement Act (ASHAA)* - Provides funding for schools having justifiable need for asbestos abatement. (1984) Public Law 101-637.

*Asbestos School Hazard Reauthorization Act (ASHARA)* - Reauthorized funding for schools in need and mandated revisions to EPA's MAP developed under AHERA. (1990) Public Law 101-637.

*Clean Air Act (CAA)* - Legislation that provides EPA with authority to regulate sources of air pollution. (1970) 42 U.S.C. §7401 et seq.

*Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)* - Addresses problems associated with actual or potential release of hazardous substances into the environment. (1980) 42 U.S.C. 9601 et seq.

*Model Accreditation Plan (MAP)* - Established training requirements for asbestos inspectors, management planners, project designers, contractors/supervisors, and abatement workers in schools; mandated by AHERA. (1987) 40 CFR Part 763 Subpart E Appendix C. (Revision: Asbestos Model Accreditation Plan; Interim Final Rule published in 59 FR 5236, February 3, 1994).

*National Emission Standards for Hazardous Air Pollutants (NESHAP)* - Current NESHAP regulations address stationary sources of arsenic, asbestos, benzene, beryllium, coke oven emissions, mercury, radionuclides, and vinyl chloride.

*Resource Conservation and Recovery Act (RCRA)* - Regulates management of hazardous waste ("cradle to grave"). (1976) 42 U.S.C. 6901 et seq.

*Safe Drinking Water Act (SDWA)* - Established a program to require compliance with national drinking water standards for contaminants, focused on removal of contaminants from water supplies, and established programs intended to protect underground sources of drinking water. (1974) 42 U.S.C. 300.

*Superfund Amendments and Reauthorization Act (SARA)* - Clarified the authority of CERCLA. Public Law 99-499. 1974.

*Toxic Substances Control Act (TSCA)* - Permits EPA to identify and evaluate potential hazards from chemical substances and regulate the production, use, distribution and disposal of hazardous chemical substances. 15 U.S.C. 2601, et seq. 1976.

*Worker Protection Rule (WPR)* - TSCA regulation which protects public employees performing asbestos abatement work in states not covered by asbestos standards. 40 CFR 763, Subpart G. 1987.

## GENERAL TERMS

*Action level* - An airborne concentration of asbestos of 0.1 f/cc of air calculated as an 8-hour, time-weighted average. Attaining the action level triggers exposure monitoring, medical surveillance, and employee information and training requirements.

*Adequately wet* - To sufficiently mix or penetrate with liquid to prevent the release of particulates. If visible emissions are observed coming from asbestos-containing material, then that material has not been adequately wetted. However, the absence of visible emissions is not sufficient evidence of being adequately wet.

*Aggressive air sampling* - Air sampling which takes place after final cleanup while the air is being physically agitated with leaf blowers and fans to produce a "worst case" situation.

*Air cell insulation* - A type of insulation that looks like corrugated paper and is usually light to medium gray in color.

*Air lock* - A system of enclosures consisting of two polyethylene curtained doorways at least 3 feet apart that should permit air movement from clean to contaminated areas. Air locks are usually part of a decontamination chamber attached to an abatement area which is under reduced pressure.

*Air monitoring* - The process of measuring the airborne fiber concentration in a specific quantity of air over a given amount of time.

*Alveolar macrophages* - Highly specialized mobile cells in the lungs that attempt to engulf and digest such lung intruders as dusts or fibers.

*Alveoli* - Microscopic sacs in the lungs where the exchange of oxygen and carbon dioxide occurs.

*Amended water* - Water to which a chemical wetting agent (surfactant) has been added to improve penetration of the water into asbestos-containing materials that are being removed.

*Amphibole asbestos* - Hydrated silicate forms of asbestos; includes crocidolite, anthophyllite, amosite, actinolite and tremolite.

*Area air monitoring* - Air sampling conducted in an area representative of the overall area under investigation; used for hazard assessment, ambient and background surveys, and monitoring during and after abatement actions.

*Asbestiform* - Fibrous minerals which, due to their crystalline structures and chemical composition, can be classified as a form of asbestos.

*Asbestos* - The asbestiform varieties of serpentinite (chrysotile), riebeckite (crocidolite), cummingtonite-grunerite, anthophyllite, and actinolite-tremolite.

*Asbestos abatement* - Procedures used to control fiber release from asbestos- containing materials in buildings; includes removal, encapsulation, enclosure or repair of ACM.

*Asbestos-containing waste materials (ACWM)* - Mill tailings or any waste that contains commercial asbestos and is generated by a source subject to the provisions of this subpart. This term includes filters from control devices, friable asbestos waste material, and bags or other similar packaging contaminated with commercial asbestos. As applied to demolition and renovation operations, this term also includes regulated asbestos-containing material waste and materials contaminated with asbestos including disposable equipment and clothing.

*Asbestos fibers* - Fibers with a length greater than 5 microns and a minimal length to width ratio of 3:1 generated from an asbestos-containing material.

*Asbestosis* - A non-malignant, progressive, irreversible lung disease caused by the inhalation of asbestos dust and characterized by diffuse fibrosis and rales.

*Atmosphere-supplying respirator* - Respiratory protection devices which exclude workplace air altogether and provide clean air from some independent source. (i.e., SCBA and Type C SAR).

*Background air monitoring* - Air sampling done to determine existing levels of airborne asbestos prior onset of abatement activities.

*Cancer* - A cellular tumor which normally leads to premature death of its host unless controlled.

*Category I nonfriable ACM* - Asbestos-containing packings, gaskets, resilient floor covering (and mastic), and asphalt roofing products containing more than 1 percent asbestos as determined using the method specified in Appendix A, Subpart F, 40 CFR Part 763, Section 1, Polarized Light Microscopy.

*Category II nonfriable ACM* - Any material, excluding Category I nonfriable ACM, containing more than 1 percent asbestos as determined using the methods specified in Appendix A, Subpart F, 40 CFR Part 763, Section 1, Polarized Light Microscopy that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.

*Chain of custody (COC) form* - Documentation used to track samples from the point of collection through receipt by the analytical laboratory (and, potentially, back to the inspector).

*Chrysotile (white asbestos)* - The only asbestiform mineral of the serpentine variety; fibrils resemble a cylindrical scroll or tube; fiber length determined by crystallization conditions; most common form of asbestos used in buildings.

*Cilia* - Tiny, hair-like, mucus-coated structures in the windpipe and bronchi of the lung passages that help force undesirable particles up and out of the lungs.

*Clean room/area* - The first stage or room of the decontamination enclosure system in which workers prepare to enter the work area.

*Clearance air monitoring* - Air sampling done at a project's completion to determine if airborne levels of asbestos are at an acceptable level; done before critical barriers are removed.

*Commercial asbestos* - Any material containing asbestos that is extracted from ore and has value because of its asbestos content.

*Competent person* - One who is capable of identifying existing asbestos hazards in the workplace, and who has the authority to take prompt corrective measures to eliminate them. The competent person has specific duties as outlined in 1926.32(f).

*Continuous flow airline respirator* - A respirator that maintains a constant airflow to the wearer.

*Critical barrier* - Plastic, foam, duct tape, plywood, sheetrock, etc. used to seal penetrations into the worksite to help prevent the release of asbestos fibers into the environment.

*Cutting* - To penetrate with a sharp edge instrument. This includes sawing, but does not include shearing, slicing, or punching.

*Decontamination enclosure system* - A series of connected chambers (separated by polyethylene-curtained doorways) which prevent contamination of areas adjacent to the work area. Usually comprised of a clean room, shower and equipment (dirty) room.

*Demolition* - The wrecking or taking out of any load-supporting structural member of a facility together with any related handling operations or the intentional burning of any facility.

*Emergency renovation operation* - A renovation operation that was not planned, but results from a sudden, unexpected event that, if not immediately attended to, presents a safety or public health hazard, is necessary to protect equipment from damage, or is necessary to avoid imposing an unreasonable financial burden. This term includes operations necessitated by nonroutine failures of equipment.

*Encapsulation* - Treatment of ACM with a material that surrounds or embeds the ACM in an adhesive matrix. "Penetrating" encapsulants soak into ACM and bind together all fibers. "Bridging" encapsulants coat the ACM to prevent fiber release.

*Enclosure* - Permanent barrier which prevents the migration of fibers from ACM.

*Equipment/dirty room* - The last stage or room of the decontamination system before entering the work area.

*Facility* - Any institutional, commercial, public, industrial, or residential structure, installation, or building (including any structure, installation, or building containing condominiums or individual dwelling units operated as a residential cooperative, but excluding residential buildings having four or fewer dwelling units); any ship; and any active or inactive waste disposal site. For purposes of this definition, any building structure, or installation that contains a loft used as a dwelling is not considered a residential structure, installation, or building. Any structure, installation, or building that was previously subject to this subpart is not excluded, regardless of its current use or function.

*Facility component* - Any part of a facility including equipment.

*Fibrosis* - A lung condition marked by the presence of scar tissue caused by the inhalation of excessive amounts of fibrous dust.

*Fit factor* - The ratio of challenge agent concentration outside and inside the respirator facepiece determined during quantitative fit testing; specific to the individual and model of respirator worn.

*Forced expiratory volume - 1 second ($FEV_1$)* - The maximum volume of air that can be forced from an individual's fully inflated lungs in 1 second.

*Forced vital capacity (FVC)* - The part of a pulmonary function test which measures the quantity of air that can be forcibly exhaled from a person's lungs after full inhalation.

*Friable asbestos material* - Any material containing more than 1 percent asbestos as determined using the method specified in Appendix A, Subpart F, 40 CFR Part 763 Section 1, Polarized Light Microscopy, that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure. If the asbestos content is less than 10 percent as determined by a method other than point counting by polarized light microscopy (PLM), verify the asbestos content by point counting using PLM.

*Full-face respirator* - A respirator which covers the wearer's entire face from across the forehead, around the temples, along the cheek bones to below the chin.

*Glove bag* - A sealed compartment with attached inner gloves used for the handling of asbestos-containing materials. Properly installed and used, glove bags provide a small work area enclosure typically used for small-scale asbestos stripping operations. Information on glove bag installation, equipment and supplies, and work practices is contained in OSHA's final rule on occupational exposure to asbestos (Appendix G to 29 CFR Part 1926.58).

*Grinding* - To reduce to powder or small fragments. This includes mechanical chipping or drilling.

*Half-mask respirator* - A respirator which covers one-half of the wearer's face from the bridge of the nose across the cheeks to below the chin.

*Heat cramps* - A form of heat stress resulting in painful spasms of heavily-used skeletal muscles such as hands, arms, legs, and abdomen, sometimes accompanied by dilated pupils and weak pulse resulting from depletion of the salt content of the body.

*Heat exhaustion* - A form of heat stress resulting from dehydration and/or salt depletion characterized by cold, clammy skin, profound weakness, and a pale appearance. Other symptoms include nausea, headache, giddiness, vomiting, muscle cramps, and diarrhea.

*Heat stroke* - The most severe form of heat stress disorder resulting from the loss of the body's ability to sweat; characterized by hot dry skin, dizziness, nausea, severe headache, confusion, delirium, loss of consciousness, convulsion, and possibly coma and death.

*HEPA vacuum* - A vacuum system equipped with a HEPA filter.

*High efficiency particulate air (HEPA)* - Filter rated capable of trapping and retaining 99.97% of all particles larger than 0.3 microns.

*Homogeneous* - Evenly mixed and similar in appearance and texture throughout.

*Inactive waste disposal site* - Any disposal site or portion of it where additional asbestos-containing waste material has not been deposited within the past year.

*In poor condition* - Means that the binding of the material is losing its integrity as indicated by peeling, cracking, or crumbling of the material.

*Installation* - Any building or structure or any group of buildings or structures at a single demolition or renovation site that are under the control of the same owner or operator (or owner or operator under common control).

*Kleenguard®* - A triple-layer nonwoven polypropylene fabric which is durable, chemically inert, lightweight, and breathable. Kleenguard is relatively inexpensive and often used for disposable garments.

*Leak-tight* - Means that solids or liquids cannot escape or spill out. It also means dust-tight.

*Local exhaust ventilation (LEV) unit* - Machine designed to mechanically remove air contaminants from a point of operation.

*Lung cancer* - An uncontrolled growth of abnormal cells in the lungs which normally results in the death of the host.

*Medical history* - A record of a person's past health record, including all of the hazardous materials that they have been exposed to and any injuries or illnesses which might affect/dictate their future health status.

*Mesothelioma* - A relatively rare, incurable form of cancer of the membrane which lines body cavities and covers body organs.

*Micron* - One-millionth of a meter.

*"Mil"* - Prefix meaning one-thousandth; commonly used to describe thickness of polyethylene sheeting (6 mil poly = 0.006" thick.)

*National Asbestos Registry System (NARS)* - A national electronic database system used to track notifications, inspections, and enforcement responses.

*Natural barrier* - A natural object that effectively precludes or deters access. Includes physical obstacles such as cliffs, lakes or other large bodies of water, deep and wide ravines and mountains. Remoteness by itself is not a natural barrier.

*Nomex®* - A woven fabric of polyamide fibers which is very durable, chemical-, acid-, and flame-resistant. Nomex will not continue to burn once the source of flame is removed.

*Nonfriable asbestos-containing material* - Any material containing more than one percent asbestos as determined using the method specified in Appendix A, Subpart F, 40 CFR Part 763, Section 1, Polarized Light Microscopy that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.

*Nonscheduled renovation operation* - A renovation operation necessitated by the routine failure of equipment, which is expected to occur within a given period based on past operating experience, but for which an exact date cannot be predicted.

*Outside air* - The air outside buildings and structures, including, but not limited to, the air under a bridge or in an open-air ferry dock.

*Owner or operator of a demolition or renovation activity* - Any person who owns, leases, operates, controls or supervises the facility being demolished or renovated or any person who owns, leases, operates, controls, or supervises the demolition or renovation operation, or both.

*Peritoneum* - The thin membrane that lines the surface of the abdominal cavity.

*Permissible exposure limit (PEL)* - Amount of an airborne contaminant thought to have no deleterious effect when encountered for an entire work day; the PEL for asbestos is 0.2 f/cc.

*Personal air monitoring* - Air sampling conducted in the "breathing zone" of a worker during his/her normal work schedule; used to determine personal exposure to airborne asbestos.

*Personal protective equipment (PPE)* - Any material or device worn to protect a worker from exposure to, or contact with, any harmful material or force. May include a respirator, coveralls, hard hat, steel toed shoes, safety glasses, etc.

*Phase contrast microscopy (PCM)* - An optical microscopic technique used for counting fibers in air samples, but which does not distinguish asbestos fibers.

*Pipe lagging* - The insulation or wrapping around sections of pipes.

*Planned renovation operation* - A renovation operation, or a number of such operations, in which some RACM will be removed or stripped within a given period of time and that can be predicted. Individual nonscheduled operations are included if a number of such operations can be predicted to occur during a given period of time based on operating experience.

*Pleura* - The thin membrane surrounding the lungs which also lines the internal surface of the chest cavity.

*Pleural plaque* - Diffuse area of scar tissue that may form on the mesothelium of the chest cavity or (rarely) on the pericardium; indicative of asbestos exposure.

*Point counting* - A technique used to determine the relative projected areas occupied by separate components in a microscope slide preparation of a sample. For asbestos analysis this technique is used to determine the relative concentrations of asbestos minerals to nonasbestos sample components.

*Polarized light microscopy (PLM)* - An optical microscopic technique used to distinguish between different types of fibers based on their shapes and unique optical properties; commonly used to determine the presence of asbestos in bulk samples of suspected asbestos- containing materials.

*Polyethylene (poly)* - Plastic sheeting often used to seal off an area in which asbestos removal is taking place; used to prevent contamination of other areas.

*Polyvinyl chloride (PVC)* - A commonly used material which is resistant to acids but will allow permeation and retention of traces of contamination.

*Pre-molded insulation* - Insulation used on pipes that is formed in half circles. It is usually held in place by steel bands and/or canvas wrap.

*Pressure-demand airline respirator* - A respiratory protection device which has a regulator and valve designed to maintain positive pressure in the facepiece at all times.

*Protection factor (PF)* - Amount of protection provided by a respirator; determined by dividing the airborne fiber concentration outside of the mask by the concentration inside the mask. Protection factors have been assigned to classes of respirators (i.e., half-face, full-face, etc.).

*Protective clothing* - Protective, lightweight garments worn by workers performing asbestos abatement to keep gross contamination off the body.

*Pulmonary function test* - A part of the medical examination required to determine the health of a person's lungs.

*Qualitative fit test* - A method of testing a respirator's face-to-facepiece seal using a challenge material of irritant smoke, banana oil or saccharin. Successful qualitative fit tests confer a minimum protection factor of 10 according to OSHA regulation 29 CFR Part 1910.134 Appendix C.

*Quality control (QC) samples* - Bulk samples used to determine both sampling and analytical precision.

*Quantitative fit test* - A method of testing a respirator's face-to-facepiece seal which involves measuring the relative amounts of a challenge substance both inside and outside the mask. Quantitative fit testing results in the establishment of a numerical fit factor.

*Rales* - A dry crackling sound heard posteriorly in the bases of the lungs; common symptom of asbestosis.

*Reduced pressure atmosphere* - An atmosphere created in a work area enclosure such that airborne fibers will tend to be drawn through the filtration system rather than leak out into the surrounding areas. The air pressure inside the work area is less than that outside the work area.

*Regulated area* - Established by the employer to demarcate areas where airborne concentrations of asbestos, tremolite, anthophyllite or actinolite exceed, or can reasonably be expected to exceed, the permissible exposure limit.

*Regulated asbestos-containing material (RACM)* - (a) Friable asbestos material, (b) Category I nonfriable ACM that has become friable, (c) Category I nonfriable ACM that will be or has been subjected to sanding, grinding, cutting, or abrading, or (d) Category II nonfriable 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 this subpart.

*Remove* - To take out RACM or facility components that contain or are covered with RACM from any facility.

*Renovation* - Altering a facility or one or more facility components in any way, including the stripping or removal of RACM from a facility component. Operations in which load-supporting structural members are wrecked or taken out are demolitions.

*Repair* - Overhauling, rebuilding, reconstructing or reconditioning.

*Reportable quantity (RQ)* - Minimal amount of hazardous material subject to the requirements of CERCLA; the RQ for asbestos is one pound.

*Resilient floor covering* - Asbestos-containing floor tile, including asphalt and vinyl floor tile, and sheet vinyl floor covering containing more than 1 percent asbestos as determined using polarized light microscopy according to the method specified in Appendix A, Subpart F, 40 CFR Part 763, Section 1, Polarized Light Microscopy.

*Respirator program* - A written program established by an employer which provides for the safe use of respirators on the job site.

*Saranex®* - A thermoplastic material used to coat protective clothing to provide resistance to PCBs and solvents.

*Scanning electron microscopy (SEM)* - A method of microscopic beam directed at the sample and then collects the beams that are reflected to produce an image from which fibers can be identified and counted.

*Self-contained breathing apparatus (SCBA)* - A respirator with air provided by a tank worn by the user; provides the highest level of protection; can be used when a contaminant's concentration is unknown.

*Standard operating procedures (SOPs)* - A body of information which helps ensure consistency in a particular activity.

*Strip* - To take off RACM from any part of a facility or facility components.

*Structural member* - Any load-supporting member of a facility such as beams and load-supporting walls; or any nonload-supporting members, such as ceilings and nonload-supporting walls.

*Surfactant* - A chemical wetting agent added to water to improve its penetration into asbestos-containing materials.

*Threshold limit value (TLV)* - Level of contaminant to which it is believed workers can be exposed with minimal adverse health effects; established by the American Conference of Governmental Industrial Hygienists (ACGIH).

*Time-weighted average (TWA)* - Technique used when determining average exposure to airborne asbestos during a specified length of time. For example, the PEL for asbestos is 0.2 f/cc as an 8-hour TWA. If an individuals's exposure to asbestos is limited to 1.0 f/cc for one half-hour period during an 8-hour workday, the person's 8-hour TWA would be 0.063 f/cc (1.0 f/cc ÷ 16 half-hour periods), well below the PEL.

*Transmission electron microscopy (TEM)* - A method of microscopic analysis in which an electron beam penetrates (transmits through) a thin sample and produces an image on a fluorescent screen from which samples can be identified and counted; typically used to identify and quantify asbestos in air samples.

*Type C supplied-air respirator* - A respirator which supplies air to the wearer from an outside source such as a compressor; designed to provide a very high level of protection.

*Tyvek®* - A non-woven fabric of spun-bonded olefin fibers which is tear-resistant, relatively inexpensive, resistant to particulate penetration, and often used for disposable garments. Tyvek's melting point is 270°F.

*Visible emissions (VE)* - Any emissions (excluding condensed uncombined water vapor) visually detectable without the aid of instruments, coming from RACM or asbestos-containing waste material or from any asbestos milling, manufacturing or fabricating operation.

*Waste generator* - Any owner or operator of a source covered by this subpart whose act or process produces asbestos-containing waste material.

*Waste shipment record (WSR)* - The shipping document, required to be originated and signed by the waste generator, used to track and substantiate the disposition of asbestos-containing waste material.

*Wetting agents* - Materials (such as surfactants) that are added to water which is used for wetting the asbestos-containing material in order for the water to penetrate more effectively.

*Working day* - Monday through Friday including holidays that fall on any of the days Monday through Friday.

*260/160/35* - 260 linear feet (80 linear meters) of ACM on pipes, 160 square feet (15 square meters) of ACM on other facility components, or 35 cubic feet of ACM off facility components where the amount of ACM previously on pipes and other facility components is unknown.. These figures form the basis of applicability in the asbestos NESHAP standard.

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"INSPECTIONS AND REPORT WRITING: FOR THE FUN OF IT"

May 19, 1988 Karen A. Meyer and Dana J. Stotsky

## ASBESTOS NESHAP FACT PATTERN

You are a highly trained and skilled EPA NESHAP asbestos inspector. One afternoon you get a telephone call at your desk and a frantic and hushed voice at the other end of the line asks, "Are you with EPA?".

The person tells you that she works at the First National Bank in downtown Duke City and that she is worried about some construction work going on at the bank. She tells you that there is white dust flying all around the bank lobby and that she and her co-workers have been coughing a lot since the work began. She tells you that when she told her supervisor she was worried about the renovation project, her supervisor told her that there was nothing to worry about. She tells you that she took a sample of the white dust to a lab that a friend of hers runs and that her friend told her the material was asbestos. She refuses to give you her name.

You get your respirator and suit and go down to the bank. When you arrive in your decontamination suit, the bank manager and the foreman of the construction site quickly greet you with a barrage of questions. You present your EPA credentials and tell the manager and foreman that you are there to take a look at the renovation project in the bank lobby. They ask if they have to let you in, and you tell them you can always go back to the office and get a search warrant. They let you in. When you enter the bank lobby this is what you see:

The bank lobby is huge. It appears to be 200 feet long and 100 feet wide. The renovation work involves the ceiling, which appears to be 30 feet from the floor. There is scaffolding going up to the ceiling and twelve men standing on it are scraping a white, fluffy material off the ceiling. The men are dressed in T-shirts and jeans. The workers, scaffolding, and the floor below are covered with white dust. The bank lobby is full of bank patrons, lined up to conduct last-minute transactions before the bank closes. There is a sign posted near the tellers' counter which says "PLEASE EXCUSE THE DUST. WE ARE MAKING THE BANK MORE BEAUTIFUL FOR ALL OF YOU!".

(For non-Air people, the asbestos NESHAP requires the following:

1. Notification to the State or EPA on a planned renovation or demolition project involving friable (crumbly) asbestos-containing material.

2. Wet removal of asbestos if over 160 square feet, 260 linear feet, or 35 cubic feet.

3. Bagging and proper disposal of asbestos materials.

# ASHARA COMPLIANCE REFERRAL FORM

BUILDING LOCATION____________________________________________

CITY______________________________STATE__________ZIP__________

CORPORATE NAME OF BUILDING OWNER______________________________

ADDRESS______________________________________________________

CITY______________________________STATE__________ZIP__________

RESPONSIBLE PERSON____________________________PHONE____________

## SECTION I

**ABATEMENT PROJECT DESCRIPTION**

| PROJECT DESCRIPTION | LINEAR FEET | SQUARE FEET |
|---|---|---|
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| | | |

## SECTION II

**CONTRACTOR**______________________________________________

ADDRESS______________________________________________________

CITY______________________________STATE__________ZIP__________

TELEPHONE (_______)__________________CURRENT STATE LICENSE NUMBER__________

Was an inspection conducted to identify where asbestos is located? Yes _____ No _____

If yes, is a copy of the building inspection survey available? Yes _____ No _____

**ACCREDITED BUILDING INSPECTOR**______________________________

COMPANY__________________________CURRENT STATE LICENSE NUMBER__________

ADDRESS______________________________________________________

CITY______________________________STATE__________ZIP__________

**NESHAP INSPECTOR**__________________________DATE______________

**IF ANY INFORMATION UNOBTAINABLE, BRIEFLY EXPLAIN WHY**__________________

______________________________________________________________

______________________________________________________________

**AFTER COMPLETING FORM, FORWARD TO:**

CHIEF
ASBESTOS CONTROL SECTION
U.S. EPA
ADDRESS
CITY, STATE, ZIP

# STATE WORKER ACCREDITATION

| WORKER NAME | STATE ISSUING LICENSE | TYPE | NUMBER | EXPIRATION DATE |
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