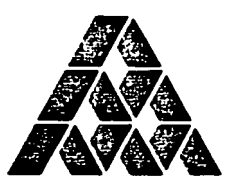
# DEMOLITION AND RENOVATION INSPECTION AND SAFETY PROCEDURES WORKSHOP SLIDE NARRATIVE

*Final Report*

**July 1989**



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# 1989 DEMOLITION AND RENOVATION INSPECTION AND SAFETY PROCEDURES WORKSHOP SLIDE NARRATIVE

**Final Report**

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## PEER REVIEW STATUS

This document has not been formally peer reviewed by the Environmental Protection Agency.

# NOTE TO THE SPEAKERS

The information contained in this document accompanies the *Demolition and Renovation Inspection and Safety Procedures Workshops Speaker Manual (Final Report, July 1989).*

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## SECTION 1

## BACKGROUND INFORMATION AND DEFINITIONS

**Slide 1** **Asbestos NESHAP Inspection Safety & Procedures Workshop [word slide (ws)]**

**Slide 2-5** **Building demolition sequence**

Since asbestos is an airborne health hazard, it has been included in the National Emission Standards for Hazardous Air Pollutants (NESHAP) regulation. Although much of the dust seen in this sequence of slides may not be asbestos, what portion does exist may be very harmful.

**Slide 6** **Asbestos abatement site**

The presence of the NESHAP and other regulations has given rise to the multi-billion dollar a year asbestos abatement industry. Oftentimes, for older facilities, the cost of asbestos abatement exceeds the original cost to construct the building. Abatement, however, is still cost effective, for owners of buildings containing asbestos have more difficulty renting or selling them and usually obtain much less than the full market value of the property in the process.

**Slide 7** **Background Information (ws)**

**Slide 8** **Federal Government (ws)**

**Slide 9** **EPA Asbestos Regulations (ws)**

CAA = Clean Air Act
TSCA = Toxic Substances Control Act
RCRA = Resource Conservation Recovery Act
CERCLA= Comprehensive Environmental Response, Compensation and Liability Act

**Slide 10** **CAA (ws)**

**Slide 11** **Demolition/Renovation (ws)**

The demolition/renovation provisions of the asbestos component of NESHAP will be discussed in detail during this course.

**Slide 12** **TSCA (ws)**

**Slide 13** **RCRA/CERCLA (ws)**

**Slide 14** **Blank**

**Slide 15** **Asbestos vein**

**Slide 16** **Geological Terms (ws)**

**Slide 17** **Size Comparison (chart)**

**Slide 18** **Commercial Asbestos product**

**Slide 19** **Asbestos Containing Products (chart)**

**Slide 20** **Asbestos bulk sample closeup**

**Slide 21 Workers scraping ceiling**

Workers are removing a spray-applied decorative/acoustical asbestos coating from the ceiling and walls in this room. The way the material is holding together as it is scraped is an indication that it has been adequately wetted.

**Slide 22 Gymnasium—spray-applied asbestos**

If the I-beams in this gymnasium were uninsulated and heated in a fire, they would expand and lose tensile strength and perhaps be unable to support the roof.

**Slide 23 Thermal insulation on pipes**

Several types of insulation can be seen in this picture. The straight runs of pipe appear to be covered with premolded asbestos insulation whereas the elbows and boiler itself are insulated with a troweled-on cementitious asbestos material. Although not visible, asbestos may also be found in valve packings or gasket materials in this boiler room.

## SECTION 2

## NATIONAL REGULATORY STRATEGY/INSPECTOR GENERAL AUDIT

**NO SLIDES ARE USED IN THIS SECTION**

## SECTION 3

## HEALTH EFFECTS OF EXPOSURE TO ASBESTOS

**Slide 1** **Health Effects of Asbestos Exposure (ws)**

**Slide 2** **Asbestosis (ws)**

**Slide 3** **Layers of Pleura (diagram)**

The lungs reside in the chest (pleural) cavity in two membranous sacs known as pleura.

**Slide 4** **Peritoneum and Pleura (model)**

Abdominal organs are enclosed by a similar lining known as the peritoneum.

**Slide 5** **Respiratory System (diagram)**

The chest cavity is lined with a thin, transparent, plastic-like film called the mesothelium. The mesothelium continues around and adheres tightly to the outer surface of each lung. The layer on the surface of the lungs is barely separated by a thin layer of fluid from the membrane lining the chest wall. In a manner similar to two planes of glass with a drop of water between them, these two membranes will move across one another, but are very difficult to pull apart. It is this particular aspect that allows us to inhale and exhale without difficulty. As the ribs and diaphragm expand, the pleural cavity lining also expands. Since this lining is "stuck" to the membrane on the surface of the lungs themselves, the lungs subsequently expand, allowing air to rush in. If either of these membranes were damaged, severe difficulty in breathing would result.

**Slide 6** **Respiratory System (diagram and commentary)**

If asbestos fibers get past the other defenses of the lung, they will probably be attacked by white blood cells known as macrophages. These cells ordinarily engulf and digest materials such as bacteria, fungal spores, pollen, etc. which have entered the lung. Unlike these other substances, however, asbestos fibers are inorganic, so macrophages cannot digest them. Failing to destroy the fibers, the body does the next best thing...it encapsulates them.

**Slide 7** **Blank**

**Slide 8** **Normal & Scarred Air Sacs (diagram)**

If enough fibers are encapsulated in these spaces, true scar tissue begins to form and continues to build up in layers, resulting in a condition known as asbestosis. The scarring reduces lung capacity and hinders the exchange of oxygen and carbon dioxide across the alveolar membranes.

**Slide 9** **Asbestosis x-ray**

Normal lungs are not visible on x-rays. The milky white sections visible in the lower lung fields on this x-ray are the dense scar tissues that have formed in the lungs of this individual with asbestosis.

**Slide 10** **Lung Cancer (ws)**

**Slide 11** **Smoking and Asbestos Increases Risk of Cancer (ws)**

Smoking is known to paralyze and/or destroy the cilia involved in the muco-ciliary escalator. Because this defense mechanism is impaired, many more asbestos particles are thought to be able to reach the deep recesses of the lung and cause harm there.

**Slide 12 Mesothelioma Cancer (ws)**

Mesothelioma continues to be a rare disease, even among asbestos workers. Approximately 75% of the cases reported involve the pleural cavity and about 25% the abdominal cavity.

**Slide 13 Mesothelioma x-ray**

The large white mass seen in this x-ray is mesothelioma.

**Slide 14 Pleural Plaques (ws)**

**Slide 15 Pleural Thickening (ws)**

**Slide 16 Pleural Effusion (ws)**

Pleural effusions are treated by extracting the fluid with a hypodermic syringe.

**Slide 17 Medical examination**

Anyone with prolonged contact with asbestos-containing materials is well-advised to have regular physical exams. OSHA requires employers whose workers are subject to its regulations to institute a medical surveillance program to monitor the health of their employees.

**Slide 18 Pulmonary function test**

Pulmonary function tests are performed to measure the elasticity and capacity of the lungs, both of which may be impaired if the lungs are injured in any way.

## SECTION 4

## IDENTIFYING ASBESTOS CONTAINING MATERIALS

**Slide 1 Identifying Asbestos Materials**

In order to properly conduct an asbestos NESHAP inspection, an inspector needs to be able to recognize *suspect* asbestos-containing materials. Although NESHAP deals specifically with friable forms of asbestos, an inspector should learn to recognize nonfriable forms as well, for these substances *may* become friable during renovation or demolition. For this reason, the following sequence of slides depicts a wide variety of both friable and nonfriable asbestos-containing materials an inspector may encounter on the job.

**Slide 2 Friable Asbestos Containing Materials**

**Slide 3 Nonfriable Asbestos Containing Materials**

**SURFACING MATERIALS—INSULATING, FIREPROOFING**

**Slide 4 "Galbestos" on corrugated siding**

The corrugated walls of this building were coated with a thin layer of Galbestos, a product which contains 20% chrysotile. Since the building was going to be demolished by wrecking ball and bulldozer, the inspector examining the site recommended that the building owner remove the siding in sections and dispose of it as asbestos-containing waste. His recommendation was based on the fact that the nonfriable siding could become friable in the demolition process. Since a total of 365,000 square feet of material was involved, the cost of such treatment was $750,000. The building owner had to weigh the cost of potential fines for violations of NESHAP against the cost of doing the job properly in this situation. If only a $500 or $1000 fine were levied, the building owner would still save a significant amount of money during the demolition operation.

**Slide 5** **I-beams (overspray)**

A great deal of asbestos overspray is visible in this photo.

**Slide 6** **I-beams (hangers)**

Since small amounts of asbestos have to be removed in order to install these hangers, does NESHAP apply? (only if the cumulative amount meets the minimum amounts specified for surfacing materials in the NESHAP regulation)

**Slide 7** **I-beams & decking—troweled-on**

A troweled-on, cementitious form of asbestos insulation is seen here.

**Slide 8** **I-beams & decking—fluffy, spray-applied**

Spray-applied fireproofing or insulating material is typically light to medium gray in color and from a couple to several inches thick. It is very fluffy and resembles dirty cotton. The rusty spot on this insulated I-beam may be an indication that the roof leaks. This may cause delamination of the insulation and increase the airborne asbestos levels throughout the building, for the plenum is often used as an air return. Inspectors should never lift ceiling tiles without appropriate respiratory protection.

**Slide 9** **Close-up of fluffy spray-applied**

**Slide 10** **Cementitious insulation on corrugated decking**

This corrugated deck coating is thick and quite cementitious but still friable.

**Slide 11 Worker holding piece of cementitious insulation**

This worker is holding a piece of the insulation seen in the previous slide.

## SURFACING MATERIALS—ACOUSTICAL, DECORATIVE

**Slide 12 Band room storage area**

The plaster wall in this band storage area contained asbestos. Students had easy access to this material and carved names into it. All the hats had to be disposed of as asbestos-contaminated waste. Band rooms may also have asbestos-containing perforated acoustical wall and ceiling tiles as well as asbestos insulation in their walls.

**Slide 13 School hallway**

Students also had easy access to the asbestos-coated ceiling in this hallway.

**Slide 14 Light switch on wall**

Any time this light switch is operated, people come into contact with the asbestos-containing, decorative wall finish.

**Slide 15 Ceiling**

Ceilings often have decorative/acoustical asbestos coatings.

**Slide 16 Ceiling**

Inspectors may find that ceilings have been painted and exhibit a variety of textures.

**Slide 17 Closeup of ceiling**

Although this ceiling appears to be granular or cementitious in nature, it may still be friable.

## THERMAL SYSTEM INSULATION

**Slide 18 Ductwork**

Ductwork may have asbestos block insulation, wire mesh, paper and a final layer of plaster applied to it.

**Slide 19 Ductwork**

Ductwork may be double-walled with a layer of asbestos sandwiched between two layers of sheet metal or it may have asbestos applied to its inside surfaces. If the building in which ductwork is located is scheduled for demolition, it is important to know whether asbestos is present. If one cannot determine in any other way whether the ductwork is insulated, tapping on it and hearing a dull tone rather than a metallic ring may indicate that asbestos insulation is present.

**Slide 20 Pre-molded pipe insulation**

This pre-molded pipe insulation is in poor condition.

**Slide 21 Elevator shaft**

Elevator shafts and trash chutes should be examined for the presence of asbestos-insulated pipes.

**Slide 22 Pipe insulation**

**Slide 23 Pipe insulation - poor condition**

The fibrous nature of this pipe insulation can easily be seen.

**Slide 24 Air-cell insulation**

Air-cell insulation should always be considered suspect. It is typically light to medium gray in color and is usually held in place by a cheesecloth or canvas wrapping and metal bands.

**Slide 25 Felt wrap pipe insulation**

Thick layers of an asbestos-containing felt may also be used to insulate pipes.

**Slide 26 Boiler insulation - poor condition**

The layers of materials used to insulate this boiler can be seen.

**Slide 27 Boiler insulation layering**

The wires used to hold the block insulation against the boiler can be seen.

**Slide 28 Boiler insulation layering**

Chicken wire often was used to hold block insulation in place. The outer layer of plaster may or may not contain asbestos.

**Slide 29 Elbows, valves**

Elbows of thermal systems may be insulated with an asbestos-containing cement. Valve packings and gasket material may also contain asbestos.

**Slide 30 Outside thermal system insulation**

Suspect asbestos-containing materials may be found outside facilities as well as inside.

**Slide 31 Outside thermal system insulation**

Boilers may have steel jackets around the asbestos insulation. Inspectors should look inside the jacket where pipes attach to the boiler to see if block insulation is present.

**Slide 32 Hawaiian facility**

An inspector marked areas where samples were taken from thermal system insulation on the roof of this Hawaiian facility.

## MISCELLANEOUS MATERIALS

**Slide 33 Asbestos paper**

Asbestos-containing paper or asbestos board may be found between a hardwood floor and the subflooring or attached to steel decking. The asbestos sometimes looks like tiles and may be 1/4" thick.

**Slide 34 Johns-Manville 1-1/8" flexboard**

Inspectors should always read labels and tags. Any time a Johns-Manville label is encountered, the inspector should suspect that the material contains asbestos.

**Slide 35 Asbestos siding**

House siding, Transite board and floor tiles are generally nonfriable. However, with age and weathering, these materials may become friable.

## SECTION 5

## ABATEMENT TECHNIQUES

**Slide 1** **Abatement Techniques (ws)**

**Slide 2** **Occupied Library**

In any asbestos abatement project the area must be prepared before work can begin. In this library the books, rug, tables, lights and other items must be decontaminated and preferably removed to facilitate the asbestos removal process.

**Slide 3** **HEPA Vacuum**

This type of vacuum passes air through a high efficiency particulate air (HEPA) filter before exhausting it, thereby preventing asbestos fibers from leaving the vacuum once they have been collected.

**Slide 4** **Emptied Library**

As clear a work space as possible is created prior to abatement.

**Slide 5** **Locker room**

In this situation the contractor decided that it would be easier to clean these lockers and protect them with polyethylene (poly) than to remove them from the room.

**Slide 6** **Critical barriers**

The windows and vent seen here are sealed with poly and tape before the wall poly is attached.

**Slide 7 Warning sign/critical barrier**

Both OSHA and the EPA require the posting of signs at abatement sites. There *must* be written in English but may also be written in whatever the predominant language is in the area.

Critical barriers have been established both on the inside and outside of this large opening so that asbestos fibers cannot leave the worksite.

**Slide 8 Prepared worksite**

Although the HVAC system is this area has been shut down and sealed with poly and tape, the electricity to this area has not been shut off. Since water is used during asbestos removal and workers can easily come into contact with live wires, a very dangerous situation exists.

**Slide 9 Polyethylene being applied to a wall**

**Slide 10 Polyethylene floor and wall coverings**

The walls of a room are usually prepared first since the ladders and other equipment needed to do this could mar a prepared floor. The floor poly is stretched as smoothly as possible so that scaffolding and other equipment can be moved easily, tripping hazards are reduced and cleanup facilitated.

**Slide 11 Wrinkled floor polyethylene**

This area has not been prepared properly.

**Slide 12 "Negative Air" System (diagram)**

**Slide 13** **Men entering decontamination unit**

**Slide 14** **Worker wiping up leak/Local exhaust unit/Garden sprayer**

Leaks in containment are dealt with immediately to prevent the spread of asbestos fibers to outside areas.

**Slide 15** **Worker using garden sprayer**

**Slide 16** **Worker using garden hose**

**Slide 17** **Workers using extension wands**

**Slide 18** **Worker using long-handled ice scraper**

**Slide 19** **Worker using joint compound knife**

**Slide 20** **Worker using putty knife**

**Slide 21** **Worker using toilet brush**

It is recommended that workers using only nylon or natural bristle brushes to remove asbestos. It is thought that wire brushes may break up asbestos into finer fibers and thereby increase airborne concentrations of the contaminant.

**Slide 22** **Worker shoveling debris**

**Slide 23** **Worker using vacuum hose to remove asbestos from I-beam**

**Slide 24** **Worker examining hopper of vacuum equipment**

**Slide 25 Dry ACM in plastic bag in fiber drum**

The asbestos that has been placed in this bag has not been adequately wetted.

**Slide 26 Burlap bag with asbestos**

If these bags do contain asbestos, it has not been adequately wetted, nor sealed in properly labeled, leaktight containers.

**Slide 27 Workers loading disposal bag with asbestos debris**

**Slide 28 Truck storage of disposal bags**

The contractor may store bags of asbestos debris in a variety of locations (dumpsters, trucks, rooms within the facility, etc.). Inspectors should always wear protective clothing and respiratory protection when investigating these areas.

**Slide 29 Metal barrels**

Metal drums are sometimes used in the transport of bags containing asbestos debris. These are usually emptied at the landfill and reused at the worksite.

**Slide 30 Worker washing down wall polyethylene**

Once all the asbestos has been removed and the area cleaned thoroughly, workers may hose down the walls...

**Slide 31 Worker wiping down polyethylene on wall**

...and wipe them with lint-free cloths before removing the polyethylene. Alternatively, workers may hose down the walls, encapsulate the poly with latex paint to lock down any remaining fibers and the remove the poly.

**Slide 32 Worker with knife - thermal system insulation**

Contractors may choose to fully contain an area and establish "negative pressure" in areas where pipe lagging is to be removed.

**Slide 33 Worker preparing to hang a glovebag**

Alternatively, a contractor may decide to use the glovebag technique in the removal of pipe lagging.

**Slide 34 Pipe Lagging Removal (diagram)**

**Slide 35 Pipe Lagging Waste Disposal (diagram)**

## SECTION 6

## DEMOLITION AND RENOVATION REGULATIONS

**Slide 1** **Sources Under Subpart M (ws)**

**Slide 2** **Asbestos NESHAP History (ws)**

**Slide 3** **NESHAP Asbestos D/R Regulation (ws)**

**Slide 4** **Definitions (ws)**

**Slide 5** **Applicability (ws)**

**Slide 6** **Notification (ws)**

**Slide 7** **Contents of Notification (ws)**

**Slide 8** **Procedures for Emission Control (ws)**

**Slide 9** **Double-walled construction in Hawaiian building**

Sometimes buildings are constructed with concrete block double outer walls. Risers and pipes are located within the 8 to 10 inch space between the walls. Questions have arisen as to whether the exception to removal, *Encased in Concrete [61.147 (a)(1)]* applies to such construction. It does not. If the building is going to be demolished, predemolition must be conducted and the asbestos located within the space removed.

**Slide 10** **Worker spraying asbestos with hose**

Inspectors will often find that adequate wetting is being done while the inspector is onsite. In order to determine if work practices have been conducted properly prior to his/her

arrival, the inspector should examine waste disposal bags in the storage area, document that the 260/160 requirement is met and take samples of the material if a violation of NESHAP is suspected.

**Slide 11** **Worker shoveling asbestos debris**

**Slide 12** **Blank**

**Slide 13** **Waste Disposal (ws)**

**Slide 14** **Vacuum truck**

An alternative method to bagging asbestos debris inside the facility has been approved for use. Vacuum trucks, which have an air-cleaning baghouse on the back, may be used to suck asbestos off the facility components and transport it to the landfill as a slurry. The landfill must be notified and given adequate time to prepare a trench for the delivery of the slurry. Once the slurry has been deposited, the trench must be covered immediately.

This sort of collection system is not commonly used. Another type of vacuum truck which permits the bagging of asbestos debris outside the facility may more often be seen.

**Slide 15** **Active Waste Disposal Site Provisions (ws)**

**Slide 16** **Future Developments (ws)**

## SECTION 7

## RESPIRATORY PROTECTION EQUIPMENT

**Slide 1** **Classes of Respirators (ws)**

**Slide 2** **Air Purifying Negative Pressure Respirators (ws)**

**Slide 3** **Worker wearing single use paper mask**

**Slide 4** **Worker wearing half-face dual cartridge air-purifying respirator**

Polyvinyl chloride (PVC), silicone, neoprene or natural rubber may be used in the construction of respirator face masks. Silicone masks tend to be more pliable and comfortable than other masks and are less likely to cause irritation or allergic reactions. The mask shown has a speaking diaphragm which aids in communication in the worksite. This mask also has dual HEPA filters which are generally magenta or purple in color. The color is an industry standard (not required by any law) and the shades will vary from manufacturer to manufacturer. One U.S. company produces an approved gold HEPA cartridge. In Europe HEPA cartridges are white in color.

**Slide 5** **Worker wearing full-face dual cartridge air-purifying respirator**

This respirator provides both face and eye protection, thus eliminating the need for goggles. The sealing surface of the mask contacts flatter areas of the face and therefore affords the wearer greater protection.

**Slide 6** **Powered Air Purifying Respirators (PAPR) (ws)**

**Slide 7** **Worker wearing PAPR with waist-mounted motor/filtration unit**

**Slide 8** **Worker donning PAPR with mask-mounted motor/filtration unit**

This mask is more tiresome to wear than the previous one shown, for the weight of the motor/filtration unit is on facepiece itself.

**Slide 9** **Worker wearing hood/helmet type PAPR**

**Slide 10** **Supplied Air Respirators (ws)**

**Slide 11** **Workers wearing half-face and full-face supplied-air respirators**

**Slide 12** **Worker wearing supplied-air respirator with auxiliary SCBA**

**Slide 13** **Worker wearing supplied-air respirator with auxiliary HEPA**

**Slide 14** **Self-Contained Breathing Apparatus (SCBA) (ws)**

**Slide 15** **Worker wearing SCBA**

**Slide 16** **Selection of Respirators (ws)**

**Slide 17** **Fiber Concentration (ws)**

**Slide 18** **Respiration Selection Criteria (ws)**

**Slide 19** **Conditions for No Respiratory Protection - Outside Barrier (ws)**

**Slide 20** **Conditions for Air Purifying Respirators (ws)**

**Slide 21** **Additional OHSS Conditions for APR's (ws)**

**Slide 22** **Conditions for SCBA's (ws)**

**Slide 23** **Medical/Physical Considerations (ws)**

## SECTION 8

## ASBESTOS INSPECTOR SAFETY GUIDANCE

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| **Slide 1** | **Sources for Inspector Safety Guidance (ws)** |
| **Slide 2** | **OSHA Regulations (ws)** |
| **Slide 3** | **Scope and Application (ws)** |
| **Slide 4** | **OSHA Exposure Limits (ws)** |
| **Slide 5** | **Regulated Areas (ws)** |
| **Slide 6** | **Respiratory Protection (ws)** |
| **Slide 7** | **Protective Clothing (ws)** |
| **Slide 8** | **Hygiene Facilities (ws)** |
| **Slide 9** | **Housekeeping (ws)** |
| **Slide 10** | **Medical Surveillance (ws)** |
| **Slide 11** | **EPA Worker Protection Rule (ws)** |
| **Slide 12** | **EPA/NIOSH Guidance (ws)** |
| **Slide 13** | **Contents of EPA/NIOSH Guidance (ws)** |
| **Slide 14** | **EPA/NIOSH Recommendations (ws)** |

**Slide 15** Basis for Recommendations (ws)

**Slide 16** OHSS Guidelines for Asbestos Inspectors (ws)

**Slide 17** Health and Safety Plan (ws)

**Slide 18** EPA Asbestos Inspector Training (ws)

**Slide 19** EPA Asbestos Inspector Training - continued (ws)

**Slide 20** Medical Monitoring (ws)

**Slide 21** Respiratory Protection (ws)

## SECTION 9
## RESPIRATORY PROTECTION PROGRAM ELEMENTS

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| **Slide 1** | **Respirator Protection Factors (ws)** |
| **Slide 2** | **Respirator Protection Factors (chart)** |
| **Slide 3** | **Respirator Fit Testing (ws)** |
| **Slide 4** | **Qualitative Fit Testing (ws)** |
| **Slide 5** | **Man undergoing qualitative fit test** |
| **Slide 6** | **Quantitative Fit Testing (ws)** |
| **Slide 7** | **Quantitative Fit Test (diagram)** |
| **Slide 8** | **Respirator Inspection and Maintenance (ws)** |
| **Slide 9** | **Man cleaning respirator** |
| **Slide 10** | **Field Inspection and Checkout Procedures (ws)** |

# SECTION 10
# PROTECTIVE CLOTHING

**NO SLIDES ARE USED IN THIS SECTION**

**DEMONSTRATIONS ARE GIVEN**

# SECTION 11
# ASBESTOS NESHAP INSPECTIONS LEGAL PERSPECTIVES

**NO SLIDES ARE USED IN THIS SECTION**

## SECTION 12
## OTHER SAFETY CONSIDERATIONS IN ASBESTOS WORK

**Slide 1** **Other Safety Considerations (ws)**

**Slide 2** **Asbestos abatement workers**

These asbestos abatement workers, due to the protective clothing and equipment they wear and the hot, humid conditions in which they work, are likely to develop symptoms of heat stress. Inspectors, although similarly attired, will face a much reduced risk of heat-related problems for they typically will not work so strenuously in the hot environment.

**Slide 3** **Steep Stairway**

**Slide 4** **Abatement workers on scaffolding and ladder**

The worker in the foreground is using a stepladder improperly.

**Slide 5** **Floor with wrinkled polyethylene**

The poly on the floor of this worksite presents a tripping hazard because it was not stretched out and smoothed properly when applied.

**Slide 6 Workers in high humidity / live electricity**

Since a great deal of water is being used at this worksite and the air temperature is cool, a fog has been produced. Since the electricity is still functioning in the area, a hazardous situation exists.

**Slide 7 Abatement worker working above operating light fixture**

Workers are conducting abatement around live electricity in this area as well. An inspector, perhaps having to climb up to see if the removal process is being done properly, should be extremely cautious.

**Slide 8 Accumulated water in containment**

**Slide 9 Wrecking ball and building**

An inspector entering this building would be wise to ask when the building is scheduled for demolition.

**Slide 10 Partially demolished building**

On occasion, an inspector will be required to determine whether the NESHAP standard applies to a building already being demolished. One's safety should never be jeopardized at such a site.

**Slide 11 Workers near wharf**

Inspectors may be asked to conduct inspections in unusual locations. Here, workers were removing asbestos from a pipe that ran under the pier. An inspector's safety equipment should include a lifevest in this situation.

## SECTION 13
## PRE-INSPECTION PROCEDURES

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| **Slide 1** | **D/R Inspection Procedures (ws)** |
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## SECTION 14
## ONSITE FACILITY INSPECTIONS

**Slide 1** **Pre-inspection Observations (ws)**

**Slide 2** **Pre-entry Interview (ws)**

**Slide 3** **Safety Evaluation (ws)**

**Slide 4** **Pre-removal Inspections (ws)**

**Slide 5** **Active Removal Inspections (ws)**

**Slide 6** **Worker spraying facility component**

Asbestos abatement equipment and supply dealers now offer contractors a large variety of wetting agents from which to choose. The EPA recommends using a 50:50 blend of polyoxyethylene ether and polyoxyethylene ester to ensure adequate wetting of the asbestos.

**Slide 7** **Workers on scaffold scraping ceiling**

The way the asbestos material is holding together and producing no visible emissions as it is scraped is an indication that it has been adequately wetted.

**Slide 8** **Worker wiping down I-beam**

Approximately 60-70 percent of the time involved in an asbestos abatement project is used to final clean the surfaces from which the asbestos has been removed. After the final cleaning, encapsulant may be sprayed on the facility components to ensure that any remaining fibers are locked down.

**Slide 9** **Waste storage area**

An inspector visiting a jobsite such as this should take samples of the dry material seen on the floor and inform the owner/operator that the work practices onsite need improvement. An enforcement action may not be needed in such a situation. An inspector desiring samples form the storage bags should take the bags into containment if it is still in place and open the bags and take samples while near an operating local exhaust unit.

**Slide 10** **Blank**

**Slide 11** **Post-removal Inspections (ws)**

**Slide 12** **Asbestos waste heap**

Has a violation of NESHAP occurred if an inspector sees the asbestos debris being removed from a facility stored outside in this manner? The inspector should take pictures and samples and document that NESHAP was applicable in this case (260/160 requirement, adequately wet, maintained in wet condition until collected for disposal).

**Slide 13** **Post-inspection Interview (ws)**

**Slide 14** **Exit Observations (ws)**

## SECTION 15
## POST-INSPECTION

**Slide 1** **Post Inspection Activities (ws)**

## SECTION 16

## LANDFILL INSPECTIONS

**Slide 1** **Landfill Inspections (ws)**

**Slide 2** **Entrance to landfill**

No asbestos hazard signs are visible at the entrance to this landfill. If an inspector sees suspected asbestos-containing debris being brought here, additional information will be required to determine if violations of NESHAP are occurring.

**Slide 3** **Truck/bulldozer at landfill**

**Slide 4** **Bulldozers compacting and covering material at landfill**

**Slide 5** **Bulldozer covering barrels of ACM with soils**

The EPA would like to have containers of asbestos-containing material off-loaded by hand and have it covered with soil rather than other non-asbestos-containing materials.

**Slide 6** **Truck dumping packaged ACM**

Neatly packaged asbestos-containing material is being off-loaded into the landfill, producing no visible emissions.

**Slide 7** **Truck dumping dusty ACM**

If an inspector sees this sort of disposal and the material is covered appropriately within 24 hours, is NESHAP being violated? *Yes.* Although Section 61.156 appears to give either "no visible emissions" or coverage with "compacted non-asbestos-containing material" as

options to the landfill operator, Section 61.152 states that there shall be "no visible emissions to the outside air during ... deposition of any asbestos-containing waste material generated by the source..." Photographs and samples will help document that the material was inadequately wetted and handled and that it contained >1% asbestos by weight. The inspector must also determine that the material came from a "facility" and that the 260/160 provision of NESHAP was met.

## SECTION 17

## ASBESTOS BULK SAMPLING AND ANALYSIS

**Slide 1** **OHSS Guidance for Bulk Sample Collection (ws)**

**Slide 2** **Sampling Equipment (ws)**

**Slide 3** **Carrying case for inspector's equipment**

**Slide 4** **Sampling containers**

Whirlpack plastic bags sometimes come with an area for information to be recorded. Be sure to use indelible marking pens since everything taken into the worksite must be decontaminated in the shower. 35 mm film canisters, either opaque or clear may be used for sampling, or blood vials may be used.

**Slide 5** **Demolished structure rubble heap**

If a building has not yet been demolished, taking samples is easy. Partial demolition has occurred here. No inspector should ever jeopardize his/her safety for the sake of acquiring samples at such a site. By looking around the partially-demolished building, an inspector may determine that other parts of the building are still safe enough to enter to obtain samples. Protective clothing and respiratory protection are essential in this sort of investigation, for vibrations created in the demolition process may have caused an increase in the airborne asbestos fiber levels.

**Slide 6** **Pieces of thermal system insulation in barrel**

Sampling this suspect asbestos-containing material is easy. However, the inspector must gather enough information to determine whether NESHAP is applicable. The amount of material visible must be measured and site personnel should be interviewed to determine

where the material came from, who stripped it, what procedures were used in the stripping and when it was done.

**Slide 7 Inspector sampling suspect ACM**

A properly labeled, rigid sample container is being used to take a sample of suspect asbestos-containing material. Inspectors must make sure the outside of sampling containers are cleaned of any dust before sending them to the laboratory.

**Slide 8 Inspector sampling suspect ACM**

If this were an EPA inspector, what would be wrong with this picture in reference to the OHSS guidelines for inspectors? (No protective clothing except for one glove and a half-face mask is being worn.) Two items that should be noted are that the inspector *is* using a spray bottle containing amended water to moisten the area where the sample is being taken and has marked the area with spray paint for photographic documentation of the site.

**Slide 9 Fireproofing/Insulation**

Inspectors should document the number of homogeneous areas seen in a site and take a minimum of three samples from each of these areas. In this slide, how many homogeneous areas can be seen? (3 = thermal system insulation on pipe, troweled-on insulation on I-beam and spray-applied fireproofing/thermal insulation on decking.)

**Slide 10 Analysis Methods (ws)**

**Slide 11 Polarized Light Microscopy (ws)**

Polarized light microscopy can determine the type and percentage of asbestos and other substances (vermiculite, sand, fibrous glass, etc.) present in a bulk sample. The cost of such analysis typically ranges from $25-40/sample.

**Slide 12 X-ray Diffraction (ws)**

Like humans, every mineral substance is unique. A mineral's "fingerprint" can be illustrated on film using a technique known as x-ray diffraction. X-ray diffraction is typically used to confirm the results of PLM especially if the PLM results report a low percentage of asbestos in a bulk sample. The technique is a bit more accurate than PLM but is more expensive, usually costing $75-90/sample.

**Slide 13 Electron Microscopy (ws)**

Although it is a very accurate technique, electron microscopy is not recommended for use in analyzing bulk samples for it is very costly and takes more time than PLM and x-ray analyses which can suffice.

**Slide 14 Quality Assurance (ws)**

**Slide 15 Quality Assurance (ws)**

## SECTION 18
## ASBESTOS AIR MONITORING

**Slide 1** **Asbestos Air Monitoring (ws)**

**Slide 2** **Equipment (ws)**

**Slide 3** **Personal air sampling device**

A personal air sampling device consists of a pump, air tube and cassette with air filter. The device is worn and operated for a certain length of time and the cassette sent to a laboratory for filter analysis. The fibers that have accumulated are counted and the results averaged over an 8-hour time interval.

**Slide 4** **Area air sampling device**

These devices are often seen operating just outside the decontamination facility at an abatement site. They are usually placed there by an industrial hygienist hired by the building owner to certify that the abatement process is not contaminating areas outside containment.

**Slide 5** **Filter cassettes**

**Slide 6** **Analytical Techniques (ws)**

**Slide 7** **Continuous Monitors (ws)**

**Slide 8 Continuous monitor**

The fibrous aerosol monitor weighs approximately 20-25 lbs. and has a 20-lb. battery, making it portable, but quite heavy.

**Slide 9 Man carrying continuous monitor**

Until the weight and cost of these units are reduced, inspectors will have to use available information and their judgment in selecting appropriate protective gear for use at abatement sites.