

**Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09**

Course Overview and curriculum

This course is intended to train experienced roofers who may be removing **intact (non-friable)** asbestos containing roofing. The training is in compliance with OSHA CFR 29 1926-1101 (K)(9). An annual refresher course is required by OSHA.

Information is presented on how possible asbestos roofing must be identified and how possible friable asbestos roofing can be identified.

This course may **not** be used for EPA Accreditation or for CT DPH (Connecticut Dept. of Public Health) initial or refresher Certification. A separate DPH Approved course must be taken and the individual may then apply for certification. Only certified workers and supervisors can remove non-intact (friable) roofing can be done.

In addition, an Accredited asbestos supervisor (OSHA competent persons) must be on site for evaluation and removal of intact roofing. This supervisor must take a separate 5-day DPH approved course and then apply for DPH certification. This supervisor must take a DPH approved 8 hour annual refresher to maintain certification. DPH certification must be renewed annually.

For any work involving friable (non-intact) asbestos containing roofing, the individual must take a separate DPH Approved course and then apply for certification.

OSHA requires training on handling friable (non-intact ACM (asbestos containing materials) and the required material is included in this course. Because of the CT DPH regulations, however, persons not certified by DPH may **not** handle friable asbestos and therefore this aspect of the training exceeds the level of work the student will be doing.

Following is the OSHA course curriculum covered in this course.

(A) Methods of recognizing asbestos, including the requirement in CFR 29 1926.1101 paragraph (k)(1) to presume that certain building materials contain asbestos;

(B) The health effects associated with asbestos exposure;

(C) The relationship between smoking and asbestos in producing lung cancer;

(D) The nature of operations that could result in exposure to asbestos, the importance of necessary protective controls to minimize exposure including, as applicable, engineering controls, work practices, respirators, housekeeping procedures, hygiene facilities, protective clothing, decontamination procedures, emergency procedures, and waste disposal procedures, and any necessary instruction in the use of these controls and procedures

(E) The purpose, proper use, fitting instructions, and limitations of respirators as required by 29 CFR 1910.134;

(F) The appropriate work practices for performing the asbestos job;

(G) Medical surveillance program requirements;

**Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09**

(H) The content of CFR 29 1926.1101 including appendices;

(I) The names, addresses and phone numbers of public health organizations which provide information, materials and/or conduct programs concerning smoking cessation. The employer may distribute the list of such organizations contained in CFR 29 1926.1101 Appendix J, to comply with this requirement; and

(J) The requirements for posting signs and affixing labels and the meaning of the required legends for such signs and labels.

**Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09**

TABLE OF CONTENTS

Section	Page
Section 1 Background Information about Asbestos	5-14
Section 2 Summary of Work Practices and Personal Protection for Roofing Work With Asbestos	15-18
Section 3 Employee Personal Protective Equipment	19-36
Section 4 OSHA Construction Standard: (29 CFR 1926.1101)	37-52
Section 5 Work Practices	53-74
Section 6 Other Pertinent Regulations	75-94
Section 7 Selected Definitions	95-101
Extracts from OSHA Guidance Questions and Answers	96-105

Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09

PRE-COURSE QUIZ

This quiz is for your use to evaluate your knowledge before the course. This will not be graded but questions are typical of the exam to be given at the end of this course.

Circle the letter by the best answer to the question.

1. The OSHA Excursion Limit (EL) involves the following:
 - a. 20 minute sampling
 - b. 2 fibers/cc EL
 - c. 30 minute sampling
 - d. sampling for excursions once per month

2. Which regulation covers worker protection?
 - a. AHERA
 - b. OSHA
 - c. NESHAP
 - d. NIOSH

3. Personal air sampling is conducted for the purpose of:
 - a. determining the cleanliness of the work area
 - b. proving that individuals are working each day
 - c. proving compliance with the PEL and EL
 - d. to check the fit test

4. Which asbestos-related condition is associated with large concentrations of asbestos inhaled over a long period of time?
 - a. Skin disorders
 - b. Mesothelioma
 - c. Lung cancer
 - d. Asbestosis

5. Prior to a roofing project in Connecticut, which of the following needs to be done?
 - a. Asbestos inspection by a Connecticut DPH licensed inspector
 - b. Evaluation by the competent person
 - c. Both of the above

6. Which agency regulates asbestos disposal in Connecticut?
 - a. DEP
 - b. OSHA
 - c. DPH

**Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09**

**Section 1
Background Information about Asbestos**

(I) Methods of recognizing asbestos, presumption of asbestos;

Key Words:

ACM = asbestos containing material ACBM = asbestos containing material

TSI = Thermal System Insulation

A. Identification of Asbestos:

1. Suspect ACBM

Any suspect material is assumed to be ACBM unless proven otherwise using a licensed inspector and laboratory analysis. Following are the types of ACBM:

a. Surfacing

- 1) Plaster or other troweled on material
- 2) Sprayed on material

b. Thermal System Insulation (TSI)

- 1) Pipe insulation
- 2) Boiler and breeching insulation
- 3) Tank insulation
- 4) Duct insulation
- 5) Other mechanical insulation applied to prevent heat loss or gain.

c. Miscellaneous Materials

- 1) Transite products
- 2) Floor tile and linoleum
- 3) Mastics, adhesives, caulks, putties and cements
- 4) Pre-formed boards and sheets such as acoustical panels
- 5) Gaskets, packings and electrical components
- 6) Roofing and other suspect exterior materials are suspect ACM.

**Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09**

2. Licensed and Accredited Inspector

Follows EPA, OSHA and DPH rules for inspection and collecting samples.

3. Laboratory Analysis: Mandatory Requirements

- a. PLM (polarized light microscopy)
- b. NIST Accredited Lab (National Institute of Standards and Technology)
- c. > 1 % asbestos

B. Physical appearance and Forms of Asbestos:

1. Physical Appearance of Asbestos

- a. Naturally occurring mineral fibers
- b. Fibrous forms can be seen with a microscope
 - 1) Parallel bundles of minute fibers.
 - 2) Smaller bundles called "fibrils."
 - 3) Minute individual fibers.
 - 4) Length-to-width ratio typically > 10:1

2. There are 6 asbestos fibrous mineral forms: 1 serpentine form and 5 amphibole forms.

a. Chrysotile (Serpentine)- Most common form of asbestos

- 1) White Asbestos
- 2) Wavy fibers
- 3) Considered the least dangerous type of asbestos
- 4) 93 percent of total domestic Asbestos products

b. Amphiboles -Less common, more dangerous forms, straight rigid fibers:

- 1) Amosite brown
- 2) Crocidolite - blue
- 3) Anthophyllite rare white form
- 4) Actinolite rare green form
- 5) Tremolite rare white form

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Asbestos Roofing Removal
5/14/09**

C. PROPERTIES OF ASBESTOS

Thermal insulating ability	Inexpensive
Virtually indestructible	Mechanical strength
Chemical resistance	Flexibility
Fire resistance	Friction and wear characteristics
Wet strength	Acoustical properties

D. Aerodynamic Properties of Asbestos fibers

1. Flight Characteristics

- a. Long, thin and light weight.
- b. Very small fibers
- c. Can get airborne with little force.
- d. Amphiboles get airborne more readily than Chrysotile
 - 1) Chrysotile picks up humidity which makes it heavier
 - 2) Kinks and weave of chrysotile help keep it together vs straight amphiboles.
 - 3) Special surfactants and removal encapsulants are needed with amosite and other amphiboles to wet them with water.
 - 5) Amosite is more costly to abate since it is harder to wet and gets airborne more readily.
- e. Humidity and moisture effects:
 - 1) Summer vs winter conditions: lower chrysotile volatility in summer.
 - 2) Reason for wetting: to make fibers heavy.
 - 3) Matrix effects of binders: binders tend to prevent fibers from getting airborne.
- f. Other factors that cause fiber release:
 - 1) Erosion
 - 2) Abrasion
 - 3) Vibration

g. Air Entrainment: Wet residues can dry and become entrained in air

**Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09**

2. Settling Time:

- a. Fibers may remain suspended in air indefinitely with moderate air movement and can spread throughout a building.
- b. Even in still air, fibers may take days to settle.

E. Uses and Locations of Asbestos

1. General Information:

- a. 3,600 products since the early 1900's.
- b. 90,000 tons of asbestos used in the USA in 1989 compared to 900,000 tons in 1973.

2. Asbestos Cement Products: "Transite"

- a. 65 percent of all asbestos used, Hard and tough flexible cement.

b. Flat or corrugated sheets

- 1) Siding
- 2) Tiles
- 3) Insulating board

c. Pipe

- 1) Rainwater drains
- 2) Gutters
- 3) Water mains = largest single use.

3. Major Building Uses:

a. Flooring:

- 1) Mastic (still used)
- 2) Floor tiles (rarely used after 1989)
- 3) Linoleum (top layer or felt backing up to 1989)

b. Thermal Insulation:

Pipes, ducts and vessels: Rarely used after 1980. Retards heat loss or gain

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Asbestos Roofing Removal
5/14/09**

c. Fireproofing and Structural uses in Condensation Control:

Surfacing on steel beams and decking: Rarely used after 1980. Delay or prevent collapse of structures in fires.

Applied to steel and concrete to minimize condensation.

d. Acoustical:

Used extensively prior to the 1970's for ceiling tiles and panels.

Surfacing on ceilings and sometimes walls: Rarely used after 1980.

e. Roofing: asbestos roofing used from 1910 to the present

- 1) Flashing
- 2) Tar- adhesives
- 3) Built up roofs- felts
- 4) Shingles

f. Transite Panels:

Rarely used after 1980. Frequently seen behind radiators and in siding

g. Electric cable insulation and lighting fixtures

h. Glues and putties

i. Preformed boards

4. Major Non - Building Uses (ACM):

a. Brake linings

b. Clutch facings

c. Gaskets

d. Reinforced plastics.

e. Appliances

**Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09**

II The health effects associated with asbestos exposure;

A. Nature of Asbestos Related Diseases;

Dose Response Relationships, Latency Periods and the Lack of a Safe Exposure Level

Key Terms:

Dose-Response relationship -

A principle in toxicology wherein increases in the dose, or exposure, result in proportional increases in the response, or effects.

Latency Period -

Length of time between exposure to a toxic substance and the onset or appearance of resultant disease. Asbestos-related diseases have relatively long latency periods.

1. Major Diseases:

a. Asbestosis:

- 1) Scarring of the lung tissue seen on x-ray.
- 2) Associated with breathing large amounts of asbestos.
- 3) A restrictive lung disease. When fibers lodge in the alveoli, the resultant scarring results in decreased surface area, thereby reducing the lung's ability to oxygenate the blood. Also, as the lung's ability to expand and the breathing capacity are reduced, patients become short of breath.
- 4) A progressive lung disease, which means that it can progress even after exposure is discontinued. If the disease process is advanced, it can cause disability and death.
- 5) Prevention and early detection include chest x-rays, pulmonary function tests and exposure history.
- 6) The latency period for Asbestosis is 5 - 10 years with very heavy exposure. Otherwise it may be 20 - 40 years.

b. Lung Cancer: - abnormal cell growth

- 1) Asbestos is a known human carcinogen.
- 2) Generally, a dose-response relationship exists: the risk of disease increases in direct proportion to the increase in Asbestos exposure.
- 3) However, for lung cancer, there is no known threshold, or "safe" dose, at which it can be said that the risk of this response, lung cancer, is zero.
- 4) Latency period > 15 years, with a peak at 30-35 yrs.

Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09

c. Mesothelioma:

- 1) A rare form of cancer of the pleural cavity or peritoneal cavity, associated only with Asbestos exposure.
- 2) An essentially incurable form of cancer.
- 3) Mesothelioma tumors are the uncontrolled growth of cells in the lining of the chest cavity (called the pleura) in between the chest walls and the lungs, or in the lining of the abdominal cavity (called the peritoneum).
- 4) Associated with low levels of Asbestos exposure.
- 5) Latency period for mesothelioma is up to 40 years.
- 6) Usually fatal within 1-2 years after diagnosis.

2. Minor Occurrence of Diseases:

a. Other Cancers- (Less common).

- 1) Gastrointestinal tract or digestive tract due to the ingestion of Asbestos fibers.
- 2) Vaginal (very rare)

b. Pleural Diseases - Less Serious Disease,

Thickening or scarring of the pleural tissues which normally have no serious health effect but indicate Asbestos exposure

B. Routes of Exposure to Asbestos fibers.

1. Lung diseases caused by inhalation (breathing)

a. Lungs continuously exposed to vapors and suspended particulate matter.

b. Defenses: Most particles, including Asbestos fibers, are trapped and eliminated by the defense mechanism.

- 1) Breathing passages lined with a sticky mucous layer that traps small particles.
- 2) Cilia line the bronchial tubes. These are hair-like projections that continuously move the mucous layer toward the mouth.

c. Some Asbestos fibers can be carried along in the air, down the bronchial tubes, and lodge in the lung tissue where they may remain and incite a reaction in the surrounding lung tissue.

d. Some fibers break into small fragments and are eliminated from the body.

e. Other fibers migrate to the mesothelial lining. These retained fibers trigger tissue defense reactions and create lung disease.

**Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09**

2. Less common gastrointestinal diseases caused by ingestion.
 - a. Ingestion means to take into the gastrointestinal system. May include eating or indirectly by swallowing fibers that were inhaled.
 - b. Asbestos can contaminate food, water or other beverage
 - c. Residues of asbestos on the skin may result in this extra exposure by hand to mouth activity.

C. Relationship Between Asbestos Exposure and Asbestosis, Lung Cancer, Mesothelioma, and Cancer of Other Organs.

1. Signs of exposure to Asbestos:

No way to tell except by:

- 1) Personal air monitoring or
- 2) Knowing that Asbestos is being disturbed in the area.

Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09

2. Relative Hazards of Asbestos Types

- a. All agree that the amphibole types are dangerous.
- b. Generally accepted that chrysotile Asbestos is less dangerous than amphiboles.
- c. Other important factors known are the fiber length and diameter which combined with the long latency make it extremely difficult to draw conclusions.
- d. The most prudent approach is to treat all forms of Asbestos with due care and minimize exposure.
- e. One point is generally agreed on: Crocidolite and amosite are more dangerous than chrysotile
- f. Much controversy over Chrysotile. some say it is harmless; some say just as bad as amphibole type asbestos.

3. Fiber size and shape:

- a. Fibers longer than 5 microns and thinner than 0.5 microns appear to be more carcinogenic than shorter and thicker fibers.
- b. Fibers longer than 8 microns are not generally respirable and much less dangerous.
- c. Therefore, thin fiber between 5-8 microns are the worst.

**Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09**

III The relationship between smoking and asbestos in producing lung cancer;

A. Synergistic effect between cigarette smoking and asbestos exposure;

1. Synergistic effect means the combined, or multiplicative, effect of two factors wherein the whole is greater than the sum of its parts.
2. Incidence of lung cancer is much higher among smokers who were also exposed to Asbestos:
3. Smokers not exposed to Asbestos ten times that of non-exposed, non-smokers.
4. Non - smokers exposed to asbestos have a risk of approximately five (5) times that of non-exposed, non-smokers.
5. Combination (synergistic) effect, among smokers who are also exposed to Asbestos, is 50 - 90 times that of non-exposed, non-smokers.
6. Extrapolation: Conclusions above about the synergistic effect have been extrapolated from data at high exposures to risk assessments for low exposures.
7. Greater lung cancer risk for smokers exposed to asbestos
8. Mesothelioma: No synergistic effect known.

B. Cigarette smoke has numerous other adverse effects.

1. Cigarette smoke deactivates the cilia.
2. Cigarette smoking can cause other respiratory diseases

C. Stop smoking and risk of lung cancer can decrease to close to that of a non-smoker.

D. Smoking Cessation Program Information- See Appendix J of 1926.1101 in the CD handout

The following organizations provide smoking cessation information:

1. The National Cancer Institute 1-800-4-CANCER*
2. American Cancer Society (404) 320-3333
3. American Heart Association, (214) 750-5300
4. American Lung Association, (212) 245-8000
5. Office on Smoking and Health, U.S. Department of Health and Human Services, 5600 Fishers Lane, Park Building, Room 110, Rockville, Maryland 20857.

Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09

Section 2

Summary of Work Practices and Personal Protection for Roofing Work With Asbestos

I The nature of operations that could result in exposure to asbestos

A. Aggressive Methods which can release asbestos fibers into the air from intact ACM:

1. Sanding
2. Grinding
3. Blasting
4. Abrading
5. Other method that
 - a. Breaks
 - b. Crumbles
 - c. Grinds or
 - d. Disintegrates

B The importance of necessary protective controls to minimize exposure

1. Engineering controls

a. When vacuum cleaners are used, they must be equipped with HEPA filters to collect all debris and dust containing ACM and PACM.

b. Wet methods, or wetting agents, to control employee exposures during asbestos handling, mixing, removal, cutting, application, and cleanup, except where employers demonstrate that the use of wet methods is infeasible due to for example, the creation of electrical hazards, equipment malfunction, **and, in roofing**, except as provided in paragraph (g)(8)(ii) of 1926.1101. (See below)

c. Demarcation of the work area with signs and barriers

d. Personal hygiene facilities

2. OSHA Roofing Work Practices: in 1926.1101 (g) (8) (ii):

a. Roofing material shall be removed in an intact state to the extent feasible.

b. Wet methods shall be used to remove roofing materials that are not intact, or that will be rendered not intact during removal, unless such wet methods are not feasible or will create safety hazards.

c. Cutting machines shall be continuously misted during use, unless a competent person determines that misting substantially decreases worker safety.

d. When removing built-up roofs with asbestos-containing roofing felts and an aggregate surface using a power roof cutter, all dust resulting from the cutting operation shall be collected by a HEPA dust collector, or shall be HEPA vacuumed by vacuuming along the cut line.

**Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09**

e. When removing built-up roofs with asbestos-containing roofing felts and a smooth surface using a power roof cutter, the dust resulting from the cutting operation shall be collected either by a HEPA dust collector or HEPA vacuuming along the cut line, or by gently sweeping and then carefully and completely wiping up the still-wet dust and debris left along the cut line. The dust and debris shall be immediately bagged or placed in covered containers.

f. Asbestos-containing material that has been removed from a roof shall not be dropped or thrown to the ground. Unless the material is carried or passed to the ground by hand, it shall be lowered to the ground via covered, dust-tight chute, crane or hoist:

1) Any ACM that is not intact shall be lowered to the ground as soon as is practicable, but in any event no later than the end of the work shift. While the material remains on the roof it shall either be kept wet, placed in an impermeable waste bag, or wrapped in plastic sheeting.

2) Intact ACM shall be lowered to the ground as soon as is practicable, but in any event no later than the end of the work shift.

3) Upon being lowered, unwrapped material shall be transferred to a closed receptacle in such manner so as to preclude the dispersion of dust.

g. Roof level heating and ventilation air intake sources shall be isolated or the ventilation system shall be shut down.

h. Removal or repair of sections of intact roofing < 25 square feet in area does not require use of wet methods or HEPA vacuuming as long as manual methods which do not render the material non-intact are used to remove the material and no visible dust is created by the removal method used. In determining whether a job involves < 25 square feet, the employer shall include all removal and repair work performed on the same roof on the same day.

**3. Alternative Work Practices and Controls 1926.1101 (g) (8) (vi) (as it applies to roofing):
Instead of the work practices and controls listed in paragraph (g)(8) (ii), the employer may use different or modified engineering and work practice controls if the following provisions are complied with.**

a. The employer shall demonstrate by data representing employee exposure during the use of such method under conditions which closely resemble the conditions under which the method is to be used, that employee exposure will not exceed the PELs under any anticipated circumstances.

b. A competent person shall evaluate the work area, the projected work practices and the engineering controls, and shall certify in writing, that the different or modified controls are adequate to reduce direct and indirect employee exposure to below the PELs under all expected conditions of use and that the method meets the requirements of this standard. The evaluation shall include and be based on data representing employee exposure during the use of such method under conditions which closely resemble the conditions under which the method is to be used for the current job, and by employees whose training and experience are equivalent to employees who are to perform the current job.

**Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09**

4. Alternative Methods of Compliance Extracted from 1926.1101 (g) (11): To be followed as long as the asbestos roofing remains intact: Extracted from

- a. Before work begins and as needed during the job, a competent person shall conduct an inspection of the worksite and determine that the roofing material is intact and will likely remain intact.**
- b. All employees performing work covered by this paragraph (g)(11) shall be trained in a training program that meets the requirements of paragraph (k)(9)(viii) of this section. (This course.)**
- c. The material shall not be sanded, abraded, or ground. Manual methods which do not render the material non-intact shall be used.**
- d. Material that has been removed from a roof shall not be dropped or thrown to the ground. Unless the material is carried or passed to the ground by hand, it shall be lowered to the ground via covered, dust-tight chute, crane or hoist. All such material shall be removed from the roof as soon as is practicable, but in any event no later than the end of the work shift.**
- e. Where roofing products which have been labeled as containing asbestos are installed on non-residential roofs during operations covered by this paragraph (g)(11), the employer shall notify the building owner of the presence and location of such materials no later than the end of the job.**

5. Respirators Extracted from 1926.1101 (h) and 1910.134 (See also Section 3)

a. If roofing is indeed intact as determined by the competent person, then a negative exposure assessment has been made and respirators are not required. (Note : if roofing is not intact, respirators would be required as well as certified workers.)

b. When respirator use is not required: 29 CFR 1910.134 OSHA Respirator Standard

1) An employer may provide respirators at the request of employees or permit employees to use their own respirators, if the employer determines that such respirator use will not in itself create a hazard.

2) If the employer determines that any voluntary respirator use is permissible, the employer shall provide the respirator users with the information contained in Appendix D to 29 CFR 1910.134 ("Information for Employees Using Respirators When Not Required Under the Standard"); { See CD Handout for this regulation} and

3) In addition, the employer must establish and implement those elements of a written respiratory protection program necessary to ensure that any employee using a respirator voluntarily is medically able to use that respirator, and that the respirator is cleaned, stored, and maintained so that its use does not present a health hazard to the user. Exception: Employers are not required to include in a written respiratory protection program those employees whose only use of respirators involves the voluntary use of filtering facepieces (dust masks).

**Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09**

c. A respirator and protective clothing (See Section 3) is required for non-intact roofing and also DPH requires certified workers for:

- 1) Roofing asbestos work when ACM is not removed in a substantially intact state.**
- 2) Roofing asbestos work that is not performed using wet methods, except for removal of ACM from sloped roofs when a negative-exposure assessment has been conducted and ACM is removed in an intact state.**
- 3) Class II and III asbestos work for which a negative-exposure assessment has not been conducted.**
- 4) Any work operations for which employees are exposed above the TWA or excursion limit.**

6. Hygiene facilities,

This is a clean area where a worker can clean himself off and change to street clothes. This is not required for intact removal by the asbestos standard. This should be outside the work area, either on the ground or on the roof.

Requirements Extracted from 1926.1101 (h)

a. Includes Class II asbestos work where exposures exceed a PEL or where there is no negative exposure assessment produced before the operation.

b. Establish an equipment room or area that is adjacent to the regulated area for the decontamination of employees and their equipment which shall consist of an area covered by an impermeable drop cloth on the floor or horizontal working surface.

c. The area must be of sufficient size as to accommodate cleaning of equipment and removing personal protective equipment without spreading contamination beyond the area (as determined by visible accumulations).

d. Work clothing must be cleaned with a HEPA vacuum before it is removed.

e. All equipment and surfaces of containers filled with ACM must be cleaned prior to removing them from the equipment room or area.

f. The employer shall ensure that employees enter and exit the regulated area through the equipment room or area.

7. Housekeeping procedures

a. Where vacuuming methods are selected, HEPA filtered vacuuming equipment must be used. The equipment shall be used and emptied in a manner that minimizes the reentry of asbestos into the workplace.

b. See also work practices above

8. Medical Surveillance (See Section 3)

**Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09**

SECTION 3

EMPLOYEE PERSONAL PROTECTIVE EQUIPMENT

A. CLASSES AND CHARACTERISTICS OF RESPIRATOR TYPES:

1. Air Purifying Respirators:

a. Negative Pressure:

Crimson colored HEPA filter NIOSH* approved for asbestos.
(*National Institute for Occupational Safety and Health)

Half Face-piece Mask ("Half Face")

Full Face-piece Mask ("Full Face")

b. Powered Air Purifying Respirator (PAPR):

Face piece can be tight fitting half-mask/full-face mask or helmet.

At least 4 CFM to a tight fitting facepiece

At least seven CFM to a loose fitting helmet or hood.

Batteries need constant attention

2. Supplied Air Respirators:

Deliver breathing air through a supply hose connected to the worker's facepiece.

Very high degree of protection

Can operate in oxygen deficient and toxic atmospheres.

Special training is needed to operate and maintain the individual system.

3. SCBA (Self Contained breathing apparatus)

Portable tank with fresh air

Short term or emergency escape use

**Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09**

B. LIMITATIONS OF RESPIRATORS:

1. Oxygen Deficiency:

Normal air contains about 20.9% oxygen.

Breathing air must contain 19.5 to 23.5 % oxygen.

Only supplied air or SCBA is OK in oxygen deficient air.

HEPA or other air purifying respirators do NOT protect against oxygen deficiency.

2. Toxic Contaminants:

HEPA filters do NOT protect against toxic vapors.

Special cartridges are needed for each class of vapors.

Always request a material safety data sheet (MSDS) when dealing with strange contaminants. The MSDS must say what type of respirator is needed.

Respirator suppliers and Industrial Hygienists should also be consulted.

C. PROPER RESPIRATOR SELECTION

1. By class of respirators for the hazard or combinations of Hazards as discussed above.

2. By protection factor: Select the respirator which provides the required protection factor.

a. Exposure Limits Developed by Research:

ACGIH- American Conference of Governmental Industrial Hygienists

NIOSH- National Institute for Occupational Safety and Health.

b. Enforced by OSHA, Limits for Asbestos:

PEL- Permissible Exposure Limit for Asbestos:

0.1 fibers/cc
8 hour time weighted average

EL- excursion limit:

1 fiber/cc
30 minute exposure.

**Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09**

c. Protection Factors:

The higher the protection factor, the higher is the protection.

A protection factor is a value obtained by dividing the concentration outside by the concentration inside the mask.

$$\text{Protection Factor (PF)} = \frac{\text{Conc. outside mask}}{\text{Conc. inside mask}}$$

Respirator Type	Protection factor
Half face neg press	10
Loose fitting PAPR or Type CE continuous flow	25
Full face, quantit. fitted or tight fitting PAPR	50

Supplied Air:

1/2 mask pressure demand	1000
full face pressure demand	2000
SCBA pressure demand	1000

D. DONNING, USE, MAINTENANCE, INSPECTION AND STORAGE PROCEDURES;

1. Donning:

- a. Medical approval required by OSHA for negative pressure respirators
- b. Only use the respirator for which fit tests were made.
- c. Inspect and repair if needed as detailed below.
- d. Use only correct parts of the same brand
- e. Install new cartridges as needed.
- f. Adjust straps. Respirator straps go under protective hood
- g. Seal check and adjust straps as needed. Move head around while fit checking to ensure proper fit.
- i. If fit is unsatisfactory, check for loose cartridges, missing gaskets and other defects (below) and adjust as needed or obtain new fitted respirator or parts.

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Asbestos Roofing Removal
5/14/09**

2. Use and Daily Maintenance:

a. Trouble

1) Negative Pressure Respirators:

a) Increased breathing resistance indicates filters are full. Leave work area immediately and change the filters.

b) Decreased breathing resistance indicates leak. Correct at once.

2) PAPR

a) Reduced air flow can be detected by feel and sound and indicates weak battery or plugged filters. Leave work area immediately and correct.

b) If battery goes, tight fitting PAPR becomes temporary negative pressure respirator.

b. Taking off

1) HEPA vacuum off any gross contamination.

2) Proceed to the shower with respirator still on.

3) Clean the respirator using soap and water and rinse.

4) Remove the cartridges and wash the respirator with detergent (disinfectant if needed) in warm water using a brush and wiping with a clean paper towel.

5) Wash the cartridge gaskets separately with warm water.

6) Rinse thoroughly in warm tap water to remove all traces of detergent and disinfectant.

7) Dispose of the wet respirator cartridges in a receptacle for Asbestos waste.

8) Proceed to the Clean (change) Room and dress

3. Storage:

Allow to dry on a clean paper towel for the next days use.

When dry, reassemble with the cartridges and package the unit in a 1-2 gallon zip loc bag with the exhalation valve up. Store free of overlaying material and equipment to avoid distorting the rubber.

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Asbestos Roofing Removal
5/14/09**

4. Maintenance of Air Purifying Respirators: Checking for Defects:

Half-face mask and full facepiece)

a. Rubber facepiece:

- 1) Dirt- Clean .
- 2) Cracks, tears, or holes - Issue new facepiece.
- 3) Permanent distortion- Obtain new facepiece.
- 4) Loose fitting valves or other parts- Replace or issue new facepiece).
- 5) Warped, cracked, torn or missing gaskets- Replace.

b. Headstraps:

- 1) Breaks, loss of elasticity or tears- Replace headstraps.
- 2) Broken or malfunctioning buckles or keepers- Obtain new parts or replace headstraps.

c. Valves:

- 1) Loose- Tighten or replace.
- 2) Dirt or residue- Clean or replace.
- 3) Rupture, missing cover or other defect- Replace.

d. Filter element:

- 1) Proper filter.
- 2) Missing or worn gaskets- Replace.
- 3) Worn, Cracked, dented or contaminated- Replace filter.

5. Fit-Test Methods:

FIT TESTS REQUIRED EVERY YEAR

SEAL CHECKS EACH TIME THE RESPIRATOR IS DONNED.

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Asbestos Roofing Removal
5/14/09

a. Qualitative FIT TEST (Useable in Field or Lab - pass/fail basis)

1) Irritant Smoke Test:

- a) Stannic chloride in sealed glass tubes
- b) Irritant smoke is sprayed/squeezed.
- c) Wear goggles to protect eyes.
- d) Move about and talk.
- e) Can't fake this test. Wearer coughs if there is a leak.
- f) Adjustments or replacement of the respirator is required if the respirator leaks.

2) Banana Oil and Saccharin:

- a) The same general procedure is used as for irritant smoke.
- b) Depend on the wearer's response to smell or taste and are not reliable.

b. Quantitative Fit Tests: (Lab Method)

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Asbestos Roofing Removal
5/14/09**

c. Seal check: (Field Test)

1) Negative Pressure Test

- a) Cover air inlets with the palms and inhale gently so the facepiece collapses slightly.
- b) Hold breath for about 10 seconds.
If the facepiece remains slightly collapsed and no inward leakage is detected, the respirator probably fits tightly enough.

2) Positive Pressure Test:

- a) Close exhalation valve and exhale gently into the facepiece.
- b) This should lift the mask off the face while first exhaling.

3) Always Seal check before use.

d. Factors that alter respirator fit:

- 1) Active field conditions
- 2) Length of time since lab test
- 3) Wear on equipment
- 4) Dust build up in HEPA filters
- 5) Reproducibility of mask adjustment
- 6) Growth of facial hair
- 7) Change in weight

e. Establishing a proper respiratory protection program;

A respirator program is required for any employer who issues employees respirators (OSHA 1910.134).

- 1) Written Program is Required
- 2) Program Administrator
- 3) Enforcement Procedures
- 4) Selection and Use of Respiratory Protection Equipment
- 5) Medical Surveillance (ANNUAL)
- 6) Fit-Testing annually
- 7) Respirator Assignment and Maintenance
- 8) Employee Training Program
- 9) Respirator Program Evaluation and Recordkeeping

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Asbestos Roofing Removal
5/14/09**

E. PERSONAL PROTECTIVE CLOTHING AND PERSONAL HYGIENE:

1. Selection and Use

- a. Protective clothing must be worn in the asbestos work area.
- b. The suit is needed to keep gross asbestos contamination off the body.
- c. Disposable coveralls with attached "feet" and hooded head covering made with breathable fabrics
- d. Selection of sizes: Most popular Suit sizes: triple (xxx) and double (xx).
- e. Too loose - may get caught. Tape with duct tape.
- f. Too tight - may rip.
- g. Other equipment:

- hard hats
- safety goggles
- protective gloves
- safety shoes. For high places wear rubber soled shoes
- knee pads

Keep these items HEPA vacuumed and stored in plastic bags between jobs.

2. Donning the suit and Work Area Entry:

- a. Don suit in clean area outside the work area
 - 1) Zip the suit down to the crotch
 - 2) Step into the suit and zip up
 - 3) Use duct tape if necessary to blouse or adjust fit
 - 4) Use duct tape to make a belt for personal pump.
 - 5) Place street clothes in locker stripping naked or at least to undergarments or swim suit.
- b. Don and Seal check respirator
- c. Pull hood over head
- d. Don any other needed safety equipment
- e. Enter via the shower Decon or the "bag out"
- f. No Eating, smoking chewing gum or tobacco.

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Asbestos Roofing Removal
5/14/09**

3. Taking off the Suit, Exit and Decontamination Procedures:

- a. HEPA vacuum contamination from self and equipment.
- b. Proceed to the Equipment Room and remove all clothing (except respirator)
- c. If wearing a sampler, place personal air sample cassette in clean zip loc pouch and HEPA vacuum or wet wipe the pump.
- d. Remove suit and dispose in asbestos waste receptacle.
- e. Leave on respirator.
- f. Proceed to the shower. Still wearing the respirator, clean the respirator and self using soap and water and rinse self in the shower. Dispose of the wet respirator cartridges in a receptacle for Asbestos waste.
- f. Following showering and drying off, proceed directly to the Clean (change) Room and dress in clean clothes. Clean clothes may be disposable clothing of a different color or otherwise distinctively different, for use outside the work Area, than suits used inside the Work Area.

F. QUALITATIVE RESPIRATOR FIT TESTING PROTOCOL USING IRRITANT SMOKE:

- 1. Prior to initial use of a respirator, whenever a change in conditions such as a different respirator facepiece type is used, and at least annually thereafter.**
- 2. Test subject clean shaven at facepiece sealing surface.**
- 3. Fit-testing of tight-fitting PAPR's in the negative pressure mode. This is accomplished by shutting off the power.**
- 4. Selection of respirators available and mirror available to evaluate the fit.**
- 5. Test subject informed about the selection process and trained in putting on respirators.**
- 6. Assessment of comfort shall include the following points:**
 - a. Position of the mask on the nose
 - b. Room for eye protection
 - c. Room to talk
 - d. Position of mask on face and cheeks
- 7. The following criteria shall be used to help determine the adequacy of the respirator fit:**
 - a. Chin properly placed;
 - b. Adequate strap tension, not overly tightened;
 - c. Fit across nose bridge;
 - d. Respirator of proper size to span distance from nose to chin;
 - e. Tendency of respirator to slip;
 - f. Self-observation in mirror to evaluate fit and respirator position.
- 8. Test subject conducts a seal check.**

**Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09**

- 9. If a test subject exhibits difficulty in breathing during the tests, she or he shall be referred back to the doctor who approved this individual for respirator use.**
- 10. If the employee finds the fit of the respirator unacceptable, the test subject shall be given the opportunity to select a different respirator and to be retested.**
- 11. To be discussed with test subject prior to the commencement of the fit test:**
 - a. Description of the fit test and test exercises that the subject will be performing.**
 - b. Test subject's responsibilities during the test procedure.**
- 12. The respirator shall be worn for at least 5 minutes before the start of the fit test.**
- 13. The fit test shall be performed while the test subject is wearing any safety equipment that may be worn during actual respirator use which could interfere with respirator fit.**
- 14. Test Substance delivery: The test substance is an irritant smoke (stannic chloride). Sealed glass and plastic tubes with substances to generate this smoke are available from IPCO safety supply company. When the tube ends are broken and air passed through them with an aspirator (squeeze bulb), a dense irritating smoke is emitted. The squeeze bulbs used are Sensodyne kits calibrated to deliver 20 cc of air per squeeze using the thumb and index finger to compress the bulb until the opposite walls are touching. By squeezing gradually over 6 seconds, 20 cc is delivered and using 10 squeezes/per minute, a rate of 200 cc/min of smoke is delivered.**
- 15. No form of test enclosure or hood over the test subject shall be used.**
- 16. The smoke can be irritating to the eyes, lungs, and nasal passages. The test conductor shall take precautions to minimize the test subject's exposure to irritant smoke. Sensitivity varies, and certain individuals may respond to a greater degree to irritant smoke. Care shall be taken when performing the sensitivity screening checks that determine whether the test subject can detect irritant smoke to use only the minimum amount of smoke necessary to elicit a response from the test subject.**
- 17. The fit test shall be performed in an area with adequate ventilation.**
- 18. Sensitivity Screening Check:**
 - a. Break both ends of a smoke tube
 - b. Attach one end of the smoke tube to a 1/2 ounce aspirator squeeze bulb calibrated to deliver 20-cc per squeeze.
 - c. Cover the other end of the smoke tube with a short piece of open rubber tubing to prevent potential injury from the jagged end of the smoke tube.
 - d. Advise the test subject that the smoke can be irritating to the eyes, lungs, and nasal passages and instruct the subject to keep his/her eyes closed while the test is performed.
 - e. Carefully direct one squeeze of the irritant smoke in the test subject's direction to determine that he/she can detect it.

**Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09**

19. Irritant Smoke Fit Test Procedure

- a. Test subject dons the respirator without assistance, and performs seal checks.
- b. The test subject instructed to keep eyes closed.
- c. Respirator not adjusted once the fit test exercises begin. Adjustment voids the test.
- d. The test operator directs the stream of irritant smoke from the smoke tube toward the face seal area of the subject, using the low flow pump or the squeeze bulb. The test operator shall begin at least 12 inches from the facepiece and move the smoke stream around the whole perimeter of the mask. The operator shall gradually make two more passes around the perimeter of the mask, moving to within six inches of the respirator.
- e. If the person being tested has not had an involuntary response and/or detected the irritant smoke, proceed with the test exercises.

20. Test Exercises

During the following exercises, challenge the respirator seal continually with the smoke, directed around the perimeter of the respirator at a distance of six inches at a rate of 10 gradual squeezes per minute (200 cc/min). Withdraw the tube and stop pumping at once if the test subject should exhibit a characteristic cough reaction to the smoke. In this case the test has failed and the procedure needs to be repeated with another facepiece.

- a. 1 Minute Normal breathing. In a normal standing position, without talking, the subject shall breathe normally.
- b. 1 Minute Deep breathing. In a normal standing position, the subject shall breathe slowly and deeply, taking caution so as not to hyperventilate.
- c. 1 Minute Turning head side to side. Standing in place, the subject shall slowly turn his/her head from side to side between the extreme positions on each side. The head shall be held at each extreme momentarily so the subject can inhale at each side.
- d. 1 Minute Moving head up and down. Standing in place, the subject shall slowly move his/her head up and down. The subject shall be instructed to inhale in the up position (i.e., when looking toward the ceiling).
- e. 1 Minute Talking. The subject shall talk out loud slowly and loud enough so as to be heard clearly by the test conductor. The subject can read from the Rainbow Passage or count backward from 100.

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.

**Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09**

f. 1 Minute Bending over. The test subject shall bend at the waist as if he/she were to touch his/her toes.

g. Normal breathing. Same as exercise (1).

21. Follow-up

a. Question the test subject regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of respirator shall be tried.

b. If the subject reports detecting the irritant smoke at any time, the test is failed; repeat the entire sensitivity check and fit test procedure.

c. Each test subject passing the irritant smoke test without evidence of a response (involuntary cough, irritation) shall be given a second sensitivity screening check, with the smoke from the same smoke tube used during the fit test, once the respirator has been removed, to determine whether he/she still reacts to the smoke. Failure to evoke a response shall void the fit test.

d. If a response is produced during this second sensitivity check, then the fit test is passed.

G. Emergency response Plan- OSHA Regulations

29 CFR 1926.35 Employee emergency action plans.

1. Written plan required for fire and other emergencies unless there is 10 or less employees.
2. Emergency escape procedures and emergency escape route assignments;
3. Procedures to be followed by employees who remain to operate critical plant operations before they evacuate;
4. Procedures to account for all employees after emergency evacuation has been completed;
5. Rescue and medical duties for those employees who are to perform them;
6. The preferred means of reporting fires and other emergencies; and
7. Names or regular job titles of persons or departments who can be contacted for further information or explanation of duties under the plan.
8. Alarm system.
 - a. The employer shall establish an employee alarm system which complies with Sec. 1926.159.
 - b. If the employee alarm system is used for alerting fire brigade members, or for other purposes, a distinctive signal for each purpose shall be used.
9. Evacuation. The employer shall establish in the emergency action plan the types of evacuation to be used in emergency circumstances.
10. Training.
 - a. Before implementing the emergency action plan, the employer shall designate and train a sufficient number of persons to assist in the safe and orderly emergency evacuation of employees.
 - b. The employer shall review the plan with each employee covered by the plan at the following times:
 - (i) Initially when the plan is developed,
 - (ii) Whenever the employee's responsibilities or designated actions under the plan change, and
 - (iii) Whenever the plan is changed.
 - c. The employer shall review with each employee upon initial assignment those parts of the plan which the employee must know to protect the employee in the event of an emergency. The written plan shall be kept at the workplace and made available for employee review.

**Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09**

CFR 1910.120 Each employer must have an emergency response plan that is suitable for the work application.

1. An organizational structure showing personnel roles, lines of authority communications and training.
2. Pre-emergency planning
3. Safe distances and places of refuge
4. Site security and control measures
5. Evacuation routes and procedures
6. Decontamination procedures
7. Medical emergencies - treatment and first aid
8. Emergency alerting and response
9. Inspection for effectiveness of the plan
10. Personal protective equipment
11. Procedures for handling emergency response

H. EMERGENCY PROCEDURES, UNPLANNED RELEASES AND POTENTIAL EXPOSURE SITUATIONS:

1. Emergency Exits:

- a. Exits clear of equipment and materials at all times to permit emergency exit without interference.
- b. Brightly colored markings on the floor tracing the escape route and clearly mark the safe ways out of the containment. Each worker must be specifically instructed as to the emergency evacuation procedure. Make sure emergency lighting will operate.
- c. When fire or other emergency threatens safety, it is acceptable to cut or break barriers to get out.

2. Power Failure:

- a. Prior training on procedures including escape.
- b. Suspend work.
- c. Prior setup to provide emergency lighting.
- d. Back-up generators.
- e. Decontaminate as best can do. Don't shake out suits; roll them up. Keep respirator on.

Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09

f. Limit area of tracking until power is back on and then finish decontamination and clean up of any tracked dust.

3. Emergency Response to Asbestos Fiber Releases

- a. Isolate area with barriers and signs and keep material wet.
- b. Limit access to the area to trained personnel with respirator and a disposable suit.
- c. HVAC shutdown in the area if possible.
- d. Seal air vents especially return vents.
- e. Use a mini-enclosure or a glovebag as appropriate to address damaged ACM.
- f. HEPA vacuum any visible residue and cover the floor under the damaged ACM with 6- mil polyethylene.
- g. Use properly labeled leak-proof disposal containers.
- h. Patch the damaged area with appropriate asbestos free materials.
- i. Dispose of wastes in EPA approved landfill.

4. Medical Prevention and Response:

- a. Emergency plans must be ready in the event medical treatment is needed.
- b. Heat Related Disorders.
- c. Other Preparations:
 - 1) Emergency phone available
 - 2) First Aid Supplies and training
 - 3) CPR training
 - 4) Evacuation to designated medical facility
 - 5) For large projects involving physical and chemical hazards: arrangements made with local medical response units, can be coordinated with local hospital.

5. Fire Prevention and Response at Abatement Sites:

- a. Polyethylene burns similarly to candle wax. Fire resistant poly should be used but this is not much better than ordinary poly.
- b. Special precautions for containing hot surfaces
- c. Written emergency action plan and fire prevention plan

Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09

d. OSHA Fire Protection and Prevention includes requirements for:

- 1) Temporary or permanent water supply for fire protection
- 2) A trained fire fighting brigade as the project warrants
- 3) Portable fire extinguishers of a 2A rating for every 3000 sq ft of the Work Area. Point of travel to the nearest fire extinguisher must not exceed 100 ft.
- 4) Where more 5 gal of flammable or combustible liquid exists, a 10B fire extinguisher must be located within 50 ft of the material. (This is likely to include gasoline used for generators.)

e. Ensure that the area allows a quick and easy escape route and all workers are briefed on escape.

f. No smoking, no welding, no other ignition sources near flammable materials.

g. Make sure outside contractors or other building occupants who may work near the area are aware of the safety requirements.

h. Notify local fire marshal in advance.

i. Emergency equipment on hand including fire extinguishers and first aid kits.

j. Do not block exits

8. Training:

Workers must be instructed on fire, electrical, and other hazards peculiar to each job site. Instructions must include spill response, power failure and emergency evacuation procedures.

9. Sudden Releases Which May Result in Occupant and Worker Exposure:

a. Prevention

- 1) Planning ahead
- 2) Proper work practices and housekeeping
- 3) Training

b. Detection

- 1) Visual observation of dust
- 2) Air monitoring.

c. Response

- 1) Asbestos- site specific response needed.
- 2) Chemicals - see MSDS for spill response.

Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09

I. WASTE TRANSPORT AND DISPOSAL PROCEDURES INCLUDING PROPER CLEAN-UP

1. Cleanup

a. Equipment and Container Clean-up:

Note: Gross contamination may still exist inside HEPA vacuums and negative air machines. These are changed in a controlled Area if the filter becomes full. The controlled area may be adjacent to the intake of a negative air machine and on plastic drop cloths. Before moving this equipment out of the work area, always seal the inlets with plastic and duct tape.

1) Empty HEPA vacuum in the controlled area.

2) Negative air unit:

a) Outer filters on negative air units must be disposed of in the asbestos wastes, and the outside of the units thoroughly wet cleaned before removal from the Work Area. Remove all pre-filters and damp clean the unit.

b) Inner filters on negative air units must be changed when the filter gets full. This can be determined by a back pressure gauge on the unit, or using a manometer.

3) Sealed waste containers and all equipment used in the Work Area must be included in the clean-up and must be removed from Work Areas.

4) When decontamination is not possible or feasible, the object must be wrapped in two air tight layers of 6 mil polyethylene and the outside thoroughly cleaned before removal or placed in an airtight metal drum with a locking lid. Includes:

a) HEPA vacuums and accessories

b) Asbestos insulated or coated materials removed intact without stripping

c) Construction materials

d) Tools

e) Electrical equipment

f) Decon components

g) Negative air units, and

h) Anything else.

Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09

2. Transportation and Disposal:

- a. Asbestos wastes must be wet.
- b. No visible emissions.
- c. Must be sealed in water and air tight containers.
- d. Double 6-mil polyethylene bags.
- e. Commercial fiber drums designed for asbestos wastes.
- f. Bulk storage and transportation vessels must be lined, air and dust tight.
- g. Outer containers must be clean and tightly sealed.
- h. May be specially lined dumpsters or trucks. Contained "Suck trucks" may be used provided the transfer is HEPA filtered and emissions monitored.
- i. Waste must not be liquid.
- j. Must be labeled per OSHA regulations in large legible letters:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD
- k. The waste must go to an EPA approved landfill for asbestos wastes.
- l. Disposal in Connecticut - DEP permit is needed.
- m. For NESHAP covered jobs: Also label each container with the name of the generator and the name of the work site.
- n. Waste manifest completed. One copy goes with the shipment and one copy is kept by the contractor.

J. Medical Surveillance

1. Required for those employees who:
 - a. Are issued a negative pressure respirator.
 - b. For a combined total of 30 days or more per year either engage in Class I, II or III work and/or who are exposed above the PEL or EL.
2. More than one hour of work counts as a day.

Note: This is one area where the General Industry Standard is stricter: All exposed above the PEL or EL, irrespective of the 30 days, must have medical surveillance.

Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09

3. At least once per year and at time of hire unless done within the year hired.
4. Requires
 - a. Examination under supervision of a licensed physician.
 - b. No cost to the employee.
 - c. At a reasonable time and place.
 - d. Requires a questionnaire with medical and work history with special emphasis directed to the pulmonary, cardiovascular, and gastrointestinal systems.
 - e. Medical Exam including pulmonary function testing of forced vital capacity (FVC) and forced expiratory volume at one second (FEV 1).
 - f. Optional chest X-ray if ordered by the physician.
 - g. Information provided to the physician.
 - 1) A copy of 1926.1101 with Appendices D, E, G and I;
 - 2) Description of the affected employee's duties as they relate to the employee's exposure;
 - 3) The employee's representative exposure level or anticipated exposure level;
 - 4) A description of any personal protective and respiratory equipment used or to be used; and
 - 5) Information from previous medical examinations of the affected employee that is not otherwise available to the examining physician.
 - h. Physician's written opinion
 - 1) Whether the employee has any detected medical conditions that would place the employee at an increased risk of material health impairment from exposure to asbestos;
 - 2) Any recommended limitations on the employee or on the use of personal protective equipment such as respirators; and
 - 3) A statement that the employee has been informed by the physician of the results of the medical examination and of any medical conditions that may result from asbestos exposure.
 - 4) A statement that the employee has been informed by the physician of the increased risk of lung cancer attributable to the combined effect of smoking and asbestos exposure.
 - 5) The employer shall instruct the physician not to reveal in the written opinion given to the employer specific findings or diagnoses unrelated to occupational exposure to asbestos.
 - 6) The employer shall provide a copy of the physician's written opinion to the affected employee within 30 days from its receipt.

**Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09**

Section 4

OSHA Construction Standard: (29 CFR 1926.1101)

Final Rule Effective 10/11/94; As Amended 7/30/98 and As Amended by 1910.134 Eff 4/98.

1. Definitions Include:

Disturbance means activity that crumbles or pulverizes ACM or generates visible debris.

Employee exposure is defined as the exposure outside any respirator use. Designation of controls according to classification:

Class I work = TSI and surfacing removal of ACM or PACM (presumed asbestos containing material) (TSI and Surfacing have the same meaning as in EPA AHERA except drywall is not classed as surfacing but plaster is.

Class II work = Removal of ACM or PACM other than TSI and surfacing, i.e. miscellaneous material such as transite siding or sheetrock.

Class III work = repair and maintenance where ACM may be disturbed, less than a standard glove bag or less than 3 sq ft.

Class IV work = maintenance and custodial including work in general industry or construction industry associated with Class I, II and III work, i.e., custodial and maintenance work is Class IV work only if associated with a construction asbestos project.

Regulated area = an area established by the employer to demarcate areas where Class 1, 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.

2. Regulated Areas (Asbestos Work Areas) 1926.1101 (e)

a. All Class I, II and III Asbestos Work

Any area where Asbestos is disturbed (Does not depend on exceeding PEL)

b. Demarcation including Signs

1) Signs posted at all entries to Work Areas.

DANGER
ASBESTOS
CANCER AND LUNG DISEASE HAZARD
AUTHORIZED PERSONNEL ONLY
RESPIRATORS AND PROTECTIVE CLOTHING REQUIRED IN THIS AREA

2) Supplementary bilingual, pictograph, and/or graphics signs must be available.

3) Demarcation usually includes critical barriers or negative pressure enclosures in addition to signs.

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Asbestos Roofing Removal
5/14/09

- c. Limited Access (to authorized persons)
- d. Respirators and protective clothing
- e. Prohibited activities: No one can eat, drink, smoke, chew tobacco or gum, or apply cosmetics in the regulated area.
- f. Competent Person
- g. Personal monitoring
- h. Trained personnel

3. Exposure Limits:

- a. Permissible Exposure Limit (PEL): 0.1 f/cc, 8 hour TWA
- b. Excursion Limit (EL) 1.0 f/cc, 30 minute monitoring during each day's peak work disturbing asbestos in each Work Area
- c. Method: We can use the method that only counts asbestos fibers, OSHA Method ID-160 (Same as the method in Appendix B of 1926.1101) for personal samples.

4. Personal Air Sampling:

- a. Required for Class I, II and for Class III jobs.
(Remember OSHA requires personals, HEPA Vacuums and water on all these jobs)
- b. Required daily for each Work Area.
- c. Very tough to rely on first day or past work history to avoid doing this sampling.
 - 1) OSHA says that first day monitoring can no longer be relied on to predict the exposures of a job since the first day may have lighter exposure.
 - 2) Assessments are needed to rely on historical data.
- d. Employees must be able to observe this monitoring and the results must be posted daily at the work site.

Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09

5. Respirator Use:

- a. Operation specific requirements. Respirators are required for:
 - 1) Class I work
 - 2) Class II work where ACM is not removed intact
 - 3) All Class II and III work where the employer cannot produce a negative initial exposure assessment
 - 4) Class IV work in regulated areas (e.g. cleanup in a Class I job is Class IV work).
- b. Class I jobs require PAPR if the expected or actual exposure is from 0.1 - 1.0 f/cc for the 8 hr PEL. Supplied air must be used above 1.0 f/cc.
- c. In addition to the operation specific requirements for regulated areas, respirators are required at any time when exposure is above the PEL.
- d. A PAPR must be used when the employee wants it.

6. Protective Clothing

- a. Disposable Coveralls
- b. Laundering (for non-disposable clothing)
- c. Contaminated clothing.

Either as wastes or for laundering, handled as Asbestos Wastes.

- a) Must be transported in sealed impermeable bags, or other closed, impermeable containers, and
 - b) Have required labels.
- d. Inspection of protective clothing.
 - 1) The competent person shall examine work suits worn by employees at least once per work shift for rips or tears.
 - 2) When rips or tears are detected, immediately mend or replace.

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Asbestos Roofing Removal
5/14/09**

7. Hygiene Facilities and Practices: "Decons"

a. See OSHA requirements above in Section 2.

b. Configuration.

1) Decons or Decontamination areas: connected to the regulated area with an equipment room, shower area, and clean room connected to each other in series. See schematic drawings in the **CD** handout.

a) Equipment room. Supplied with impermeable, labeled bags and containers for the containment and disposal of contaminated protective equipment.

b) Shower Area unless the employer can demonstrate that it is not feasible. Provided per 29 CFR 1910.141(d)(3) (One shower per 10 employees or fraction thereof of each sex and soap with warm water.)

c) Remote Shower: Where the employer can demonstrate that it is not feasible to locate the shower between the equipment room and the clean room, or where the work is performed outdoors, the employers shall ensure that employees:

(1) Remove asbestos contamination from their work suits in the equipment room using a HEPA vacuum before proceeding to a shower that is not adjacent to the Work Area; or

(2) Remove their contaminated work suits in the equipment room, then don clean work suits, and proceed to a shower that is not adjacent to the Work Area.

d) Clean Change Room. The clean room shall be equipped with a locker or appropriate storage container for each employee's use. When the employer can demonstrate that it is not feasible to provide a clean change area adjacent to the Work Area or where the work is performed outdoors, the employer may permit employees engaged in Class I asbestos jobs to clean their protective clothing with a portable HEPA-equipped vacuum before such employees leave the regulated area. Following showering, such employees however must then change into street clothing in clean change areas provided by the employer which otherwise meet the requirements of this section.

2) Decontamination Area Entry Procedures. The employer shall ensure that employees:

a) Enter the decontamination area through the clean room;

b) Remove and deposit street clothing within a locker provided for their use; and

c) Put on protective clothing and respiratory protection before leaving the clean room.

d) Before entering the regulated area, the employer shall ensure that employees pass through the equipment room.

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Asbestos Roofing Removal
5/14/09

- 3) Decontamination area exit procedures. The employer shall ensure that:
- a) Before leaving the regulated area, employees shall remove all gross contamination and debris from their protective clothing.
 - b) Employees shall remove their protective clothing in the equipment room and deposit the clothing in labeled impermeable bags or containers.
 - c) Employees shall not remove their respirators in the equipment room.
 - d) Employees shall shower prior to entering the clean room.
 - e) After showering, employees shall enter the clean room before changing into street clothes.
- 4) Lunch Areas. Whenever food or beverages are consumed at the worksite where employees are performing Class I asbestos work, the employer shall provide lunch areas in which the airborne concentrations of asbestos are below the permissible exposure limit and/or excursion limit.

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Asbestos Roofing Removal
5/14/09**

c. Requirements for Class IV work.

Employees performing Class IV work within a Class I, II or III area must comply with the respective hygiene practice required within that area.

d. In Review: Considering OSHA and DPH Regulations, There are Four exceptions to Contiguous Shower Requirement:

- 1) Outdoors
- 2) Where is shown not to be feasible.
- 3) Class III jobs.
- 4) Any job involving less than 3 sq ft or 3 lin ft of ACM.

8. Medical Surveillance:

See section 2 above.

9. OSHA Asbestos Record Retention

- a. Exposure monitoring results (30 years)
- b. Medical surveillance records (duration of work +30 years)
- c. Training records (one year)

10. Presumption of asbestos: Assume material is asbestos or test to prove otherwise.

- a. All TSI and surfacing materials installed before 1980* are PACM.
- b. All floor tile and roofing installed before 1980* is assumed to contain asbestos.

*Note: Don't let the dates fool you since EPA and DPH, and DEP do not recognize any time limits.

- c. Assumed asbestos materials as adopted by EPA are also asbestos unless shown to be otherwise. (These are timeless and don't recognize any age limit.)

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Asbestos Roofing Removal
5/14/09

- d. If the owner wishes to not assume materials are asbestos, OSHA requires the following:
- 1) Inspection and sampling using an EPA Accredited Inspector.
 - 2) Sampling requirements for bulk samples are now the same as the EPA requirements. For each homogeneous area:
 - a) Surfacing:
 - 3 samples up to 1000 sq ft,
 - 5 samples for 1-5000 sf
 - 7 samples above 5000 sf
 - b) Miscellaneous Materials: in a manner sufficient to be correct. (Industry practice is to generally take 3 samples unless it is a patch or very small area.)
 - c) TSI 3 samples
 - 3) PLM analysis: Lab used must be NIST or AIHA proficient in bulk sample analysis. AIHA Proficiency is rated twice a year by AIHA based on ability to run unknown samples for asbestos content.
 - 4) To prove material in a homogeneous area is not asbestos, all samples in the area must test negative (<1% asbestos).
- e. Building owner or employer is responsible for treating the above materials as asbestos.
- f. If there is good cause to know that a material is asbestos containing the employer and/or building owner is deemed to know that fact. This includes material besides those mentioned above.
- g. Debris in an enclosed area where TSI or surfacing is present, and not intact, is presumed to be asbestos containing.

11. Hazard Communication Requirements for Employers Besides Owners:

- a. Employers who discover the presence of ACM or PACM on the worksite must notify the project or building owner.
- b. On worksites having multi employers:
 - 1) The person who discovers the material is also to notify the other employers.
 - 2) An employer planning Class I or Class II asbestos work is to inform all the other employers on the site of the location and quantity of these materials and the measures to be taken to protect them from exposure.

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Asbestos Roofing Removal
5/14/09

c. Employers who are not owners planning Class I, II or III work must notify the owner of the location and quantity of ACM and PACM known or later discovered.

- 1) Within 10 days of completion of Class I or II asbestos work, the employer of the employees who performed the work shall inform the owner and employers who will be working in the area of the quantity and PACM or ACM remaining in the former regulated area and the final monitoring results.
- 2) For inadvertently discovered ACM/PACM there is a 24 hour notification requirement to the owner and all employers at the site.

12. Owners - Notification and Labeling

a. Building "Owners:

- 1) OSHA considers building owners as statutory employers, who must "take necessary and appropriate action to protect employees other than their own..."
- 2) OSHA is requiring the owner to receive, maintain and communicate knowledge of the location and amount of ACM or PACM to employers of employees who may be exposed.
- 3) The building owner must keep records of all information received through this notification scheme, or through other means, which relates to the presence, location and quantity of ACM and PACM in the owner's building, project or vessel and transfer all such information to successive owners.
- 4) OSHA has defined 'building owner' to include those lessees who control the management and record keeping functions of a building/facility.
- 5) When the lease expires the records go to the owner or the next lessee.

b. Owners must notify of the location of ACM/PACM:

- 1) Employers who bid for work
- 2) Tenants
- 3) Employees

c. Asbestos materials must be visibly labeled when feasible as close to the installed material as feasible:

- 1) In construction areas where there is any possibility for disturbance.
- 2) In areas of buildings where they may be disturbed by any type of construction related activity including custodial, maintenance or outside contractors.

d. Exemption: products which the manufacturer demonstrates cannot release fibers in excess of the PELs. OSHA has found that this exemption will never apply to PACM (surfacing or TSI); rarely will it apply to other asbestos containing materials.

e. Housekeeping workers must be informed that all resilient floor material that they clean buff or otherwise maintain may contain asbestos.

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Asbestos Roofing Removal
5/14/09

13. Note on Assessments which are discussed below.

- a. There are 2 kinds of assessments done by a competent person: one is called "Initial Exposure assessment" which is required for Class I, II, and III jobs; and the other is called "Negative initial exposure assessment", which is an optional process.
- b. A new Initial Exposure Assessment must be produced immediately before or at the initiation of a new job. Employers may evaluate repetitive operations with highly similar characteristics, as one job, such as cable pulling in the same building so long as historic data used reflect operations of the same duration and frequency."
- c. The best approach for the monitor is to see that personal air sampling is done daily, evaluate those results and also to complete the pre-abatement inspection form in the hand-outs.

14. Initial Exposure Assessment:

- a. Class I, II, III jobs: Immediately before each job or at the beginning of each job unless a Negative Initial Exposure assessment has already been made for this job.
- b. Purpose is to ascertain actual or expected employee exposures during the job, to make sure that all control systems are appropriate for the operation and will work properly.
- c. Basis of assessment:
 - 1) Assessment shall be based on personal air monitoring for this job, if feasible, and
 - 2) Consideration of all observations, information or calculations which indicate employee exposure to asbestos, including any previous monitoring. The initial assessment may conclude that exposures are likely to be below the PEL only as the result of a negative initial exposure assessment.

15. Negative Initial Exposure Assessment:

It is possible, but difficult, to make a Negative Initial Exposure Assessment for any one specific asbestos job by any one of three methods:

- a. Objective Data: Use objective data to demonstrate that the product involved in the work or the process used cannot exceed PEL's. (Note: objective data is recognized by OSHA for intact roofing based on data previously evaluated.)
 - 1) This is virtually impossible for Class I work,
 - 2) Very difficult to prove for Class II work and
 - 3) May apply to Class III or IV work.

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Asbestos Roofing Removal
5/14/09

b. Historical Data: Monitoring data from prior jobs closely resembling the present job (PEL and EL):

- 1) Within 12 months of the present job
- 2) Monitoring and analysis done in accordance with the OSHA standard in effect at the time.
- 3) Data obtained during work operations closely resembling the present job considering:
 - a) Process used
 - b) Type of material
 - c) Control methods including placing and repositioning the ventilation equipment,
 - d) Work Practices including techniques used for wetting the ACM or PACM in the various circumstances encountered
 - e) Environmental conditions including impacts due to weather conditions
 - f) Employee training
 - g) Employee experience
 - h) Workplace conditions
 - i) Degree and quality of supervision
 - j) Duration of the job and corresponding monitoring

c. Personal Monitoring of the Present Job: (PEL and EL for Class I and II work)

- 1) For Class I jobs, we must assume PEL is exceeded until we actually have test results unless the steps in b. above are completed.
- 2) Furthermore, the results of the first day's monitoring cannot be used to predict the results for the additional days unless the operation is identical.

Attach Personal Monitoring Data for the Present Job: (PEL and EL) when available to the Summary Sheet on the following page.

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Asbestos Roofing Removal
5/14/09**

NEGATIVE EXPOSURE ASSESSMENT SUMMARY:

The purpose is to prove exposure is below the PEL of 0.1 f/cc.

1. Are the present crew and supervision at least as experienced and competent as prior crews/supervisors? _____
2. Do the process, conditions, materials, work practices of the historical jobs cited, closely resemble the present job being evaluated? _____
3. Does any days monitoring results indicate a mean TWA (8 hr) greater than 0.05 f/ cc for any employee? _____
4. Does any days monitoring results indicate a single EL value (30 min) greater than 0.5 f/ cc for any employee? _____
5. What training does the Competent Person performing this evaluation have: AHERA training as contractor/supervisor: ____ project designer _____ or inspector management planner course _____. Does the Competent Person meet the requirements in 1926.32: "one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them." _____
6. What is expected employee exposures during the job: PEL statistically less than 0.1 f/cc? _____ EL statistically less than 1 f/cc? _____.
7. Are all control systems appropriate for the operation and will they work properly? _____

To confirm this, inspect the actual work setup and document with the Pre-Abatement Check List in the hand-outs.

Conclusion: After consideration of all observations, information and calculations which indicate employee exposure to asbestos, including any previous monitoring: There is _____ is not _____ a high degree of certainty that employee exposures are likely to be below the PEL using the processes and practices outlined above for this job.

Workers will use a minimum of _____ NIOSH approved respirators for this job and also perform initial and periodic personal monitoring of exposures (PEL and EL) for each shift of this job. (Class I jobs require PAPR or Supplied Air Respirators if the expected or actual exposure is from 0.1 - 1.0 f/cc for the 8 hr PEL. Supplied air must be used above 1.0 f/cc.)

Negative Initial Exposure Assessment? Yes ____ No: _____

_____/_____
Competent Person Print Name Competent Person Signature/date

Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09

16. Methods of Compliance:

Note: For interior work, State regulations are still stricter except as specified below. For details See 1926.1101 (g) 4 if interested in details of the OSHA regulation.

a. Required in all jobs (Class 1, II, III and IV) regardless of the results of the Assessment:

1) HEPA vacuums

2) Wet methods "OSHA will allow employers to claim infeasibility if they cannot use wet methods due to conditions such as electrical hazards, hot surfaces, and the presence of technical equipment which cannot tolerate moisture. (NOTE for NESHAP jobs): ALL ACM MUST BE KEPT WET until sealed in a leak tight container .

3) Prompt cleanup and disposal in leak-tight containers.

b. Prohibitions:

1) High speed abrasive disc saws

2) Dry sweeping and dry cleanup including shoveling

3) Employee rotation

4) Compressed air unless in a negative pressure enclosure

17. Notification to OSHA

not pertinent for roofing

18. Exemptions:

not pertinent for roofing

19. Flooring Work:

not pertinent for roofing

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Asbestos Roofing Removal
5/14/09

20. Exterior work:

OSHA requires for disposal **wet, sealed and labeled** regardless of interior or exterior.

a. "OSHA believes that outdoor Class I work may be safely done without (negative pressure) enclosures. Therefore 1926.1101 paragraph (g) allows all outdoor Class I work to be conducted using other control methods, such as a glovebag system...." Decontamination units are still required and including showers when feasible.

b. Transite Panel and Siding Removal on Exteriors Other Than Roofs:

1) OSHA is requiring a job by job evaluation by a competent person of Class II work including transite panel removal.

2) OSHA says that: For rare cases when the evaluation of material, condition, crew and past exposure data do not support a Negative Initial Exposure assessment, additional precautions including critical barriers and a respirator must be used.

3) No cutting, breaking or abrading unless other methods cannot be used.

4) Each piece sprayed with amended water before removal.

5) Unwrapped pieces lowered immediately to the ground using dust tight chute, crane or hoist. Wrapped pieces lowered by the end of the shift.

6) Nails shall be cut with a flat, sharp instrument.

c. Roofing Work: OSHA regulates roofing; DPH does not regulate exterior non-friable materials.

1) Keep intact to the extent feasible during removal

2) When not intact, wet methods are required when feasible. Not required when there is a safety hazard.

3) Cutting machine blades must be continuously misted during use unless a competent person determines that misting substantially decreases worker safety.

4) For power roof cutter with an aggregate roof, collect dust with a HEPA vacuum or HEPA dust collector. For smooth roofs, a HEPA vacuum or HEPA dust collector or wet sweeping/wiping can be used to clean up debris. Immediately bag the dust.

5) Do not throw or drop ACM to the ground. It can be carried, passed by hand or lowered using a covered dust tight chute, crane or hoist.

6) If ACM is not intact, lower unbagged material as soon as practicable but always by the end of the shift. While the material is on the roof it shall either be wet, placed in an impermeable waste bag, or wrapped in plastic sheeting.

7) When intact, lower to the ground as soon as practicable by end of the shift.

8) Upon being lowered, transfer unwrapped material to a closed receptacle.

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Asbestos Roofing Removal
5/14/09

- 9) Roof level HVAC must be isolated or HVAC must be shut down.
- 10) For repair or removal of less than 25 sq ft during a day involving intact sections, wet methods and HEPA vacuum can be omitted unless visible dust is generated.
- 11) For intact roofing, flashing or similar work, only the following need be done:
- a) Competent person inspection determines that roofing will remain intact.
 - b) All employees trained
 - c) No sanding grinding or abrading.
 - d) Methods which keep the material intact must be used.
 - e) No dropping or throwing to the ground.
 - f) Remove from the roof by the end of the shift.
- 12) Areas of the roof will be a regulated area where dust or debris may accumulate.
- 13) Only necessary work should be done on the roof while asbestos materials are being removed and the locations of the work should be selected to minimize exposure, such as upwind of the asbestos work. OSHA said the 20 ft barrier approach has merit, but the exact determinations should be made on site and could vary according to working conditions.

21. Removing Gaskets

not pertinent for roofing

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Asbestos Roofing Removal
5/14/09**

22. Additional Notes for Class III Work

not pertinent for roofing

23. Training requirements:

Training must be at no cost to the employee.

a. All inspector work: 3 days AHERA Training

b. Class I and II work = AHERA Training

- 1) 40 hours for supervisors
- 2) 32 hours for workers

c. Class III work = 16 hours equivalent to the EPA O&M worker training plus more training if the competent person so determines

d. Class IV work = 2 hours. **Can't disturb any asbestos.**

e. Competent Person Requirements:

AHERA training as contractor/supervisor, project designer or inspector management planner course. In addition to the following requirements in 1926.32: "one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them."

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Asbestos Roofing Removal
5/14/09**

24. Floor Maintenance- Housekeeping requirements:

not pertinent for roofing

25. Appendices:

- a. Appendices A,C,D,E and F of the General Industry Std are binding.
- b. Appendices A,C,D and E of the construction Industry Std are binding. B,F,H,I and K are not binding.
- c. Appendix A changed the same for all standards:
 - 1) In para 1 "such as the NIOSH 7400 method" is replaced: with: "the most current version of the OSHA ID-160 Method or the NIOSH 7400 method". Recommended flow rate for personal samples increased; now 0.5- 5 liters/ minute.
 - 2) In para 2 add "Do not reuse or reload cassettes for asbestos sample collection"
 - 3) Para 11 : "Each set of samples taken will include 10% field blanks or a minimum of 2 field blanks....from the same set of cassettes as used for the samples..".Any blanks representing counts higher than the detection limit shall be rejected.
 - 4) In the quality control section, inter-lab participation is required.
- d. Appendix J was added: OSHA Method ID 191 for bulk identification of asbestos.

**Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09**

Section 5

Work Practices

SECTION 5-1 ASBESTOS ROOFING ABATEMENT

A. PLANNING

- 1. Does not need a containment**
- 2. If friable, must be done by licensed contractor and certified staff.**
- 3. Careful sampling of all layers by a licensed inspector**
- 4. Delineation of asbestos and non-asbestos roofing**
- 5. Are there other asbestos materials besides roofing such as:**
 - a. Siding
 - b. Flues
 - c. Transite panels
 - d. Sheds and cupolas
 - e. Asbestos underneath the roof in the building which could be affected such as:
 - 1) roof drains
 - 2) spray on surfacing

B. SAFETY AND WORK ENVIRONMENT:

- 1. HVAC intakes to be protected**
- 2. Possible leakage of water into the building**
- 3. Fate of skylights and other protrusions**
- 4. Surrounding area use- close by homes, school**
- 5. Seasonal problems including:**
 - a. Antifreeze protection for the water to be used on the roof
 - b. Excessive heat or cold stress for workers
- 6. Altitude and pitch of the roof**
- 7. Precipice or walled edge**

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Asbestos Roofing Removal
5/14/09**

- 8. Accessibility from inside the building**
- 9. Possible location of clean change area**
- 10. Structural soundness of roof for work**
- 11. Pitch and hardness of grounds around the building for staging**
- 12. Fate of the building- demolition, reinstallation of new roof, etc.**
- 13. Special electrical safety including overhead power lines**
- 14. Fire prevention and escape**
- 15. Waste storage location and movement of the material to the storage area**
- 16. Availability of a remote shower**
- 17. Electrical power availability**
- 18. Is the roof covered with stone?**

C. NOTIFICATIONS:

1. DPH Notification.
2. Local Notification and building permit often required.

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Asbestos Roofing Removal
5/14/09**

**Section 5-2
General Information**

A. HEPA FILTRATION

1. HEPA Filter: high efficiency particulate air filter; designed to trap 99.97% of particles >0.3 microns.

2. Negative Air Units: Used mainly in interior abatement, but are very useful in exterior applications.

- a. Machines consist of a fan sucking air through a pre-filter and then pushing the air through the HEPA filter.
- b. Air monitoring of the HEPA unit exhaust is very important to ensure that filters are properly working.
- c. Accessories include exhaust and intake ducts and flanges and adapters to connect the duct work, and spare filters.
- d. Flow drops as filters plug and with longer duct runs.

3. HEPA Vacuums

- a. A vacuum cleaner with a HEPA filter.
- b. Air sucked into the cleaner first goes to a vacuum bag, then to a secondary filter and finally to the HEPA filter.
- c. Never use an ordinary vacuum cleaner since it will blow out fine ACM dust.

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Asbestos Roofing Removal
5/14/09

- d. Most HEPA vacuums move about 200 CFM (cubic ft/min) of air through the filter.
- e. Used for cleaning surfaces
- f. Used for cleaning self before leaving Work Area
- g. Operating instructions provided by the manufacturer of the machine are to be followed.
- h. See that attachments are available which are appropriate for use on each type of surfaces including brushes of various sizes, crevice tools, and angular tools.
- i. Filter change:
 - 1) When machine flow begins to get restricted.
 - 2) In a contained area or at least at the intake of a negative air machine
 - 3) Full set of protective clothing including appropriate respirator.
 - 4) Usually change bag and prefilter first and see if the flow is OK.
 - 5) Hose must be checked for blockage and cleaned by suction from a second HEPA unit. Do not blow out the hose since this will contaminate the area.
 - 6) Check gaskets, filters and vacuum bag for tears.
 - 7) A second HEPA unit can be used to advantage to clean out the unit being serviced.
 - 8) Use extreme caution to avoid release of asbestos dust into the environment.
 - 9) Used HEPA filters and vacuumed debris are to be included with the asbestos waste.
 - 10) After the servicing, the machine should be turned on to check the operation.
 - 11) Surfaces near the filter change must be cleaned up.
- j. Check daily for damage, especially power cords and switches.
- k. At the end of the job before the cleaner is to be taken out of the Work Area, it is to be sealed in leak proof wrapping after doing the following:
 - 1) Clean each attachment by sucking through the vacuum while tapping and wet wipe each attachment. Place the cleaned parts in a sealable plastic bag.

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Asbestos Roofing Removal
5/14/09**

- 2) Suck out and seal the end of the hose with duct tape to prevent dust from leaking.
- 3) Unplug and damp wipe the unit clean.

B. THE DECONTAMINATION UNIT (SEE DRAWINGS IN CD RAM,)

Used mainly in interior abatement but may be used for exterior work, sometimes without the shower or with a remote shower.

- 1. Equipment Room: contaminated area next to Work Area**
- 2. Shower Room: contiguous to and between equipment room and clean room.**
- 3. Clean Room:**
 - a. Storage of street clothes
 - b. Change area
 - c. Each room separated by an airlock

C. FRIABLE WASTE DISPOSAL CONTAINERS

- 1. Water and air tight.**
- 2. Must be labeled in large legible letter:**

DANGER

CONTAINS ASBESTOS FIBERS

AVOID CREATING DUST

CANCER AND LUNG DISEASE HAZARD

- 3. Double 6-mil polyethylene bags or special drums**
- 4. Bulk storage and transportation vessels must be air and dust tight**
- 5. May be specially lined dumpsters or trucks.**
- 6. Vacuum transfer devices and receptacles may be used provided the transfer and storage is contained to permit no dust evolved to the building or outside air.**

F. WET CLEANING EQUIPMENT:

Cloths, mops, rags, towels and sponges or other cleaning tools which have been dampened with amended water.

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Asbestos Roofing Removal
5/14/09**

G. PERSONAL PROTECTIVE EQUIPMENT (PPE):

See Section 3

H. PERSONAL AIR SAMPLING:

1. Low Volume Sampling Pumps and Equipment

(Used for personal sampling)

a. Battery powered personal sampling pump

1) The pump should be able to operate for eight hours starting on a fully charged battery at a flow rate of at least 1.7 L/M (liters/minute) against a resistance of six inches of water measured at the pump inlet.

2) Commercial battery operated-rechargeable sampling pumps are available from MSA, Bendix, Sensidyne and elsewhere.

3) The pump should have an external means of adjusting the flow rate and a rotometer to indicate the flow rate.

4) Allowed flow rate of 0.5 - 5 liters per minute

5) Pumps should be recharged routinely overnight at the end of each days work.

b. Field calibration device

1) Usually a ball rotometer with a range of 0-4 liters/min.

2) Higher range rotometers are available.

c. Tubing

Laboratory tubing such as rubber or plastic with 6- mm bore and about 100 cm length. Tygon or medium wall rubber tubing are commonly used.

d. Clothing spring clip

Since the pump will usually be installed on a worker, it must have a belt clip. The clip should be designed to prevent slippage from the belt even if its position becomes inverted.

e. Tubing-to-field monitor metal adaptor

A short plastic or metal adaptor with ridges on one end to grip the inside of the tubing. The other end is designed for a pressure fit into the field monitor. Modern cassettes are equipped with this built-in adaptor.

f. Field monitor or "cassette" (filter and holder)

g. Sealable plastic bag such as a Zip-Loc bag to contain sample cassettes and parts

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Asbestos Roofing Removal
5/14/09**

2. Sampling media, types of filters, types of cassettes,

a. Field Monitor (Cassette = Filter and Holder). Millipore or equivalent. The unit consists of:

- 1) Conductive plastic case for Aerosol monitoring, consisting of a filter holder, and a 50-mm conductive cowling with an end cap.
- 2) 25- mm diameter, plain white mixed cellulose ester (MCE) membrane filter, (pore size of 0.8-1.2 micrometers for PCM and 0.4 micrometer for TEM.)
- 3) Support pad. The pad is a stiff, thick, lint-free and porous disc that rests on a rim or on studs in the cassette bottom.
- 4) Two plastic sealing caps.
- 5) The outside mating surfaces of the field monitors may be covered with a "shrink-fit" band to provide proper sealing and a writing surface for filter identification.
- 6) The OD of the filter is 25 mm, but since part of the housing covers the filter, the true effective diameter is roughly 22 mm.
- 7) Manufacturer's specification requires an effective filter area of 385 sq mm.

b. Filter Orientation:

- 1) MCE filters are cellulose strands bound together in a web called "tortuous pore" and display a very irregular surface when observed under magnification.
- 2) Filters are always placed facing at a 45 degree angle down toward the ground during sample collection and sampling is done "open faced" with the plug and the end cap off the inlet.

c. Storage and Shipment of Filters;

- 1) The field monitors in which the samples are collected should be shipped in a clean and rigid container with sufficient dust- free packing material to prevent jarring and crushing.
- 2) Never transport loose samples.
- 3) Never use dusty packing materials.
- 4) Always inspect cassettes for gross contamination after sampling and before shipment. Repeat the sampling as needed or take any corrective action needed.
- 5) Make sure cassettes are sealed with conductive cowlings in place.
- 6) Do not use plastic packing such as polystyrene foam which generates static electricity.

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Asbestos Roofing Removal
5/14/09

- 7) Sealable containers with sample silos and cover to avoid contamination or shock which may dislodge fibers from the surface.
- 8) Security seal to learn if package has been opened in transit.
- 9) Each sample labeled

3. Calibration of Flow Rate:

- a. OSHA Regulations require calibration of the sampling pump with a representative filter between the pump and the calibration device at the start and end of each sample.
- b. Frequency of Calibration: We recommend the following:
 - 1) Lab calibrate all rotometers with a soap bubble meter when new.
 - 2) In addition, lab check the rotometers vs soap bubble meter
(A soap-bubble buret is a primary standard including timed passage of bubbles through an inverted buret.)
 - 3) In the field, do external rotometer checks upstream of the filter at the beginning and end of each sample. Record these data on the sample worksheet.

4. Secondary Calibration Standards - Rotometers:

- a. General:
 - 1) A secondary standard is any air flow measuring instrument that does not fit the definitions of a primary or intermediate standard and has been calibrated by a primary standard.
 - 2) The rotometer is the principal secondary standard.
 - 3) A rotometer is a transparent tapered tube containing a float which is typically a round ball.
 - 4) The theory of operation is that air passing up through the tube must push around the ball to get out. As the ball rises, its sides get further from the wall of the tube and eventually there is not enough pressure drop to cause a further rise. The ball will then remain suspended at a pressure proportional to the flow rate indicated.
 - 5) Take the ball reading at the center of the ball and look straight across the face plate. Always make sure the rotometer is vertical, since canting it will cause errors.

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Asbestos Roofing Removal
5/14/09

b. Pump Rotometer:

- 1) The low flow sampling pump usually has a ball rotometer which typically indicates a flow rate from 0-4 l/min.
- 2) The pump rotometer is usually wrong; assume it to be so. Usually the actual flow is lower than the flow indicated by the rotometer.
- 3) The pump rotometer is useful in quickly detecting large increases in the reading signaling a leak or a ruptured cassette or large decreases in the reading indicating overloading of filters, crimped tubing or a dying battery. Internal leaks are checked by turning the pump on to full flow and plugging the inlet. If no leaks are present, the pump should nearly stop and the pump rotometer should read zero.

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Asbestos Roofing Removal
5/14/09**

- 4) Use of the secondary standard rotometer in the field upstream of the filter is strongly recommended to detect leaks and other problems.
- 5) The actual flow rate is said to be the reading of the reference calibration device in liters/min (l/min). The true value of the flow rate should be $\pm 5\%$ of the observed value.
- 6) It is possible to calibrate the pump rotometer against a primary standard (usually the soap bubble meter) and prepare a calibration chart for the apparent vs actual readings. However this approach is subject to large errors due to possible leakage and pressure changes in the field unless rigorous control of conditions is maintained.

c. External Rotometer:

- 1) In the field, the external rotometer is much more reliable than the pump rotometer. The pump flow should be determined from an external rotometer attached upstream of the cassette (where air enters the cassette).
- 2) The external rotometer is calibrated at the lab vs a soap bubble meter.
- 3) Each external rotometer should be given a serial number and the calibration data recorded in a log book and in a field worksheet.

5. Temperature and Pressure Effects

Temperature and barometric pressure affect the density of air. The temperature and barometric pressure must be measured and corrected for in the calibration process.

REMEMBER ALWAYS INSPECT THE CASSETTES WITH A FLASHLIGHT AFTER SAMPLING AND IF THE CASSETTES ARE VISUALLY CONTAMINATED OR THE FILTER IS RUPTURED, THEN REJECT THE SAMPLES AND REPEAT THE TESTS.

6. Completing Air Sampling Records and Calculations

a. PCM: (See sample of form FL 22 in **CD** Handout.

- 1) Complete the heading and sign the entry "sampled by" ____.
- 2) Record the sample number and description.
- 3) Enter the starting and end time of sampling that you measured with the rotometer. Average the two readings.
- 4) Determine the difference in minutes between the starting and end time in minutes.
- 5) Multiply the average flow rate in liters per minute times the minutes and enter the result in liters on the next column.
- 6) The analyst will complete the next four columns.

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Asbestos Roofing Removal
5/14/09**

7. Personal (Breathing Zone) Sample Collection

- a. Battery operated pump 2-5 liters/min.
- b. NIOSH 7400, OSHA Reference Method, or OSHA Method ID-160 may be used.
 - 1) All 3 methods count fibers greater than 5 microns in length.
 - 2) NIOSH 7400 counts all fibers whether they look like asbestos or not.
 - 3) OSHA reference method (ORM) 1926.1101 Appendix B does not count fibers which are obviously non-asbestos
 - 4) OSHA Method ID-160 is identical to ORM.
- c. Field Calibration:
 - 1) Remove the two end plugs and Calibrate the sampling pump with a representative cassette in line.
 - 2) Check the pump flow rate vs a rotometer connected to the intake of the cassette. A tapered hose barb is used to adapt the rotometer to the cassette opening.
 - 3) Store the end plugs in the plastic bag. Keep the bag sealed unless adding or removing cassettes or parts.
 - 4) A representative filter is always used in the sampling and calibration process. Filters of different resistances or a given filter changing resistance while sampling affects the pressure and therefore the actual flow rate.
- d. Blanks:

Two Field Blanks or 10% of sample set, whichever is greater: Momentarily open the end caps on the field blanks and re-seal
- e. Labeling and Sample Records:
 - 1) Label the sample cassette and blanks with unique ID #s.
 - 2) Store the field blanks in the plastic bag.
 - 3) Record the following information on a sample worksheet vs the sample ID #:
 - a) Date and site identification
 - b) Type of sample: personal, pre-abatement, during work, final, or general background sample.
 - c) Pump start and ending times
 - d) Starting and ending flow rates
 - e) Temperature and Barometric pressure
 - f) Name and signature of person collecting the sample
 - h) Description of the sample; e.g. Excursion or TWA.
 - i) Location of the Work Area.
 - j) Employee name and work operation
 - k) Type of respirator

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Asbestos Roofing Removal
5/14/09

f. Calculation:

sample volume (liters) = flow rate (liters/min) X time (min.)

The entire purpose of calibrating the sampling train is to find out what volume, expressed as cc or liters of air were collected.

(One liter = 1000 cc.) The volume is one of the components needed to calculate the concentration of fibers in air.

("Concentration" is the amount of something relative to the medium that something exists in. Percent (%) is a common expression of concentration that we are familiar with. The concentration of a substance in air is usually expressed as weight, number of particulates, or parts per unit volume of the air sampled.)

In the case of asbestos, the concentration units are fibers per cubic centimeter of air or f/cc.

In order to know how many cc have been collected we must know the flow rate which is usually expressed in liters/min (l/min). This is part of the information needed to later determine the concentration which is calculated after the PCM analysis of the air sample filter.

The sample volume is obtained by multiplying the sample time by the corrected flow rate as read from the standard used.

g. Mounting the Personal Sample:

- 1) Mount the Sampling Pump on the Worker and remove the end cap in order to collect an "open faced" sample.
- 2) Fasten the sampling pump to the worker's belt and fasten the cassette near the worker's mouth,
- 3) Then invert the monitor making certain the exposed filter is facing downward.
- 4) Turn the pump on to the calibrated flow rate (0.5 to 5 lpm).
- 5) Pumps must be mounted in a position which is comfortable for the worker and which provides a secure installation out of the way. In most cases the pump may be mounted at the worker's rear and the tubing strung over the shoulder so the cassette points downward at about 45 degrees.
- 6) Always tape the cassette to the tubing to prevent the cassette from falling off.
- 7) Adjust the position of the sample so that the tubing does not pinch.

h. Follow up Checking of Sampler:

- 1) Check the sampler position and pump flow rate periodically during the sampling period and record each reading in the worksheet.
- 2) Always check the flow at the end of the sample and record the final reading and time the sample ends in the log book.

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Asbestos Roofing Removal
5/14/09

c. 8-hour TWA Samples:

Samples taken to determine the 8-hour, time-weighted concentration may have to be changed several times to prevent overloading.

i. "Excursion Limit" (EL) Samples:

1) Separate daily sampling must be conducted for the "Excursion Limit" (EL) of 1.0 f/cc over a 30 minute sampling period.

2) The EL sample may be taken as one increment of the 8 hour time weighted average PEL. (see discussion on below on the EL.

j. Recharging of Pumps:

1) Follow manufacturer's instructions. Check the voltage of the pump battery with a voltmeter both with the pump off and while it is operating to assure adequate voltage for operation.

2) If necessary, charge the battery to manufacturer's specifications.

3) Pump batteries that are repeatedly used for short times and then prematurely recharged will develop a "memory" and eventually the battery will run down at the time it remembers.

4) One approach is to fully discharge the battery by running until the battery is depleted and then recharge at the end of each days work.

5) Another approach is to keep a log of operating and charging times and follow the manufacturer's recommendation for hours of operation before recharging.

k. Pump records:

Keep an operating log of each pump including the serial number, date put into service, and dates of use and calibration data.

8. Review of Strategy for Daily Personal Samples to Determine EL and PEL Compliance:

a. Objective:

Personal testing is needed for the required assessment.

b. Method: NIOSH METHOD 7400 (PCM) OR ORM OR ID-160

c. Samples Must Include Daily:

30 min excursion limit samples and

8 hour time-weighted average concentration samples.

d. Personal air sampling results must be at the work site within 24 hours

Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09

- e. The sampling must cover each type of work operation.
- f. Excursion limit monitoring be conducted for each shift, each job classification, and each Work Area in which operations are most likely to produce exposures above the EL.
- g. Sampling and calibration for the excursion limit is conducted by the same procedure as that used for monitoring the PEL. One or more samples collected from the breathing zone over the 30 minute period are analyzed, and the results used to determine the 30-minute exposure.
- h. The table on the next page shows the optimum flow rates and sampling times required to reach a limit of detection which reliably falls under the 1.0 f/cc EL.

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Asbestos Roofing Removal
5/14/09**

**QUANTITATION LIMITS FOR
EXCURSION LIMIT ASBESTOS SAMPLING**

FLOW RATE	SAMPLING TIME F/CC	LIMIT OF LOWER QUANTITATION, LOQ
5.0 lpm	30 min.	0.0323
2.5 lpm	30 min.	0.065
2.0 lpm	30 min.	0.081
1.6 lpm	30 min.	0.102
1.0 lpm	30 min.	0.163
0.5 lpm	30 min.	0.336

Using 25 mm cassette filters, Based on 10 fibers/100 fields

9. Interpretation of Personal Samples TWA result:

Ask the lab to calculate the TWA.

- a. Compare the time weighted average with the PEL and the 30 min excursion result with the EL:

10. Excursion Limit (EL)

1.0 f/cc over a 30 minute sampling period.

The EL sample may be taken as one increment of the 8 hour time weighted average PEL.

Example:

a Work Area has 6 workers; 4 removing pipe insulation and 2 bagging.

Worker 1 is removing in an area with much prior damage and likely to have the highest exposure of the group and especially when he begins.

The following should be done:

- a. Take a 30 min excursion sample for the first half hour for worker 1.
- b. Take a TWA sample for the balance of the work day for worker 1.

If the Work Area is dusty, split the remaining 7 1/2 hours between two samples to avoid blinding filters.

- c. Take an 8 hour TWA sample or two 4 hour samples for one of the workers bagging.

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Asbestos Roofing Removal
5/14/09**

i. Non-Intact Work

1. Personal Hygiene

a. Entry and Exit Procedures for the Work Area;

1) Restricted Access to Work Area:

- a) Signs to restrict access.
- b) Barriers
- c) Guard(s) at entries

2) Entry Procedure:

- a) All persons entering the Work Area must be properly authorized and equipped with proper respiratory protection and protective clothing.
- b) Enter the decontamination area through the clean room.
- c) Remove and deposit street clothing in locker.
- d) Put on protective clothing and respiratory protection in the clean room.
- e) Before entering the regulated area, employees pass through the equipment room.

3) Exit Procedure and Use of Showers:

- a) HEPA vacuum self **in the work area**.
- b) Equipment Room, remove all clothing.
- c) Do not remove respirators in the equipment room.
- d) Shower when feasible
- e) Clean room.

b. Other personal hygiene requirements:

Eating, smoking, chewing gum or tobacco and drinking prohibited in the Work Area.

**Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09**

2. Use of Wet Methods and Continuous Cleaning; Abatement Area Clean-up Procedures

a. Wetting ACM: The first step in asbestos stripping is to wet the material by spraying of ACM with amended water and then continue wetting during abatement.

NESHAP (and other regulations) require adequate wetting during stripping and maintaining the asbestos material in a wet condition in preparation for transport and disposal.

b. Wet cleaning surfaces:

Use cloths, mops, rags and towels and sponges or other cleaning tools which have been dampened with amended water, and by afterwards disposing of these cleaning items as Asbestos contaminated waste.

c. When Water Use is Not Feasible:

1) DPH/EPA: When it is not feasible to use water for reason of unavoidable equipment damage or for safety reasons, obtain prior written approval from EPA and/or the State DPH. (NOTE for NESHAP sized jobs): ALL ACM MUST BE KEPT WET until sealed in a leak tight container. Subject to such approval, water may be omitted during stripping but must still be added to the wastes as packaged.

2) OSHA: OSHA will allow employers to claim infeasibility if they cannot use wet methods due to conditions such as electrical hazards, hot surfaces, and the presence of technical equipment which cannot tolerate moisture.

d. Gross Removal:

1) Wet Asbestos Material freshly.

2) Remove intact or in manageably sized sections.

3) Carefully lower to the floor.

4) Drop restrictions.

a) For heights greater than 15 ft, use an inclined chute or scaffolding or containerize the material at the elevated level.

b) For materials removed at a height greater than 50 ft from the floor, a dust- tight, enclosed chute must be used to transport material to containers on the floor unless a raised scaffold is used to bag the wastes.

3) Do not let Asbestos materials dry out once disturbed during the work.

4) Repeat all cleaning operations constantly during the work to avoid any accumulations of debris.

Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09

e. Bagging:

- 1) Bag the wet Asbestos waste freshly. Perform bagging at frequent intervals to prevent drying and to prevent possible tracking of Asbestos wastes.
- 2) Seal filled containers with the wet Asbestos waste in the Work Area. Wet clean the outside of the sealed bag and move to the Holding Area (bagout) for double bagging by workers who have entered from uncontaminated areas dressed in clean disposable suits. Only the double sealed bags and other cleaned materials should exit via the bagout. Persons should leave only via the Decon- shower route.
- 3) The Asbestos materials must be packaged in impermeable dust tight containers (i.e., heavy duty six (6) mil polyethylene bags or sealed fiber pack drums):
- 4) All containers including the Asbestos waste storage unit must be labeled in large legible letter:

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

f. Cleaning Surfaces:

- 1) Remove visible accumulations of Asbestos Material and debris.
- 2) HEPA or Wet clean all surfaces within the Work Area.
- 3) Constantly change to fresh wipers, mops, brushes etc. Used wipers will only smear. Use clean water each time.

g. Lock-down

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Asbestos Roofing Removal
5/14/09**

J. WASTE TRANSPORT AND DISPOSAL PROCEDURES INCLUDING PROPER CLEAN-UP

NOTE: All roofing asbestos whether intact or non intact must be disposed of in an EPA approved landfill. Since there are none available in Connecticut without a special permit, these wastes normally go out of state. Contact licensed asbestos waste disposal companies for further information. See also DEP regulations in Section 6.

1. Cleanup

a. Equipment and Container Clean-up:

Note: Gross contamination may still exist inside the HEPA vacuums and negative air machines. These are changed in the Work Area if the filter becomes full.

1) Empty HEPA vacuum in the Work Area.

2) Negative air unit:

a) Outer filters on negative air units must be disposed of in the asbestos wastes, and the outside of the units thoroughly wet cleaned before removal from the Work Area.

b) Inner filters on negative air units must be changed at the beginning of the next abatement job inside the contained Work Area. Remove all pre-filters and damp clean

c) Change HEPA filters in the Work Area during early stages of abatement including gross removal if the filter becomes full. Otherwise change the inner filters at the start of next project after containment is established. Outer filters on negative air units must be moistened and disposed of in the asbestos wastes at any time when loaded or before taking from the site.

3) Sealed waste containers and all equipment used in the Work Area must be included in the clean-up and must be removed from Work Areas.

4) When decontamination is not possible or feasible, the object must be wrapped in two air tight layers of 6 mil polyethylene and the outside thoroughly cleaned before removal or placed in an airtight metal drum with a locking lid. Includes:

a) HEPA vacuums and accessories

b) Asbestos insulated or coated materials removed intact without stripping

c) Construction materials

d) Tools

e) Electrical equipment

f) Decon and shower components

g) Negative air units, and

h) Anything else.

Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09

- b. Lock-down: Must be done after the visual but before final air samples and allowed to dry before the samples. A leaf blower may be used to speed up the drying.
- 1) Spray encapsulate (lock-down) all stripped surfaces using a fine spray mist. Follow manufacturer's instructions for the airless sprayer and encapsulant.
 - 2) After all visible residue has been removed, spray apply a thin coat of Encapsulant to cleaned surfaces and to plastic barriers after cleaning.
 - 3) Lock-down spray is usually a skin irritant and tends to plug respirator cartridges and air samples, so avoid contact with the liquid and mist.
 - 4) Since the lock-down is invisible on most surfaces, monitor the process to ensure complete work.
 - 5) Air sampling for final clearance must be done after lock-down is dry.

2. Transportation and Disposal:

- a. Asbestos wastes must be wet.
- b. No visible emissions.
- c. Must be sealed in leak-tight containers.
- d. Bulk storage and transportation vessels must be lined, air and dust tight.
- e. Must be labeled per OSHA regulations in large legible letters:
DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD
- k. The waste must go to an EPA approved landfill for asbestos wastes, or where permitted a specially designated waste site for non-friable roofing..
- l. Disposal in Connecticut - DEP permit is needed.
- m. For NESHAP covered jobs: Also label each container with the name of the generator and the name of the work site.
- n. Waste manifest completed. One copy goes with the shipment and one copy is kept by the contractor.

**Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09**

G. USE OF HEPA VACUUMS:

1. Operating Instructions:

- a. Follow instructions provided by the manufacturer of the machines used.
- b. Workers must be trained in the specific operation and filter changing procedures.

2. Special Attachments Needed:

Brushes of various sizes, crevice tools, and angular tools.

3. HEPA Vacuuming Procedures:

- a. HEPA vacuums are used only on dry material.
- b. They are to be used in all stages of the work including the pre-cleaning, final cleanup and are used to supplement the wet cleaning operation.
- c. At the conclusion of the active abatement process, all surfaces in the abatement area must be thoroughly and completely HEPA-vacuumed. These surfaces include abated and non-abated surfaces exposed to asbestos dust generated by the abatement process.
- d. Final performance criteria for successful cleaning including HEPA vacuuming must be specified and include no visible residue and the successful final aggressive air test.

4. Maintenance of the HEPA Vacuum:

- a. HEPA vacuums must be properly maintained in accordance with manufacturer's instructions.
- b. Change filters in the work area at appropriate times during the abatement process, such as during gross removal. Operators must use extreme caution when opening the HEPA vacuum for filter replacement or debris removal, due to the potential leakage if the vacuum's seal has been broken and the vacuum's bag is disturbed. Operators shall wear a full set of protective clothing and equipment, including appropriate respirators, when performing this maintenance function.
- c. Include filters and bags in the asbestos wastes, making sure to wet the material before disposal.
- d. Once the final cleaning process is underway, filter changes must not be done in the work area and suction intakes must be sealed with plastic before removal from the work area.

**Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09**

H. PROPER CLEAN-UP

1. Cleaning

a. Surfaces:

1) Remove visible accumulations of Asbestos Material and debris. HEPA or Wet clean all surfaces within the Work Area. The secret to wet cleaning is to constantly change to fresh wipers, mops, brushes etc. Used wipers will only smear. Use clean water each time.

2) Use HEPA vacuum and amended water until there is no visible residue.

3) Decontaminate or wrap equipment before removal from area

b. Equipment and Container Clean-up:

c. Lock-down:

**Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09**

SECTION 6

OTHER PERTINENT REGULATIONS

Key points are presented from selected regulations. The professional should read the entire regulation referenced and be familiar with other existing regulations. Regulations vary in scope but overlap considerably. Some regulations are more detailed or are stricter than other regulations on certain requirements. Where regulations differ, the strictest provision must apply.

Section 6-1

U.S. EPA Asbestos Regulations

A. NESHAP

National Emission Standards for Hazardous Air Pollutants.

40 CFR Part 61 Subparts A (general) and M (Asbestos). Clean Air Act,

Covers practically all facilities, activities and buildings except some residential.

1. Requirements of Subpart M:

- a. Homes with 4 or less units exempted from regulation, unless a number of homes are done as part of the project or a home had former non-residential usage.
- b. **MUST** inspect for asbestos prior to any demolition or renovation project This includes roofing.
- c. PLM is official test method.
- d. Many new definitions including:

Demolition means any work involving taking out load supporting building members or intentional burning.

Renovation means altering a facility component in any way **including stripping of asbestos.**

Category 1 non-friable asbestos means resilient flooring, asphalt roofing, gaskets, and packings > 1% asbestos by PLM.

Category 2 non-friable asbestos means any other non-friable material with > 1% asbestos by PLM.

Regulated asbestos containing material (RACM) means any of the following:

- 1) Friable asbestos
- 2) Category 1 asbestos which has become friable
- 3) Category 1 asbestos which is subject to sanding, grinding, saw-cutting or abrading.

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Asbestos Roofing Removal
5/14/09**

4) Category 2 asbestos which has a high probability of becoming pulverized, crumbled or reduced to powder during the demolition or renovation work.

In other words RACM means asbestos which is friable or likely to become friable.

The EPA asbestos NESHAP

2. Notification Requirements Effective 10/1/97: in Maine, NH, Mass and CT.

Normal state DPH asbestos notifications (in CT of 10 calendar days or emergency notifications) satisfy NESHAP requirements and EPA does not also need to be notified. However, failure to notify DPH will also subject the party to EPA violation.

(In other states, one still must notify EPA directly.)

Note: Effective about June 2004, DPH requires notification of all demolitions.

3. Emission controls.

- a. No visible emissions
- b. Wet removal
- c. Material drop restrictions

4. Waste disposal manifests

Required by NESHAP

- a. Label each waste bag with site and generator name in addition to the usual OSHA labeling.
- b. EPA Approved Landfill
- c. Waste vehicle labeled during loading and unloading
- d. EPA must be notified if the dump receipt is not received within 45 days of the manifest date.

5. NESHAP (Supervisor) Training certification posted on site

6. Asbestos must be removed:

- a. Before demolition or renovation if friability is possible. Removal required before disturbance or dislodging will result or
- b. If the work precludes future removal.

Note: In some cases, non-regulated asbestos may be left in the affected area before demolition or renovation but the follow up work for waste disposal may be enormous since contaminated parts of the structure must be disposed of or the asbestos sorted out after demolition. These sites should be evaluated on a case by case basis. For interior asbestos, because of CT and OSHA regulations, it is usually necessary to properly remove the asbestos before disturbance.

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Asbestos Roofing Removal
5/14/09**

7. Unexpected Asbestos:

There must be a plan to handle unexpected RACM which is exposed during a project. If the unexpected RACM becomes part of the rubble, then all contaminated rubble must be properly disposed of.

8. Interaction with State and OSHA regulations:

- a. The NESHAP regulation potentially relaxes standards for Category 1 asbestos which would be significant if state regulations are relaxed.
- b. Other fine points of the regulations are in line with existing state or OSHA regulations and not mentioned here.

9. NESHAP Interpretive Rule for Roofing

**40 CFR PART 61 Appendix A to Subpart M—
Interpretive Rule Governing Roof Removal Operations**

I. Applicability of the Asbestos NESHAP

1.1. Asbestos-containing material (ACM) is material containing more than one percent asbestos as determined using the methods specified in appendix E, subpart E, 40 CFR part 763, section 1, Polarized Light Microscopy. The NESHAP classifies ACM as either "friable" or "nonfriable". Friable ACM is ACM that, when dry, can be crumbled, pulverized or reduced to powder by hand pressure. Nonfriable ACM is ACM that, when dry, cannot be crumbled, pulverized or reduced to powder by hand pressure.

Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09

1.2. Nonfriable ACM is further classified as either Category I ACM or Category II ACM. Category I ACM and Category II ACM are distinguished from each other by their potential to release fibers when damaged.

Category I ACM includes asbestos-containing gaskets, packings, resilient floor coverings, resilient floor covering mastic, and asphalt roofing products containing more than one percent asbestos. Asphalt roofing products which may contain asbestos include built-up roofing; asphalt-containing single ply membrane systems; asphalt shingles; asphalt-containing underlayment felts; asphalt-containing roof coatings and mastics; and asphalt-containing base flashings. ACM roofing products that use other bituminous or resinous binders (such as coal tars or pitches) are also considered to be Category I ACM.

Category II ACM includes all other nonfriable ACM, for example, asbestos-cement (A/C) shingles, A/C tiles, and transite boards or panels containing more than one percent asbestos. Generally speaking, Category II ACM is more likely to become friable when damaged than is Category I ACM. The applicability of the NESHAP to Category I and II ACM depends on: (1) the condition of the material at the time of demolition or renovation, (2) the nature of the operation to which the material will be subjected, (3) the amount of ACM involved.

1.3. Asbestos-containing material regulated under the NESHAP is referred to as "regulated asbestos-containing material" (RACM). RACM is defined in Sec. 61.141 of the NESHAP and includes: (1) friable asbestos-containing material; (2) Category I nonfriable ACM that has become friable; (3) Category I nonfriable ACM that has been or will be sanded, ground, cut, or abraded; or (4) Category II nonfriable ACM that has already been or is likely to become crumbled, pulverized, or reduced to powder. If the coverage threshold for RACM is met or exceeded in a renovation or demolition operation, then all friable ACM in the operation, and in certain situations, nonfriable ACM in the operation, are subject to the NESHAP.

A. Threshold Amounts of Asbestos-Containing Roofing Material

1.A.1. The NESHAP does not cover roofing projects on single family homes or on residential buildings containing four or fewer dwelling units. 40 CFR 61.141. For other roofing renovation projects, if the total asbestos-containing roof area undergoing renovation is less than 160 ft, the NESHAP does not apply, regardless of the removal method to be used, the type of material (Category I or II), or its condition (friable versus nonfriable). 40 CFR 61.145(a)(4). However, EPA would recommend the use of methods that damage asbestos-containing roofing material as little as possible. EPA has determined that where a rotating blade (RB) roof cutter or equipment that similarly damages the roofing material is used to remove Category I nonfriable asbestos-containing roofing material, the removal of 5580 ft of that material will create 160 ft of RACM. For the purposes of this interpretive rule, "RB roof cutter" means an engine-powered roof cutting machine with one or more rotating cutting blades the edges of which are blunt. (Equipment with blades having sharp or tapered edges, and/or which does not use a rotating blade, is used for "slicing" rather than "cutting" the roofing material; such equipment is not included in the term "RB roof cutter".) Therefore, it is EPA's interpretation that when an RB roof cutter or equipment that similarly damages the roofing material is used to remove Category I nonfriable asbestos-containing roofing material, any project that is 5580 ft or greater is subject to the NESHAP; conversely, it is EPA's interpretation that when an RB roof cutter or equipment that similarly damages the roofing material is used to remove Category I nonfriable asbestos-containing roofing material in a roof removal project that is less than 5580 ft, the project is not subject to the NESHAP, except that notification is always required for demolitions. EPA further construes the NESHAP to mean that if slicing or other methods that do not sand, grind, cut or abrade will be used on Category I nonfriable ACM, the NESHAP does not apply, regardless of the area of roof to be removed.

Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09

1.A.2. For asbestos cement (A/C) shingles (or other Category II roofing material), if the area of the roofing material to be removed is at least 160 ft² and the removal methods will crumble, pulverize, reduce to powder, or contaminate with RACM (from other ACM that has been crumbled, pulverized or reduced to powder) 160 ft² or more of such roofing material, the removal is subject to the NESHAP. Conversely, if the area of the A/C shingles (or other Category II roofing materials) to be removed is less than 160 ft², the removal is not subject to the NESHAP regardless of the removal method used, except that notification is always required for demolitions.

40 CFR 61.145(a). However, EPA would recommend the use of methods that damage asbestos-containing roofing material as little as possible. If A/C shingles (or other Category II roofing materials) are removed without 160 ft² or more of such roofing material being crumbled, pulverized, reduced to powder, or contaminated with RACM (from other ACM that has been crumbled, pulverized or reduced to powder), the operation is not subject to the NESHAP, even where the total area of the roofing material to be removed exceeds 160 ft²; provided, however, that if the renovation includes other operations involving RACM, the roof removal operation is covered if the total area of RACM from all renovation activities exceeds 160 ft². See the definition of regulated asbestos-containing material (RACM), 40 CFR 61.141.

1.A.3. Only roofing material that meets the definition of ACM can qualify as RACM subject to the NESHAP. Therefore, to determine if a removal operation that meets or exceeds the coverage threshold is subject to the NESHAP, any suspect roofing material (i.e. roofing material that may be ACM) should be tested for asbestos. If any such roofing material contains more than one percent asbestos and if the removal operation is covered by the NESHAP, then EPA must be notified and the work practices in Sec. 61.145(c) must be followed. In EPA's view, if a removal operation involves at least the threshold level of suspect material, a roofing contractor may choose not to test for asbestos if the contractor follows the notification and work practice requirements of the NESHAP.

B. A/C Shingle Removal (Category II ACM Removal)

1.B.1. A/C shingles, which are Category II nonfriable ACM, become regulated ACM if the material 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. 40 CFR 61.141. However, merely breaking an A/C shingle (or any other category II ACM) that is not friable may not necessarily cause the material to become RACM. A/C shingles are typically nailed to buildings on which they are attached. EPA believes that the extent of breakage that will normally result from carefully removing A/C shingles and lowering the shingles to the ground will not result in crumbling, pulverizing or reducing the shingles to powder. Conversely, the extent of breakage that will normally occur if the A/C shingles are dropped from a building or scraped off of a building with heavy machinery would cause the shingles to become RACM. EPA therefore construes the NESHAP to mean that the removal of A/C shingles that are not friable, using methods that do not crumble, pulverize, or reduce the A/C shingles to powder (such as pry bars, spud bars and shovels to carefully pry the material), is not subject to the NESHAP provided that the A/C shingles are properly handled during and after removal, as discussed in this paragraph and the asbestos NESHAP. This interpretation also applies to other Category II nonfriable asbestos-containing roofing materials.

Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09

C. Cutting vs. Slicing and Manual Methods for Removal of Category I ACM

1.C.1. Because of damage to the roofing material, and the potential for fiber release, roof removal operations using rotating blade (RB) roof cutters or other equipment that sand, grind, cut or abrade the roof material are subject to the NESHAP. As EPA interprets the NESHAP, the use of certain manual methods (using equipment such as axes, hatchets, or knives, spud bars, pry bars, and shovels, but not saws) or methods that slice, shear, or punch (using equipment such as a power slicer or power plow) does not constitute "cutting, sanding, grinding or abrading." This is because these methods do not destroy the structural matrix or integrity of the material such that the material is crumbled, pulverized or reduced to powder. Hence, it is EPA's interpretation that when such methods are used, assuming the roof material is not friable, the removal operation is not subject to the regulation.

1.C.2. Power removers or power tear-off machines are typically used to pry the roofing material up from the deck after the roof membrane has been cut. It is EPA's interpretation that when these machines are used to pry roofing material up, their use is not regulated by the NESHAP.

1.C.3. As noted previously, the NESHAP only applies to the removal of asbestos-containing roofing materials. Thus, the NESHAP does not apply to the use of RB cutters to remove non-asbestos built up roofing (BUR). On roofs containing some asbestos-containing and some non-asbestos-containing materials, coverage under the NESHAP depends on the methods used to remove each type of material in addition to other coverage thresholds specified above. For example, it is not uncommon for existing roofs to be made of non-asbestos BUR and base flashings that do contain asbestos. In that situation, EPA construes the NESHAP to be inapplicable to the removal of the non-asbestos BUR using an RB cutter so long as the RB cutter is not used to cut 5580 ft² or more of the asbestos-containing base flashing or other asbestos-containing material into sections. In addition, the use of methods that slice, shear, punch or pry could then be used to remove the asbestos flashings and not trigger coverage under the NESHAP.

Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09

II. Notification

2.1. Notification for a demolition is always required under the NESHAP. However, EPA believes that few roof removal jobs constitute "demolitions" as defined in the NESHAP (Sec. 61.141). In particular, it is EPA's view that the removal of roofing systems (i.e., the roof membrane, insulation, surfacing, coatings, flashings, mastic, shingles, and felt underlayment), when such removal is not a part of a demolition project, constitutes a "renovation" under the NESHAP. If the operation is a renovation, and Category I roofing material is being removed using either manual methods or slicing, notification is not required by the NESHAP. If Category II material is not friable and will be removed without crumbling, pulverizing, or reducing it to powder, no notification is required. Also, if the renovation involves less than the threshold area for applicability as discussed above, then no notification is required. However, if a roof removal meets the applicability and threshold requirements under the NESHAP, then EPA (or the delegated agency) must be notified in advance of the removal in accordance with the requirements of Sec. 61.145(b), as follows:

Notification must be given in writing at least 10 working days in advance and must include the information in Sec. 61.145(b)(4), except for emergency renovations as discussed below.

The notice must be updated as necessary, including, for example, when the amount of asbestos-containing roofing material reported changes by 20 percent or more.

EPA must be notified if the start date of the roof removal changes. If the start date of a roof removal project is changed to an earlier date, EPA must be provided with a written notice of the new start date at least 10 working days in advance. If the start date changes to a later date, EPA must be notified by telephone as soon as possible before the original start date and a written notice must be sent as soon as possible.

For emergency renovations (as defined in Sec. 61.141), where work must begin immediately to avoid safety or public health hazards, equipment damage, or unreasonable financial burden, the notification must be postmarked or delivered to EPA as soon as possible, but no later than the following work day.

III. Emission Control Practices

A. Requirements to Adequately Wet and Discharge No Visible Emission

3.A.1. The principal controls contained in the NESHAP for removal operations include requirements that the affected material be adequately wetted, and that asbestos waste be handled, collected, and disposed of properly. The requirements for disposal of waste materials are discussed separately in section IV below. The emission control requirements discussed in this section III apply only to roof removal operations that are covered by the NESHAP as set forth in Section I above.

3.A.2. For any operation subject to the NESHAP, the regulation (Secs. 61.145(c)(2)(i), (3), (6)(i)) requires that RACM be adequately wet (as defined in Sec. 61.141) during the operation that damages or disturbs the asbestos material until collected for disposal.

3.A.3. When using an RB roof cutter (or any other method that sands, grinds, cuts or abrades the roofing material) to remove Category I asbestos-containing roofing material, the emission control requirements of Sec. 61.145(c) apply as discussed in Section I above. EPA will consider a roof removal project to be in compliance with the "adequately wet" and "discharge no visible emission" requirements of the NESHAP if the RB roof cutter is equipped and operated with the following: (1) a blade guard that completely encloses the blade and extends down close to the roof surface; and (2) a device for spraying a fine mist of water inside the blade guard, and which device is in operation during the cutting of the roof.

Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09

B. Exemptions From Wetting Requirements

3.B.1. The NESHAP provides that, in certain instances, wetting may not be required during the cutting of Category I asbestos roofing material with an RB roof cutter. If EPA determines in accordance with Sec. 61.145(c)(3)(i), that wetting will unavoidably damage the building, equipment inside the building, or will present a safety hazard while stripping the ACM from a facility component that remains in place, the roof removal operation will be exempted from the requirement to wet during cutting. EPA must have sufficient written information on which to base such a decision. Before proceeding with a dry removal, the contractor must have received EPA's written approval. Such exemptions will be made on a case-by-case basis.

3.B.2. It is EPA's view that, in most instances, exemptions from the wetting requirements are not necessary. Where EPA grants an exemption from wetting because of the potential for damage to the building, damage to equipment within the building or a safety hazard, the NESHAP specifies alternative control methods (Sec. 61.145(c)(3)(i)(B)).

Alternative control methods include (a) the use of local exhaust ventilation systems that capture the dust, and do not produce visible emissions, or (b) methods that are designed and operated in accordance with the requirements of Sec. 61.152, or (c) other methods that have received the written approval of EPA. EPA will consider an alternative emission control method in compliance with the NESHAP if the method has received written approval from EPA and the method is being implemented consistent with the approved procedures (Sec. 61.145(c)(3)(ii) or Sec. 61.152(b)(3)).

3.B.3. An exemption from wetting is also allowed when the air or roof surface temperature at the point of wetting is below freezing, as specified in Sec. 61.145(c)(7). If freezing temperatures are indicated as the reason for not wetting, records must be kept of the temperature at the beginning, middle and end of the day on which wetting is not performed and the records of temperature must be retained for at least 2 years. 42 CFR Sec. 61.145(c)(7)(iii). It is EPA's interpretation that in such cases, no written application to, or written approval by the Administrator is needed for using emission control methods listed in Sec. 61.145(c)(3)(i)(B), or alternative emission control methods that have been previously approved by the Administrator. However, such written application or approval is required for alternative emission control methods that have not been previously approved. Any dust and debris collected from cutting must still be kept wet and placed in containers. All of the other requirements for notification and waste disposal would continue to apply as described elsewhere in this notice and the Asbestos NESHAP.

C. Waste Collection and Handling

3.C.1. It is EPA's interpretation that waste resulting from slicing and other methods that do not cut, grind, sand or abrade Category I nonfriable asbestos-containing roofing material is not subject to the NESHAP and can be disposed of as non asbestos waste. EPA further construes the NESHAP to provide that if Category II roofing material (such as A/C shingles) is removed and disposed of without crumbling, pulverizing, or reducing it to powder, the waste from the removal is not subject to the NESHAP waste disposal requirements. EPA also interprets the NESHAP to be inapplicable to waste resulting from roof removal operations that do not meet or exceed the coverage thresholds described in section I above. Of course, other State, local, or Federal regulations may apply.

Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09

3.C.2. It is EPA's interpretation that when an RB roof cutter, or other method that similarly damages the roofing material, is used to cut Category I asbestos containing roofing material, the damaged material from the cut (the sawdust or debris) is considered asbestos containing waste subject to Sec. 61.150 of the NESHAP, provided the coverage thresholds discussed above in section 1 are met or exceeded. This sawdust or debris must be disposed of at a disposal site operated in accordance with the NESHAP. It is also EPA's interpretation of the NESHAP that if the remainder of the roof is free of the sawdust and debris generated by the cutting, or if such sawdust or debris is collected as discussed below in paragraphs 3.C.3, 3.C.4, 3.C.5 and 3.C.6, the remainder of the roof can be disposed of as non asbestos waste because it is considered to be Category I nonfriable material (as long as the remainder of the roof is in fact non asbestos material or if it is Category I asbestos material and the removal methods do not further sand, grind, cut or abrade the roof material). EPA further believes that if the roof is not cleaned of such sawdust or debris, i.e., it is contaminated, then it must be treated as asbestos-containing waste material and be handled in accordance with Sec. 61.150.

3.C.3. In order to be in compliance with the NESHAP while using an RB roof cutter (or device that similarly damages the roofing material) to cut Category I asbestos containing roofing material, the dust and debris resulting from the cutting of the roof should be collected as soon as possible after the cutting operation, and kept wet until collected and placed in leak-tight containers. EPA believes that where the blade guard completely encloses the blade and extends down close to the roof surface and is equipped with a device for spraying a fine mist of water inside the blade guard, and the spraying device is in operation during the cutting, most of the dust and debris from cutting will be confined along the cut. The most efficient methods to collect the dust and debris from cutting are to immediately collect or vacuum up the damaged material where it lies along the cut using a filtered vacuum cleaner or debris collector that meets the requirements of 40 CFR 61.152 to clean up as much of the debris as possible, or to gently sweep up the bulk of the debris, and then use a filtered vacuum cleaner that meets the requirements of 40 CFR 61.152 to clean up as much of the remainder of the debris as possible. On smooth surfaced roofs (non aggregate roofs), sweeping up the debris and then wet wiping the surface may be done in place of using a filtered vacuum cleaner. It is EPA's view that if these decontamination procedures are followed, the remaining roofing material does not have to be collected and disposed of as asbestos waste. Additionally, it is EPA's view that where such decontamination procedures are followed, if the remaining portions of the roof are non-asbestos or Category I nonfriable asbestos material, and if the remaining portions are removed using removal methods that slice, shear, punch or pry, as discussed in section 1.C above, then the remaining portions do not have to be collected and disposed of as asbestos waste and the NESHAP's no visible emissions and adequately wet requirements are not applicable to the removal of the remaining portions. In EPA's interpretation, the failure of a filtered vacuum cleaner or debris collector to collect larger chunks or pieces of damaged roofing material created by the RB roof cutter does not require the remaining roofing material to be handled and disposed of as asbestos waste, provided that such visible chunks or pieces of roofing material are collected (e.g. by gentle sweeping) and disposed of as asbestos waste. Other methods of decontamination may not be adequate, and should be approved by the local delegated agency.

3.C.4. In EPA's interpretation, if the debris from the cutting is not collected immediately, it will be necessary to lightly mist the dust or debris, until it is collected, as discussed above, and placed in containers. The dust or debris should be lightly misted frequently enough to prevent the material from drying, and to prevent airborne emissions, prior to collection as described above. It is EPA's interpretation of the NESHAP that if these procedures are followed, the remaining roofing material does not have to be collected and disposed of as asbestos waste, as long as the remaining roof material is in fact non asbestos material or if it is Category I asbestos material and the removal methods do not further sand, grind, cut or abrade the roof material.

Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09

3.C.5. It is EPA's interpretation that, provided the roofing material is not friable prior to the cutting operation, and provided the roofing material has not been made friable by the cutting operation, the appearance of rough, jagged or damaged edges on the remaining roofing material, due to the use of an RB roof cutter, does not require that such remaining roofing material be handled and disposed of as asbestos waste. In addition, it is also EPA's interpretation that if the sawdust or debris generated by the use of an RB roof cutter has been collected as discussed in paragraphs 3.C.3, 3.C.4 and 3.C.6, the presence of dust along the edge of the remaining roof material does not render such material "friable" for purposes of this interpretive rule or the NESHAP, provided the roofing material is not friable prior to the cutting operation, and provided that the remaining roofing material near the cut line has not been made friable by the cutting operation. Where roofing material near the cut line has been made friable by the use of the RB cutter (i.e. where such remaining roofing material near the cut line can be crumbled, pulverized or reduced to powder using hand pressure), it is EPA's interpretation that the use of an encapsulant will ensure that such friable material need not be treated or disposed of as asbestos containing waste material. The encapsulant may be applied to the friable material after the roofing material has been collected into stacks for subsequent disposal as non-asbestos waste. It is EPA's view that if the encapsulation procedure set forth in this paragraph is followed in operations where roofing material near the cut-line has been rendered friable by the use of an RB roof cutter, and if the decontamination procedures set forth in paragraph 3.C.3 have been followed, the NESHAP's no visible emissions and adequately wet requirements would be met for the removal, handling and disposal of the remaining roofing material.

3.C.6. As one way to comply with the NESHAP, the dust and debris from cutting can be placed in leak-tight containers, such as plastic bags, and the containers labeled using warning labels required by OSHA (29 CFR 1926.58). In addition, the containers must have labels that identify the waste generator (such as the name of the roofing contractor, abatement contractor, and/or building owner or operator) and the location of the site at which the waste was generated.

IV. Waste Disposal

A. Disposal Requirements

4.A.1. Section 61.150(b) requires that, as soon as is practical, all collected dust and debris from cutting as well as any contaminated roofing squares, must be taken to a landfill that is operated in accordance with Sec. 61.154 or to an EPA-approved site that converts asbestos waste to non-asbestos material in accordance with Sec. 61.155. During the loading and unloading of affected waste, asbestos warning signs must be affixed to the vehicles.

**Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09**

B. Waste Shipment Record

4.B.1. For each load of asbestos waste that is regulated under the NESHAP, a waste shipment record (WSR) must be maintained in accordance with Sec. 61.150(d). Information that must be maintained for each waste load includes the following:

- Name, address, and telephone number of the waste generator
- Name and address of the local, State, or EPA regional office responsible for administering the asbestos NESHAP program
- Quantity of waste in cubic meters (or cubic yards)
- Name and telephone number of the disposal site operator
- Name and physical site location of the disposal site
- Date transported
- Name, address, and telephone number of the transporter(s)
- Certification that the contents meet all government regulations for transport by highways.

4.B.2. The waste generator is responsible for ensuring that a copy of the WSR is delivered to the disposal site along with the waste shipment. If a copy of the WSR signed by the disposal site operator is not returned to the waste generator within 35 days, the waste generator must contact the transporter and/or the disposal site to determine the status of the waste shipment. 40 CFR 61.150(d)(3). If the signed WSR is not received within 45 days, the waste generator must report, in writing, to the responsible NESHAP program agency and send along a copy of the WSR. 40 CFR 61.150(d)(4). Copies of WSRs, including those signed by the disposal site operator, must be retained for at least 2 years. 40 CFR 61.150(d)(5).

V. Training

5.1. For those roof removals that are subject to the NESHAP, at least one on-site supervisor trained in the provisions of the NESHAP must be present during the removal of the asbestos roofing material. 40 CFR 61.145(c)(8). In EPA's view, this person can be a job foreman, a hired consultant, or someone who can represent the building owner or contractor responsible for the removal. In addition to the initial training requirement, a refresher training course is required **every 2 years** (maintaining DPH certification is 1 year) . The NESHAP training requirements became effective on November 20, 1991.

5.2. Asbestos training courses developed specifically to address compliance with the NESHAP in roofing work, as well as courses developed for other purposes can satisfy this requirement of the NESHAP, as long as the course covers the areas specified in the regulation. EPA believes that Asbestos Hazard Emergency Response Act (AHERA) training courses will, for example, satisfy the NESHAP training requirements. However, nothing in this interpretive rule or in the NESHAP shall be deemed to require that roofing contractors or roofing workers performing operations covered by the NESHAP must be trained or accredited under AHERA, as amended by the Asbestos School Hazard Abatement Reauthorization Act (ASHARA). Likewise, state or local authorities may independently impose additional training, licensing, or accreditation requirements on roofing contractors performing operations covered by the NESHAP, but such additional training, licensing or accreditation is not called for by this interpretive rule or the federal NESHAP.

5.3. For removal of Category I asbestos containing roofing material where RB roof cutters or equipment that similarly damages the asbestos-containing roofing material are used, the NESHAP training requirements (Sec. 61.145(c)(8)) apply as discussed in Section I above. It is EPA's intention that removal of Category I asbestos-containing roofing material using hatchets, axes, knives, and/or the use

**Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09**

of spud bars, pry bars and shovels to lift the roofing material, or similar removal methods that slice, punch, or shear the roof membrane are not subject to the training requirements, since these methods do not cause the roof removal to be subject to the NESHAP. Likewise, it is EPA's intention that roof removal operations involving Category II nonfriable ACM are not subject to the training requirements where such operations are not subject to the NESHAP as discussed in section I above.

[59 FR 31158, June 17, 1994, as amended at 60 FR 31920, June 19, 1995]

10. Commonly asked questions about the Asbestos NESHAP

Are facilities constructed in the last ten years subject to the NESHAP?

Yes. There is no exclusion date.

Is roofing work classified as a renovation? Yes.

How much roofing material is subject to the NESHAP?

160 sq ft of friable asbestos. This includes the removal of 5580 sq ft of non friable roofing with a rotating blade cutter which is expected to make 160 sq ft of friable asbestos.

Is asbestos inspection required before a roofing project starts? Yes except for most residential units. (Residential with less than 5 units are excluded, unless they were once commercial.)

11. EPA NESHAP Enforcement

An Alaska roofer was fined \$58,688 for removing 3,634 sq ft of roofing that he claimed was non friable based on affidavits from his employees. They removed the roof with axes and a bobcat but EPA found the roof was friable based on evidence presented. In addition, the contractor threw the waste in a dumpster (did not carefully lower), did not have a sign on the dumpster when loading, and had incomplete waste manifests. The docket can be viewed on the training computer.

B. ASHARA: Asbestos School Hazard Abatement Reauthorization Act

1. Synopsis:

a. This regulation requires extension of EPA Accreditation requirements to public and commercial buildings for individuals doing asbestos inspection, project design and abatement. Individuals doing more than one task must be EPA Accredited in each discipline. A Model Accreditation Plan (MAP) is included with this regulation which, as adopted by DPH, defines the syllabus of approved asbestos courses.

b. There are also increased training requirements compared to the original AHERA regulation.

c. The proposed EPA regulations were published in May of 1992. The effective date was to be 11/28/92, but the final rule was published on 2/3/94 and really effective 4/3/94.

d. Licensing and training requirements in many states such as CT reinforce this regulation and generally follow the MAP. Some states are stricter.

**Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09**

2. Applicability:

Public and commercial buildings which means All buildings other than schools and residential with < 10 units.

C. OSHA HAZARD COMMUNICATION PROGRAM FOR THE CONSTRUCTION INDUSTRY (CFR 29 1926.59)**1. General:**

a. Deals with chemical hazards in the work place such as:

- 1) Coatings
- 2) Spray Glues
- 3) Solvents/ Mastic Removers- Hazards are fire, irritation and possible health effects.
- 4) Reinsulation Materials
- 5) Encapsulants
- 6) Spray poly
- 7) Surfactants

b. Employees have a right to know if working with a dangerous material and must be trained in how to work with it safely.

2. Key Elements:

- a. Comprehensive written hazard communication program.
- b. Material safety data sheets (MSDS)
- c. Labels
- d. Employee Training

**Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09**

3. MSDS's and how to read them:

- a. MSDS's are the key to the hazard communication standard.
- b. Manufacturers must provide and employer must obtain MSDS's for all hazardous materials which are accessible to all exposed employees.
- c. Employees must be trained on how to use a MSDS
- d. Employers must have MSDS on the job site for each chemical:
- e. Employers on the job site must share MSDS's and other hazard communication with other employers and their employees; the GC (general contractor) is responsible for coordinating this effort for the entire project.
- f. MSDS's must include:

Section I

Product identity and ingredients

Must be the same as on the container label

Must have the manufacturer's name, address and emergency phone number.

Section II Hazardous Ingredients

Must list hazardous ingredients greater than 1% including: chemical name, synonyms and the CAS # (Chemical Abstracts Service). If carcinogens are present at more than 0.1% they must be identified as carcinogens.

In case of trade secrets, the manufacturer can withhold the name of the chemical but must give a more complete description of the hazards and the properties.

Legal exposure limits

PEL (OSHA)

TLV (ACGIH, AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS)

NIOSH LIMITS OR MANUFACTURER ESTABLISHED LIMITS

Section III Physical and chemical characteristics

Boiling point

Vapor Pressure

Vapor density

Appearance and odor

Specific gravity

Evaporation rate

Miscibility with water

Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09

Section IV Fire, Explosion and reactivity hazards

Flash point

< 100 deg F is flammable like gasoline, acetone, gases like methane and acetylene 100-200 deg F is combustible like lighter fluid, mineral spirits, fuel oil.

Extinguishing Media:

Class A for paper and wood

Class B for liquids or greases

Class C for electrical fires

Class D for metals such as magnesium or metal alloys

Fire fighting procedures and unusual explosion hazards

Here you will see instructions like "do not use water" and any special manufacturer's instructions for handling fires with this chemical.

Section V Reactivity Data

Incompatibility with other chemicals. For example if you mix chlorine bleach and ammonia, poisonous phosgene gas is released.

Section VI Health Hazard Data

Health hazards, risk of cancer

Acute (short term) effects

Chronic (long term) effects

Routes of entry (ingestion, inhalation, skin)

Target organs such as heart, liver, etc

Signs or symptoms of exposure

Medical conditions generally aggravated by exposure

What to do if someone is exposed

Section VII Precautions for safe handling and use

Spill and leak procedures, Waste disposal method and other special precautions for handling and storing

Section VIII Control measures

How to eliminate or minimize the hazard including:

Ventilation and other engineering controls

Personal protective equipment requirements

Emergency and first aid measures

Spill and Leak procedures

Each MSDS may use different formats but all must contain the above information.

**Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09**

C. RESPIRATORY PROTECTION STANDARD OSHA 29 CFR 1910.134

1. Written Program See F. Below

2. Respirator Assignment and Maintenance

- a. Respirators should be assigned to individual workers for their exclusive use.
- b. Fit testing must be checked after repair or replacement of component parts.
- c. Inspection for defects
- d. Maintenance and storage procedures.

3. Employee Training Program

4. Respirator Program Evaluation and Recordkeeping

D. OTHER IMPORTANT OSHA REGULATIONS AFFECTING ASBESTOS ABATEMENT

1. Fire safety OSHA 29 1910.38 and 1926.24 and 1926.150-155)

2. Ladder and Scaffold safety, OSHA 29 CFR 1926.450 et seq

3. Electrical safety OSHA CFR 29 1926.402 and .416-.417

4. Recording and Reporting of Injuries OSHA 29 CFR 1926.22

5. First Aid and Medical Attention OSHA 29 CFR 1926.23

6. Shower and Sanitation requirements OSHA 1910.141

E. REQUIRED WRITTEN SAFETY AND HEALTH PLANS/PROGRAMS:

The plans can be incorporated into a single Safety and Health Plan which always must be kept on the job sites. Usually the employer makes a number of copies of this plan which each supervisor brings to the job site.

1. Lead compliance plan (Required by OSHA, 1926.62)

- a. Activities in which lead is emitted:
 - 1) Equipment used.
 - 2) Materials used:
 - 3) Controls in place
 - 4) Crew size
 - 5) Employee job responsibilities

Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09

6) Operating Procedures

7) Maintenance Practices

b. A description of the specific means that will be employed to achieve compliance and where engineering controls are required, engineering plans and studies used to determine methods selected for controlling exposure to lead:

c. A report of technology considered in meeting the PEL

d. Air monitoring data which documents the source of lead emissions

e. A detailed schedule for implementation of the program including documentation such as copies of purchase orders for equipment, construction contracts, etc.

f. A work practice program which includes items required under protective clothing housekeeping and hygiene facilities and a good work practice program such as described in Appendix B of 1926.62:

1) Adherence to the PEL

2) Exposure assessment

3) Respirator, protective clothing and equipment use

4) House keeping procedures.

5) Hygiene facilities and practices.

6) Medical surveillance and medical removal practices

7) Employee information and training

8) Signs

9) Record keeping procedures

10) Observation of monitoring.

g. An administrative control schedule, i.e. job rotation

h. Arrangements made among contractors on multi-employer sites with respect to informing affected employees of potential exposure to lead and with respect to responsibility for compliance with 1926.62 (e) and 1926.16.

i. Other Considerations.

1) Frequent and regular inspections of the job sites, materials and equipment are made by a competent person.

2) Employee access to company program and S.O.P.s (standard operating procedure)

3) Updating of the program at least every 6 months.

**Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09**

2. Written Respiratory Protection Program

- a. Procedures for selecting respirators for use in the workplace;
- b. Medical evaluations of employees required to use respirators;
- c. Fit testing procedures for tight-fitting respirators;
- d. Procedures for proper use of respirators in routine and reasonably foreseeable emergency situations;
- e. Procedures and schedules for cleaning, disinfecting, storing, inspecting, repairing, discarding, and otherwise maintaining respirators;
- f. Procedures to ensure adequate air quality, quantity, and flow of breathing air for atmosphere-supplying respirators;
- g. Training of employees in the respiratory hazards to which they are potentially exposed during routine and emergency situations;
- h. Training of employees in the proper use of respirators, including putting on and removing them, any limitations on their use, and their maintenance; and
- i. Procedures for regularly evaluating the effectiveness of the program.

3. Emergency response plan (See Section 3)

**Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09**

4. Written Hazard Communication/Right to Know Program (29 CFR 1926.59) See Section 6

G. DPH ASBESTOS STANDARD: 19A 332-1-16 (AMENDED 4/04)

Includes single family homes.

1. Applicability:

- a. All Interior Work
- b. Includes all structures even single family homes and ships in dry dock.
- c. Notification needed for friable exterior work

2. Asbestos Project: \geq 3 sq ft or 3 linear ft of asbestos material

3. Notification:

a. From:

- 1) Asbestos abatement contractor
- 2) Facility owner
- 3) OR ANY PERSON WHO WILL BE CONDUCTING DEMOLITION ACTIVITIES**

b. For:

- 1) Asbestos abatement involving more than ten linear feet or twenty five square feet of ACM except exterior non-friable
- 2) OR BEFORE ENGAGING IN THE DEMOLITION OF ANY FACILITY.**

H. DPH LICENSING REQUIREMENTS SEC. 20-440- AND 20-441.

1. Licensure of asbestos contractors.

- a. Fee is \$500 per year.
- b. The licensed contractor has to hire certified asbestos and supervisors.

2. Certification and licensure of asbestos consultants

a. Licenses are offered in the following disciplines of asbestos consultation:

- 1) Inspector
- 2) Inspector/management planner
- 3) Project designer
- 4) Project Monitor.

c. Applicants simultaneously apply for certification and licensure as asbestos consultants in the same application-

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Asbestos Roofing Removal
5/14/09**

3. Requirements for certification and employment as an asbestos abatement site supervisor or asbestos abatement worker.

- a. Individual Certification required for work with 3 sq ft or lin ft of ACM **or more, excluding exterior non-friable ACM.**
- b. Certification is good for one year and expires on the same date as that of accreditation.
- c. Each individual sends written application to DPH including copies of training certificates.

I. ASBESTOS IN SCHOOLS: CONNECTICUT GENERAL STATUTES SECTIONS 19A-333-11B

- 1. Need permission to do abatement while school is in session or when any children are in the building. This requirement applies to removal of asbestos roofing.**
- 2. Another issue that occasionally arises from roofing jobs is collapse of part of the roof deck allowing asbestos debris to enter the school.**
- 3. Watch out also for asbestos roof drain insulation and other interior materials which may exist inside the school.**

J. DEP Disposal Regulations

Connecticut General Statutes Sec 22a-209-8 (i) (DEP Applies to Waste Disposal in Connecticut)

Connecticut DEP: Any disposal of Asbestos in the State of Connecticut must be authorized by the office of Solid Waste Management. To request a disposal permit, contact the Solid Waste Management Unit at 566-5847.

**Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09**

**Section 7
Selected Definitions**

A. Extracted from 1926.1101

Aggressive method means removal or disturbance of building material by sanding, abrading, grinding or other method that breaks, crumbles, or disintegrates intact 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), means any material containing more than one percent asbestos.

Class I asbestos work means activities involving the removal of TSI and surfacing ACM and PACM.

Class II asbestos work means 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 means repair and maintenance operations, where ``ACM", including TSI and surfacing ACM and PACM, is likely to be disturbed.

Class IV asbestos work means 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.

Competent person means, in addition to the definition in 29 CFR 1926.32 (f), ((f) Competent person means one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.) 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).

Decontamination area means an enclosed area adjacent and connected to the regulated area and consisting of an equipment room, shower area, and clean room, which is used for the decontamination of workers, materials, and equipment that are contaminated with asbestos.

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

**Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09**

Disturbance means activities that disrupt the matrix of ACM or PACM, crumble or pulverize ACM or PACM, or generate visible debris from ACM or PACM. 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.

Employee exposure means that exposure to airborne asbestos that would occur if the employee were not using respiratory protective equipment.

Equipment room (change room) means 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 means a particulate form of asbestos, 5 micrometers or longer, with a length-to-diameter ratio of at least 3 to 1.

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

Intact means that the ACM has not crumbled, been pulverized, or otherwise deteriorated so that the asbestos is no longer likely to be bound with its matrix.

Negative Initial Exposure Assessment means a demonstration by the employer, which complies with the criteria in paragraph (f)(2)(iii) of 1026.1101, that employee exposure during an operation is expected to be consistently below the PELs.

PACM means "presumed asbestos containing material".

Regulated area means: 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. Requirements for regulated areas are set out in paragraph (e) of this section.

Removal means all operations where ACM and/or PACM is taken out or stripped from structures or substrates, and includes demolition operations.

Renovation means the modifying of any existing structure, or portion thereof.

Repair means overhauling, rebuilding, reconstructing, or reconditioning of structures or substrates, including encapsulation or other repair of ACM or PACM attached to structures or substrates.

B. Other Definitions

Numbered Definitions are from the DPH regulations 20-440.

Underlined definitions are from the DPH asbestos standard 19a-332a-1-16; bold caps reflect new additions and line out reflect deleted text as of 4/04

(A definition which is numbered and underlined is the same in both standards.)

AIHA: American Industrial Hygiene Association.

**Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09**

(1) "Accredited" or "Accreditation" when referring to an individual means that an individual has successfully completed the training requirements as set forth in subsection 20-440-6(c) of DPH regulations or the refresher training requirements as set forth in subsection 20-441-2 of the regulations and has been issued a document of accreditation by the training provider. Accreditation is necessary in order to obtain certification by the Department.

Accredited or Accreditation (EPA): A person or laboratory is also accredited in accordance with section 206 of Title II of the AHERA Act. Specifically this lab accreditation refers to NIST Accredited. Persons who are accredited by the DPH per the above definition are also accredited by EPA under AHERA. Other DPH regulations also specify AIHA Accredited lab. To avoid confusion in this text, we specifically say "NIST Accredited", "AIHA Accredited", etc.

Air Monitoring: The process of measuring the fiber content of a specific volume of air in a stated period of time. See Section 5 for personal air samples.

(2) "Approved training provider" means any individual or entity which satisfactorily demonstrates through application and submission of course agenda, faculty resumes, training manuals, examination materials, and equipment inventory that it meets the minimum requirements established by Sections 20-440-1 through 20-440-8 of the Regulations of Connecticut State Agencies;

(3) "Asbestos" means the asbestiform varieties of actinolite, amosite, anthophyllite, chrysotile, crocidolite and tremolite;

(4) "Asbestos abatement" means the removal, encapsulation, enclosure, renovation, repair, demolition or other disturbance of asbestos-containing materials, but does not include activities which are related to (A) the removal or repair of asbestos cement pipe and are performed by employees of a water company as defined in Section 25-32a of the Connecticut General Statutes or (B) the removal of nonfriable asbestos-containing material found exterior to a building or structure other than material defined as regulated asbestos- containing material in 40 CFR 61, the national emission standards for hazardous air pollutants, as amended from time to time;

"Asbestos Abatement Project" means any asbestos abatement performed within a facility involving more than three (3) linear feet or three (3) square feet of asbestos-containing material;

"Asbestos abatement site supervisor" " means any individual ~~EMPLOYEE who is employed or engaged by an~~ **OF A LICENSED** asbestos contractor ~~to supervise an asbestos abatement project~~ **WHO HAS SPECIFICALLY BEEN TRAINED AS A SUPERVISOR IN A TRAINING PROGRAM APPROVED BY THE DEPARTMENT AND WHO HAS BEEN ISSUED A CERTIFICATE BY THE DEPARTMENT.** ;

"Asbestos abatement worker" means any employee of an ~~an~~ **A LICENSED** asbestos contractor who engages in asbestos abatement; **HAS COMPLETED A TRAINING PROGRAM APPROVED BY THE DEPARTMENT AND HAS BEEN ISSUED A CERTIFICATE BY THE DEPARTMENT.**

(7) "Asbestos-containing material" (ACM) means material composed of asbestos of any type and in an amount greater than one percent by weight, either alone or mixed with other fibrous or nonfibrous material;

**Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09**

Asbestos Containing Building Material: (ACBM) Surfacing ACM, thermal system insulation ACM, or miscellaneous ACM that is found in or on interior structural members or other parts of a school building. The distinction between ACBM and ACM is that ACBM is regulated under AHERA. For example roofing with more than 1% asbestos is an ACM but not an ACBM since AHERA does not regulate roofing. The Term ACM is often loosely used to describe ACM since ACBM is of course also an ACM.

Asbestos Material/Asbestos Containing Material (ACM): A material which contains more than 1% Asbestos by EPA test Method # 600/R-93/116 (PLM). All applicable Federal regulations refer to PLM analysis as the method by which asbestos is quantified.

(8) "Asbestos consultant" means a certified and licensed individual who engages in any activity involving asbestos abatement consultation services: inspector; management planner; project designer or Project Monitor;

"Asbestos contractor" means any person or entity engaged in asbestos abatement whose employees actually perform the asbestos abatement work;

(10) "Asbestos consultation services" means the inspection or evaluation of a facility for asbestos hazards, including, but not limited to, the development of asbestos abatement plans, site inspections, air monitoring and the provision of industrial hygiene services related to asbestos abatement;

Asbestosis: Scarring of the lung tissue caused by asbestos.

Cassette: air monitoring filter assembly.

Category 1 (NESHAP) non-friable asbestos means resilient flooring, asphalt roofing, gaskets, and packings > 1% asbestos by PLM.

Category 2 (NESHAP) non-friable asbestos means any other non-friable material with > 1% asbestos by PLM.

(13) "Certificate" means a document issued by the department indicating that the individual has satisfied training requirements and any other applicable requirements of the department;

(14) "Certified" or "Certification" when referring to an individual means that a certificate has been issued by the department under the provisions of Sections 20-4401 through 20-440-8 of the Regulations CF Connecticut State Agencies to an individual upon successful completion of an approved training or refresher training course, the receipt of a document of accreditation issued by the training provider and the fulfillment of any other requirements of the department. Certification is required for employment as either an asbestos abatement worker or asbestos abatement site supervisor and is a condition for licensure as an asbestos consultant. Asbestos consultant disciplines for which certification may be issued include: inspector, management planner, project designer and Project Monitor;

CFM: Cubic feet per minute. Volume moving past a reference point per unit time. HEPA vacuum

Cilia: Hair-like projections that line the bronchial tubes.

Clean Room: = Clean change room. An uncontaminated area or room which is a part of the Worker Decontamination Enclosure with provisions for storage of worker's street clothes and protective equipment. See Decon.

**Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09**

Demarcation including Signs: OSHA requirement to mark the boundaries of the asbestos work area.

Demolition (NESHAP) means any work involving taking out load supporting building members or intentional burning.

Demolition (DPH) means the wrecking or taking out of any load-supporting structural member of a facility ~~and any related razing, removing or stripping of asbestos~~ **TOGETHER WITH ANY RELATED HANDLING OPERATIONS OR THE INTENTIONAL BURNING OF ANY FACILITY**

DEP: CT Dept of Environmental Protection

DPH: or (16) "Department" means the Connecticut Department of Public Health.

(17) EPA means the United States Environmental Protection Agency.

Excursion Limit: (EL) OSHA 30 minute exposure standard of 1.0 fibers/cc.

(18) "Facility" means the interior and exterior of any private or public building or structure including but not limited to those used for institutional, residential (including single family homes), commercial or industrial purposes and vessels while ashore or in dry dock;

(19) "Facility owner" means the person having title to the facility. For purposes of publicly owned property only, the facility owner shall be defined to be the chief executive officer of the federal, state or municipal agency which owns or controls the use of the facility;

Friable ACM: EPA- An Asbestos Material that can be crumbled, pulverized or reduced to powder when dry by hand pressure and which releases Asbestos fibers into the environment.

(20) "Friable asbestos-containing material" means any asbestos-containing material that hand pressure can crumble, pulverize, or reduce to powder when dry and non-friable asbestos-containing material that potentially can be broken, crumbled, pulverized or reduced to powder as a result of asbestos abatement.

HEPA Filter: A high efficiency particulate air (HEPA) filter in compliance with ANSI Z9.2-1979.

HEPA Vacuum Equipment: Vacuum equipment with a HEPA filter system for filtering the air effluent from the unit.

(21) "High-efficiency particulate air (HEPA)" means a filtering system capable of trapping and retaining at least 99.97 percent of all monodispersed particles 0.3 micrometer in diameter or larger;

(22) HVAC means heat, ventilation and air conditioning;

(24) "Inspector" means any licensed individual who identifies, assesses the condition of, or collects bulk samples of suspected asbestos-containing material;

(25) "License" means a document issued by the department authorizing an asbestos contractor to engage in asbestos abatement work or an asbestos consultant to engage in any activity directly involved with asbestos consultation services. Licensure shall be restricted pursuant to the limitations of each discipline.

Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09

Mesothelioma: Rare form of cancer.

Miscellaneous Material: ACM or ACBM other than surfacing or TSI, such as transite, floor and ceiling tiles, roofing, mastics, tars, putties, glues, caulks, preformed sheets, paint, transite and electrical wiring

MSDS: Material Safety Data Sheet.

Negative Air Units or Negative Pressure Exhaust Ventilation: A portable local exhaust system equipped with HEPA filtration used to create negative pressure in a contaminated area (negative with respect to adjacent uncontaminated areas) and capable of maintaining a constant discharge of filtered air outside and creating suction so that air flow direction moves from uncontaminated areas into the Work Areas.

(27) "NESHAP" asbestos regulations (40 CFR 61, Subpart M) means National Emission Standard for Hazardous Air Pollutants;

NIST (NIST/NVLAP): National Institute of Standards and Technology/National Voluntary Laboratory Accreditation Program. Accredits labs for PLM and TEM.

NIOSH: National Institute for Occupational Safety and Health.

NIOSH 582: Required 5 day training course for PCM analysts.

(28) "Non-friable asbestos-containing material" means any asbestos-containing material that hand pressure cannot crumble, pulverize or reduce to powder when dry; See also Category 1, 2.

(29) OSHA means the Occupational Safety and Health Administration of the United States Department of Labor;

OSHA Method ID-160: Microscopic method that only counts asbestos fibers, (Same as the method in Appendix B of 1926.1101) may be used for samples other than final samples.

PAPR: Powered air purifying respirator

PCM: Phase contrast microscopy.

Permissible Exposure Limit (PEL): for asbestos OSHA Standard. The employer must ensure that no employee is exposed to an airborne concentration of Asbestos, tremolite, anthophyllite, actinolite, or a combination of these materials in excess of the PEL of 0.1 fibers per cubic centimeter of air as an eight (8) hour time weighted average (TWA), or in excess of 1 fiber/cubic centimeter as a 30- min excursion limit as determined by the method prescribed in Appendix A to OSHA Regulations 29 CFR 1926.1101, or by an equivalent method. (See TWA). PEL's exist for other substances and are listed in CFR 29 1910.1000, subpart Z.

PPE: personal protective equipment

RACM: NESHAP regulated ACM.

"Removal" means the taking out or stripping of any asbestos-containing materials from surfaces or structural components of a facility;

Renovation (NESHAP) means altering a facility component in any way including stripping of asbestos.

Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09

"Renovation" means altering, in any way other than demolition, one or more structural components. Operations in which load-supporting structural members are taken out are excluded;

Repair: Returning < 3 sq ft of damaged ACBM to an undamaged condition or to an intact state so as to prevent fiber release.

"Repair" means the restoration of damaged asbestos-containing material; including but not limited to the sealing, patching, enclosing or encapsulating of damaged asbestos-containing material to prevent fiber release;

Respirator: A device used to protect against inhalation hazards. See Section 3.

Rotometer: flow measuring device.

Soap Bubble Flow Meter: Primary calibration standard

Synergistic effect: Combination of more than one hazard multiplies the risk of disease.

Stripping: Taking of Asbestos materials from any surface.

Transite: Hard gray ACM sheet or tubing.

TWA: Time weighted average: calculation

Wet Cleaning, Wet Methods: The process of eliminating Asbestos contamination from building surfaces and objects by using cloths, mops, or other cleaning tools which have been dampened with amended water, and by afterwards disposing of these cleaning items as Asbestos contaminated waste.

"Work Area" means the specific area or location where the actual asbestos abatement work is being performed or such other areas of a facility which the Commissioner determines may be hazardous to public health as a result of such asbestos abatement.

Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09

From OSHA CPL 02-02-63- CPL 2-2-63 (revised) 11/3/95

ROOFING OPERATIONS

Q. What roofing operations are Class II operations?

A. Removal of built-up roofing in which the roofing felts contain asbestos, and removal of asbestos-containing shingles and asbestos-containing felt underlayments, are the major Class II operations. Class II operations may also include removals of other asbestos-containing roofing materials, such as cements, coatings, mastics, and flashings, in the unusual situations when such materials are not intact. It is expected that cements, coatings, etc. will commonly be found intact.

Q: What roofing operations are NOT Class II operations?

A: Removal of "intact" cements, coatings, mastics, and flashings, is not Class II work.

Q. Under what circumstances is removed roofing material considered non-intact?

A. As defined in the standard, ACM is considered non-intact if it has crumbled, been pulverized, or has otherwise deteriorated so that the asbestos fibers are no longer likely to be bound within their matrix. Under this definition, ACM is not rendered non-intact simply by being separated into smaller pieces. For example, in removing built-up roofing, the roof is typically cut into sections using a power roof cutter. The separation into smaller sections does not render the material non-intact material if it is otherwise intact. Other roofing materials are also typically separated into smaller sections during removal. Roof mastics and cements are usually pried, chipped or scraped off; asphalt felt underlayments are sliced and rolled-up or sometimes scraped-off or chipped-off; flashings are sliced into manageable units and then pried-up; asbestos-containing shingles occasionally break even when removed carefully. The fact that otherwise intact roofing materials become separated in such a fashion does not by itself render them non-intact under the standard. The condition of the smaller pieces must be examined to determine whether the material is non-intact.

Q. What does the standard require during removals of intact cements, coatings, mastics, and flashings?

A. On many roof removal jobs, the only asbestos is found in cements, mastics, coatings, and flashings. Because significant numbers of asbestos fibers are not released from such products when the material is intact, only minimal precautions are required. The material must be removed using manual methods and must not be sanded, abraded or ground. Material that has been removed from a roof must not be dropped or thrown to the ground and must be removed from the roof by the end of the work shift. Prior to the start of the job, the material must be examined by a competent person to determine whether it is intact and is likely to remain intact throughout the job. The employees must be trained in the hazards of asbestos exposure and the proper work practices and prohibitions applicable to such work.

Q. What does the standard require when ACM is newly installed on a roof?

A. Currently, the only materials being installed on roofs that contain asbestos are certain coatings, cements, and mastics. When such materials are installed, the requirements discussed in the previous answer apply. In addition, when materials labeled as containing asbestos are installed on non-residential roofs, the contractor must notify the building owner of the presence and location of the asbestos-containing material.

Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09

Q. What types of manual methods may be used to remove intact cements, coatings, mastics, and flashings?

A. Permissible methods include the use of spud, spade, flat-blade or slicing tools, such as axes, mattocks, pry bars, spud bars, crow bars, shovels, flat-blade knives, and utility knives, to slice, cut, strip-off, or pry-up the material.

Note: C-24 was a duplicate of C-23. Page removed after printing by the Office of Health Compliance.

Q. When must a roofing contractor monitor for asbestos on Class II jobs?

A. Evidence in the rulemaking record shows that exposures on most Class II roof removal jobs will be well below the PEL when employers comply with the work practices required by the standard and the workers are properly trained. Therefore, exposure monitoring is not required when a competent person determines that the material is intact, the work practices specified in the standard are followed, and the employees have been trained in accordance with the standard.

Q. Must asbestos-containing material that has been removed from a roof be bagged, wrapped, or kept wet on the roof?

A. These precautions are not required when the material is intact. If the material is not intact, it must either be lowered to the ground immediately or must be bagged, wrapped, or kept wet while it remains on the roof. Whether or not the material is intact, it must be lowered from the roof no later than the end of the work shift.

Q. Must a roof be HEPA-vacuumed before removal work begins?

A. The ordinary accumulation of environmental dust and debris on a roof will not require HEPA-vacuuming. Only if there is an indication that non-intact ACM is the source of dust or debris must that dust or debris be HEPA-vacuumed.

Q. May dry sweeping be used to remove accumulated dust and debris from a roof before removal work begins?

A. It is often appropriate to remove accumulated dust and debris from a roof to reduce the total atmospheric contamination produced by the removal job. Power brooms (machines similar to street sweepers) are sometimes used for this purpose. Dry cleanup of dust and debris is permitted unless the dust and debris is associated with non-intact ACM.

Q. May a power cutter be used to remove a built-up roof?

A. Yes. The blade of the cutter must be continuously misted during use unless a competent person determines that misting substantially decreases worker safety. If the roofing material is non-intact, before removal work begins, additional wetting and/or other precautions, such as use of hand methods and respirators, may be needed.

Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09

Q. When a power roof cutter is used to remove a built-up roof, how must the dust from the cutting operation be collected?

A. When the roof has an aggregate surface, the dust must be collected by a HEPA vacuum or HEPA dust collector. These methods may also be used if the roof has a smooth surface. However, in the case of roofs with smooth surfaces, the dust may also be collected by gently sweeping and carefully and completely wiping up the dust and debris left along the cut line while it is still wet and immediately placing the dust and debris in a covered container.

Q. Must asbestos-containing shingles be wetted before being removed from a roof?

A. Wetting shingles will often make them slippery and lead to slipping and falling hazards that can be particularly dangerous on sloped roofs. Wetting of intact shingles is therefore not required. Wetting of non-intact shingles is required where feasible but the shingles need not be wetted when the competent person determines that wetting would create slipping and falling hazards.

Q. When shingles are not wetted, must respirators be worn?

A. Although the standard generally requires that respirators be used for Class II work when wet methods are not used, there is an exception when shingles are removed from sloped roofs. Because respirator use reduces visibility and mobility and would therefore be hazardous on sloped roofs, respirators are not required if a negative exposure assessment has been made and the ACM is removed in an intact state.

Q. In what circumstances must respirators be worn?

A. In roofing work, respirators are required (1) when wet methods are not used during removal of non-intact material; (2) when the material does not remain substantially intact during removal; (3) when the employer is unable to make a negative exposure assessment; and (4) when asbestos exposures exceed the PEL.

Q. Is there an exception to the requirements for HEPA vacuuming and wet methods for small roofing jobs?

A. Yes. When an employer repairs or removes less than 25 square feet of a roof in a single day, HEPA vacuuming and wet methods need not be used. This exception only applies, however, when manual methods are used to remove the material and no visible dust is created by the removal method.

Q. When Class II roof removal work is done, must all roof level air intake sources on the roof be isolated or shut down?

A. No. In general, only those air intakes within the regulated area must be isolated or shut down. However, intakes outside the regulated area may need to be isolated or shut down to prevent asbestos from entering the building's ventilation system if, for example, the wind is blowing towards such intakes from the regulated area. OSHA expects the competent person to use good judgment to achieve the intent of the standard.

Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09

Q. What isolation techniques for air intakes are permitted?

A. Acceptable isolation techniques include use of a buffer zone, use of HEPA filters over the air intakes, use of horizontal or vertical extensions that relocate the opening of the air intake outside or above the regulated area or away from or above a nearby upwind source of asbestos fiber emissions, or covering the intake with plastic sheeting or other barrier. The competent person must use good judgment to choose an appropriate isolation method based on the circumstances of the particular job.

Q. How are nails removed from cementitious asbestos-containing siding and shingles?

A. The Construction standard requires in (g)(8)(iii)(D) that if the nails are to be cut they must be cut with a flat, sharp instrument. If the nails are not to be cut, the nails can be pulled out.

COMPETENT PERSON

Q. What training must a competent person have? (pg 40972)

A. For Class I and II work, the "competent person" must take a course such as that under the EPA Model Accreditation Plan for accredited contractor/supervisor, or an equivalent in content, duration, and criteria for success. For Class III and IV work, the competent person must receive the equivalent of EPA's Operations and Maintenance training. All competent persons must be capable of identifying existing asbestos hazards in the workplace and taking prompt corrective action.

Q. Has the definition of "competent person" changed? (pg 40977)

A. The definition of a "competent person" has been amended in the Construction standard and a definition of a "qualified person" has been included in the shipyard standard. The scope of the competent person's duties has expanded so that a competent person must supervise all asbestos activities under the Construction standard.

Q. Under paragraph (o) in the Construction and Shipyard standards, is a specified number of on-site supervisors required? (pg 41023)

A. OSHA has not specified a ratio of on-site supervisors to abatement workers.

Q. What is the definition of a "competent person" in the Construction standard? (pg 41023)

A. As in the regulations applying to all construction work, the "competent person" must be "capable of identifying existing and predictable hazards...which are...hazardous to employees, and (have) authorization to take prompt corrective measures to eliminate them" (29 CFR 1926.32 (f)). Also, the "competent person" must be designated by the employer (29 CFR 1926.20(b)(2)). OSHA notes that this "competency" is independent of the training required to be an asbestos competent person. "Competency" as well as training is required. Thus, a "competent person" is not merely someone with a specified level of training but connotes a high level of knowledge of worksite safety and health issues as well.

**Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal
5/14/09**

**Chem Scope, Inc 8 hour Awareness Training
Asbestos Roofing Removal**

COURSE PROGRAM

<u>TIME</u>	<u>TOPIC</u>
8:00-8:30AM	REGISTRATION & PRE-COURSE QUIZ
8:30-9:15	COURSE INTRODUCTION AND OVERVIEW BACKGROUND INFORMATION ON ASBESTOS
9:15-10:00	SUMMARY OF WORK PRACTICES AND PPE
10:00-10:45	PERSONAL PROTECTION
10:45- 11:30	OSHA CONSTRUCTION STANDARD
11:30-12	LUNCH
12:00-1:45	AIR MONITORING
1:45-2:45	WORK PRACTICES, HANDS ON TRAINING
2:45-3:15	OTHER REGULATIONS
3:15-3:30	COURSE REVIEW
3:30-4:00	QUIZ