OCCUPATIONAL EXPOSURE TO ASBESTOS

FEDERAL REGISTER 29 CFR 1926.58

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PURPOSE: General Maintenance Communication

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WHAT IS ASBESTOS ?

ASBESTOS IS A GENERIC TERM USED TO DESCRIBE A NUMBER OF NATURALLY OCCURRING FIBROUS, HYDRATED MINERAL SILICATES.

CHARACTERISTICS:

- HIGH STRENGTH
- FLEXIBILITY
- HEAT & CHEMICAL RESISTANCE
- FAVORABLE FRICTIONAL PROPERTIES

DBS:02-87

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WHAT ARE EFFECTS OF ASBESTOS EXPOSURE ?

- ASBESTOSIS - non-malignant scarring of lungs

- BRONCHOGENIC CARCINOMA - a malignancy of the interior of the lung

- MESOTHELIOMA - a malignancy (tumor) of the lining of the chest cavity or the lining of the abdomen

- CANCER - stomach, colon, rectum

KEY INFORMATION: (1) THE DISEASE IS PROGRESSIVE.

(2) EVIDENCE OF DISEASE MAY NOT OCCUR FOR 15-30 YEARS FOLLOWING THE EXPOSURE.

(3) SMOKERS ARE AT MUCH GREATER RISK THAN NON-SMOKERS AMONG PERSONS WHO WORK WITH ASBESTOS.

DBS:02-87

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OCCUPATIONAL EXPOSURE TO ASBESTOS

PERMISSIBLE EXPOSURE LIMIT (PEL)

0.2 FIBERS PER CC

Time-weighted Average for Eight Hours

0.1 FIBERS PER CC (Action Level)

NOTE: This is a reduction in the existing Permissible Exposure Limit by a factor of 10.

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OCCUPATIONAL EXPOSURE TO ASBESTOS

KEY REQUIREMENTS

(1) The employer shall use one or any combination of the following controls to achieve compliance with the PEL:

- a. Ventilation (local or general)
- * b. Vacuum cleaners equipped with HEPA filters
- c. Enclosure or isolation
- * d. Wet methods
- e. Other work practices

Wherever feasible, the employer shall establish negative pressure enclosures before commencing removal, demolition, and renovation.

On jobs requiring total enclosure and isolation (i.e.: negative-pressure enclosures), hygiene facilities must be located adjacent and connected to the regulated area.

EXCEPTION FOR CONSTRUCTION: Small scale (pipe repair, valve replacement), short duration (less than one day) jobs.

(2) The employer shall provide respirators, and ensure they are used, where required by the standard.

Dust masks are NOT permitted for exposures exceeding the PEL.

(3) The employer shall provide and require use of protective clothing, such as coveralls or similar whole-body clothing, head coverings, gloves, and foot coverings.

(4) The employer shall designate a competent person (EPA certified training) to perform or supervise handling, monitoring, and training.

(5) The employer shall perform monitoring to determine accurately the airborne concentrations of asbestos to which employees may be exposed.

(6) Labels shall be affixed to all products containing asbestos.

(7) The employer shall initiate a medical surveillance program for all employees engaged in work involving levels of asbestos at or above the action level for 30 or more days per year.

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OCCUPATIONAL EXPOSURE TO ASBESTOS

WHAT DOES THIS MEAN AT THE SALISBURY PLANT?

ASSUMPTIONS: (1) Approximately 75% of insulation at the Salisbury Plant contains asbestos.

(2) All jobs involving asbestos are likely to have exposures above the new Permissible Exposure Limit (PEL).

- INCREASED AWARENESS
- EMPHASIS ON CONTROLS TO ACHIEVE COMPLIANCE
- WHOLE BODY PROTECTION (i.e.: coveralls, head coverings, gloves, foot coverings), INCLUDING RESPIRATOR
- INCREASED MONITORING
- ASBESTOS WARNING LABELS

DBS:02-87

OCCUPATIONAL EXPOSURE TO ASBESTOS

IMPLEMENTATION PLAN

(1) ESTABLISH A LIST OF EMPLOYEES LIKELY TO BE AFFECTED BY THE NEW STANDARD. [Complete]

(2) RECEIVE RFA APPROVAL FOR EQUIPMENT. [Complete]

- Respirators
- Vacuum Cleaners
- Negative Pressure Filtration Equipment
- Labels
- Hygiene Facilities

(3) CONDUCT TRAINING IN ACCORDANCE WITH THE STANDARD. [first half of Feb.]

(4) CONDUCT FIT-TESTING FOR RESPIRATORS. [last half of February]

(5) LABEL ASBESTOS CONTAINING MATERIAL IN ALL AREAS. [February-March]

(6) ESTABLISH WORK RECORDS IN ALL AREAS WHERE EMPLOYEES HANDLE ASBESTOS. [end of February]

(7) CONDUCT PRE-EXPOSURE MEDICAL EXAMS AND QUESTIONNAIRES AS REQUIRED. [1Q, 1987]

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10461

OCCUPATIONAL EXPOSURE TO ASBESTOS

TRAINING OUTLINE AND INFORMATION MANUAL

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DATE: February 10, 1987 (initial issue)

REVISION: 0

TRAINING PROGRAM AND MANUAL

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SECTION I

INTRODUCTION TO ASBESTOS

REFERENCES:

(1) Course Manual for EPA "Asbestos Abatement Training", Drexel University, Philadelphia, Pa., January, 1987.

(2) Environmental and Occupational Medicine, William N. Rom, ed., 1983.

(3) Fundamentals of Industrial Hygiene, 2nd edition, National Safety Council, 1979.

WHAT IS ASBESTOS ?

The public is often confused about the source of asbestos. It is a mineral rock mined from the earth in much the same ways as other minerals, such as iron, lead, and copper. However, instead of crushing up into dust particles, it divides into millions of fine fibers. Asbestos is mined primarily from open pits in the following countries: the Soviet Union, Canada, South Africa, Rhodesia, People's Republic of China, Australia, Cyprus, and the United States (primarily California, Vermont, and Arizona).

These fibers come in three common varieties:

(1) CHRYSOTILE (White Asbestos) - fibrous form of mineral serpentine, most common variety (90% of commercial use), widely distributed geographically, with the largest deposits being in Canada, Russia, and Rhodesia.

(2) AMOSITE - fibrous form of mineral grunerite, mined only in South Africa, brownish-yellow to almost white color.

(3) CROCIDOLITE (Blue Asbestos) - fibrous form of mineral riebeckite, fine, resilient fibers of a characteristic blue color.

All three varieties exhibit substantial resistance to heat and chemicals, and thus have been used for a variety of commercial and industrial purposes. In fact, asbestos has been used in more than 3,000 products. Some of the key uses (and potential exposures to be aware of when developing an occupational history) include:

- asbestos-cement pipe
- brake linings
- clutch facings
- filters, gaskets, friction materials
- gas mask filters
- sprayed acoustical asbestos
- textiles (yarn, thread, belt, rope, cloth)
- steam and fire hoses
- wall, floor, roofing tile
- electrical insulation
- paints and fillers

Diseases and deaths associated with exposure to asbestos fibers are the principle factors behind the "Asbestos Problem." The three major respiratory diseases associated with asbestos are asbestosis, lung cancer, and mesothelioma. Their medical nature are discussed in much greater detail in section II, "Health Effects Associated with Asbestos Exposure."

During the early 1970's, the federal government attempted to respond to these health and legal problems by issuing regulations and guidelines to provide some controls for industrial exposures to asbestos fibers. Then during the late 70's and early 80's, they added guidelines and requirements to cover building occupants, especially schools. These actions, combined with the health and legal issues, prompted the need for asbestos abatement policies.

III. LABELS

In October-November, 1986, a survey was conducted by the Safety/Health/Environmental Department to determine primary areas of asbestos-containing insulation in the Salisbury Plant. Although this survey did not provide complete coverage, it did identify the insulation material in the most likely areas of removal work. Based on this survey, insulation will be labeled as follows if it contains asbestos:

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

IV. EXPERIENCE

Any equipment and piping installed, modified, or upgraded since 1976-78, should not carry asbestos-containing insulation. Other lines and vessels which undergo routine turn-arounds or which are commonly worked on (i.e.: HP end caps, reboiler relief valves) also will not have asbestos-containing insulation. This experience and knowledge base is a key element in asbestos recognition.

SECTION II

HEALTH EFFECTS ASSOCIATED WITH ASBESTOS EXPOSURE

REFERENCES:

Course Manual for EPA "Asbestos Abatement Training", Drexel University, Philadelphia, Pa., January, 1987.

THE RESPIRATORY SYSTEM

The primary diseases associated with asbestos are due to inhalation of asbestos fibers. A brief discussion of the respiratory system will help in understanding these effects. As air is breathed into the body, it passes through the mouth and nose into the windpipe or trachea. The trachea splits into two smaller airways called bronchi. Each bronchus divides into smaller and smaller tubes which terminate into air sacs called alveoli. In these air sacs, oxygen is absorbed into small blood vessels and waste gases such as carbon dioxide pass out of the blood.

The lung itself is divided into two halves and sits in the pleural cavity. This cavity and the outside of the lung itself have a Saran-wrap type lining. The pleural cavity and lung linings are in contact with each other and are very moist. Just like two panes of glass with a drop of water between them, these linings slide easily across each other, but are very difficult to pull apart. Accordingly, as the chest cavity expands, the lungs expand and air rushes in. If these linings (mesothelia) were to become damaged, inhalation could not occur properly.

The body has several mechanisms by which it "filters the air it breathes. First, very large particles are removed in the nose and mouth. Many smaller particles impact on the mucous-coated walls of the airways and are caught. These airways have a hair-like lining (ciliated cells) which constantly beats upward. Accordingly, particles caught in the mucous are swept up into the back of the mouth. From here they are swallowed or expelled by coughing. Cigarette smoking temporarily paralyzes these ciliated cells, inhibiting one of the body's natural defenses against unwanted dust. As the smoker sleeps, the hair-like cells start working again and carry large amounts of mucous into the back of the mouth. This causes the so-called "smoker's hack" in the morning. After the first cigarette or two, the cleansing mechanism is paralyzed again and the coughing stops. It should now be evident why cigarette smokers who are exposed to asbestos appear to be at greater risk. Other reasons will also be discussed later in this section.

Even with the above-mentioned natural defenses of the body, some dust particles inevitably reach the tiny air sacs. When this occurs, large cells (called macrophages) attempt to engulf the particle and "digest" it. For this reason, they are sometimes called the lung's garbage collectors. However, because asbestos is a mineral fiber, the macrophages are often not successful. If the cells cannot digest the fibers, they call in a secondary defense mechanism. They deposit a coating on the fibers causing scar tissue to be formed, and a condition develops known as asbestosis.

Like asbestosis, there exists a long lag time between initial exposure and the occurrence of lung cancer, typically 20-30 years. There appears to be some relationship between asbestos exposure and lung cancer, although no "safe level" has yet been determined. Again, these figures relate to past industrial situations where workers wore little or no protective equipment. Proper protection amd work practices will substantially lessen the risk of abatement workers getting lung cancer due to asbestos.

III. MESOTHELIOMA

The asbestos-associated disease of greatest concern in asbestos abatement is probably mesothelioma. Fortunately, it is also the rarest. Mesothelioma is a cancer of the chest cavity lining (mesothelium) and can also occur in the lining of the abdominal cavity. Although exposure to asbestos has been strongly associated with most cases of mesothelioma, some cases may occur without asbestos exposure. If mesothelioma occurs in the chest cavity, it is called pleural mesothelioma. In the abdominal cavity, it is known as peritoneal mesothelioma. This type of cancer spreads very rapidly and is always fatal. The exact cause remains unknown. There does not appear to be any increased risk of mesothelioma for smokers and there does not appear to be a dose-related relationship between the amount of asbestos exposure and mesothelioma. Cases have been recorded where the person's asbestos exposure had been extremely limited. Like the other diseases of asbestos, mesothelioma develops 30-40 years after initial exposure, if it occurs.

IV. OTHER DISEASES

Several other diseases are found more often among persons exposed to asbestos than the normal population. These include cancer of the esophagus, stomach, colon, and pancreas, pleural plaques, pleural thickening, and pleural effusion. The incidence of these health effects is much less than lung cancer. Again, the importance of using the proper work practices and protective equipment cannot be overemphasized to minimize the occurrence of these diseases due to unnecessary asbestos exposure.

SECTION III

O S H A STANDARD

ON

"OCCUPATIONAL EXPOSURE TO ASBESTOS"

FEDERAL REGISTER 29 CFR 1926.58

A. SCOPE AND APPLICATION

This section applies to all construction work, including the following:

- Demolition or salvage of structures where asbestos is present.
- Removal or encapsulation of materials containing asbestos.
- Construction, alteration, repair, maintenance, or renovation of structures, substrates, or portions thereof, that contain asbestos.
- Installation of products containing asbestos.
- Asbestos spill/emergency cleanup.
- [illegible] or products containing asbestos.

B. DEFINITIONS [partial listing]

- ACTION LEVEL - an airborne concentration of asbestos of 0.1 fiber per cubic centimeter (f/cc) of air calculated as an eight (8)-hour time-weighted average.
- ASBESTOS - includes chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, actinolite asbestos, and any of these minerals that have been chemically treated and/or altered.
- CLEAN ROOM - an uncontaminated room having facilities for the storage of employees' street clothing and uncontaminated materials and equipment.
- DECONTAMINATION AREA - 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 contaminated with asbestos.
- EMPLOYEE EXPOSURE - that exposure to airborne asbestos that would occur if the employee were not using respiratory protective equipment.

Prohibited Activities: Employees may not eat, drink, smoke, chew tobacco or gum, or apply cosmetics in the regulated area.

Requirements:

(1) Negative pressure enclosure

(2) Competent person to perform the following:

- . Set-up enclosure.
- . Control the entry and exit from the enclosure.
- . Supervise employee exposure monitoring.
- . Ensure proper use of protective clothing/equipment and hygiene facilities.
- . Ensure employees are properly trained.

(3) Exception: For small-scale, short-duration operations, such as pipe repair, valve replacement, installing electrical conduits, installing or removing drywall, roofing, and other general building maintenance or renovation, the employer is not required to comply with these requirements. Other engineering controls and work practices are applicable (i.e.: glove bags).

F. EXPOSURE MONITORING

Each employer shall perform monitoring to determine accurately the airborne concentrations of asbestos to which employees are exposed. All samples should be personal samples made from the breathing zone and representative of the 8-hour time-weighted average of each employee.

Initially, all asbestos handling jobs must be monitored.

The employer shall notify (in writing either individually or by posting at a centrally located place) affected employees of the monitoring results that represent that employee's exposure as soon as possible following receipt of results.

EXPOSURE LIMIT	REQUIRED RESPIRATOR
Not in excess of 20 fiber/cc (100 X PEL)	Supplied air respirator operated in continuous flow mode.
Not in excess of 200 fiber/cc (1000 X PEL)	Full facepiece supplied air respirator operated in pressure demand mode.
Above 200 fiber/cc	Full facepiece supplied air respirator operated in pressure demand mode and equipped with auxiliary positive pressure SCBA.

No employee shall be assigned to tasks requiring the use of respirators if, based on his or her most recent examination, it is determined that the employee will be unable to function normally wearing a respirator, or that the safety and health of the employee will be impaired by the use of a respirator.

Fit-testing (qualitative) is required for testing the fit of half-mask negative-pressure respirators. Facial hair (i.e.: beard) is not permitted with the use of negative-pressure respirators. Persons with facial hair which would come in contact with the sealing surface of the mask, would be required to wear a full-facepiece air-supplied (positive pressure) unit.

Fit-testing is required every 6 months following the initial fitting.

I. PROTECTIVE CLOTHING

Coveralls or similar whole-body clothing, head coverings, gloves, and foot coverings are required. Disposable-type clothing is preferable to eliminate additional laundering requirements.

J. HYGIENE FACILITIES AND PRACTICES

The employer may permit employees engaged in small-scale, short-duration operations to clean their protective clothing with a portable HEPA-equipped vacuum before such employees leave the area.

Employee training shall be provided prior to or at the time of initial assignment, unless the employee has received equivalent training within the previous 12 months, and at least annually thereafter. The program must include the following:

- Methods of recognizing asbestos.
- The health effects associated with asbestos exposure.
- The relationship between smoking and asbestos in producing lung cancer.
- The nature of operations that could result in exposure to asbestos; the importance of necessary protective controls to minimize exposure; any necessary instruction in the use of these controls and procedures.
- The purpose, proper use, fitting instructions, and limitations of respirators.
- The appropriate work practices for performing the asbestos job.
- Medical surveillance program requirements.
- A review of this standard, including appendices.

L. HOUSEKEEPING

Vacuuming: HEPA filtered vacuuming equipment.

Waste Disposal: sealed, labeled, impermeable bags or other closed, labeled, impermeable containers.

M. MEDICAL SURVEILLANCE

The employer shall institute a medical surveillance program for all employees engaged in work involving levels of asbestos at or above the action level for 30 or more days per year, or who are required by this section to wear negative pressure respirators.

Details of the program are covered in section IV of this handbook.

APPENDICES

APPENDIX A : [mandatory]	OSHA Reference Method (Procedure for Analyzing Air Samples for Asbestos)
APPENDIX B : [non-mandatory]	Detailed Procedure for Asbestos, Tremolite, Anthophyllite, and Actinolite Sampling and Analysis
APPENDIX C : [mandatory]	Methods for Respirator Fit Testing
APPENDIX D : [mandatory]	Medical Questionnaire
APPENDIX E : [mandatory]	Information for X-Ray Interpretations
APPENDIX F : [non-mandatory]	Work Practices and Engineering Controls for Major Asbestos Removal, Renovation, and Demolition Operations
APPENDIX G : [non-mandatory]	Work Practices and Engineering Controls for Small-Scale Short-Duration Asbestos Renovation and Maintenance Activities
APPENDIX H : [non-mandatory]	Substance Technical Information for Asbestos
APPENDIX I : [non-mandatory]	Medical Surveillance Guidelines for Asbestos

SECTION IV

MEDICAL SURVEILLANCE PROGRAM

REFERENCES:

(1) Course Manual for EPA "Asbestos Abatement Training", Drexel University, Philadelphia, Pa., January, 1987.

(2) Salisbury Plant Safety/Health/ Environmental Department

SALISBURY MEDICAL SURVEILLANCE PROGRAM

It is important for any employer who has workers who will have potential asbestos exposure to establish an ongoing medical surveillance program. The two most obvious reasons and the two areas of greatest concern are:

(1) The safety and health of all employees.

(2) Regulatory requirements.

Through implementation of a sound medical surveillance program, an employer will be able to verify every employee's medical status at a particular time and comply with OSHA standards on medical surveillance of workers exposed to asbestos.

According to the OSHA asbestos standard, 29 CFR 1926.58, subpart M, the employer must provide at his/her own expense, medical examinations relative to their employees' exposure to asbestos. More specifically, the employer must institute a medical surveillance program for all employees engaged in work involving levels of asbestos at or above the action level for 30 or more days per year, or who are required by this section to wear negative pressure respirators. An acceptable program must include pre-placement, annual, and termination examinations provided there is sufficient evidence that demonstrates that an employee has not been examined in accordance with the standard within the past one year period. This standard also outlines the requirements for maintaining medical records on each employee.

The three parts of the medical surveillance program are discussed as follows:

I. PRE-PLACEMENT EXAMS

According to the OSHA standard, pre-placement examinations must take place within 30 calendar days following the worker's first employment. A comprehensive medical evaluation must be performed. This includes, as a minimum, a chest X-ray, pulmonary function tests, a ColoScreen, and a medical history to determine the presence of any possible respiratory diseases. The pulmonary function tests include forced vital capacity (FVC) (the maximum amount of air that can be expired from the lung after full inhalation) and forced expiratory volume after one second (FEV1.0) (the amount of air forcibly expired in one second after full inhalation).

The results of this examination will be used as the employee's baseline health status, and also to determine whether or not they are capable of wearing respirators. A physician's report will then be furnished to the employer for their files. A statement should be provided indicating whether or not an employee is capable of wearing a respirator, and also outlining any limitations associated with its use. This form must also indicate any other limitations (i.e.: heat, cold, etc.). If an employee requests to see the report, the employer is required to supply them with a copy.

REASONS FOR SPECIFIC TESTS

All of the tests that are required to be performed during pre-placement, annual, and termination medical examinations are required in order to properly evaluate the human body systems that are most likely to be affected by exposure to elevated levels of airborne asbestos fibers. Some specific reasons for each test are discussed as follows:

I. CHEST X-RAY

These are performed primarily to detect irregularities in the lungs or the heart, including any fibrosis or pleural plaques induced by exposure to asbestos. Chest X-rays may also be used as a baseline for comparing future X-rays.

II. PULMONARY FUNCTION

These tests are conducted to determine if a person's lungs are expanding normally, and if there is adequate air movement in and out of the lungs. The FVC and FEV1.0 are conducted through the use of a spirometer. If the FEV1.0 is reduced, this may signify a possible obstruction or problem in the lungs. If the FVC or the ratio of FEV1.0 to FVC is reduced, this may signify restrictive changes in the lungs.

III. COLOSCREEN

This is a test to determine the presence of occult blood in the stool. If the test is positive it indicates a potential problem which should be investigated further.

IV. PULMONARY HISTORY

This part of the examination is simply a questionnaire that is completed by the employee. It is used to identify the potential for respiratory diseases. Several questions relate to chronic lung diseases, while others address the employee's personal habits such as smoking. There is often particular concern for the health of a person who smokes and is also exposed to asbestos. Recent studies indicate that an asbestos worker who smokes is more likely to develop lung cancer than non-smokers who do not work with asbestos.

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CELANESE - SAL.SBURY PLANT

ASBESTOS EXPOSURE LOG

ONTH ______________, 19 ____ SHOP/AREA: ______________ SUPERVISOR: ______________

EMPLOYEE NAME	PAYROLL NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

DAYS*

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*Enter an "X" on date that employee works directly with asbestos or in an area where asbestos is being worked with.

ETURN LOG SHEET TO INDUSTRIAL HYGIENE ENGINEER (S/H/E DEPARTMENT) AT END OF EACH MONTH.

SECTION V

PROTECTING THE WORKER

REFERENCES:

Course Manual for EPA "Asbestos Abatement Training", Drexel University, Philadelphia, Pa., January, 1987.

PROTECTIVE CLOTHING

It is important to understand why protective clothing is worn during asbestos abatement work. The primary reason is to keep gross amounts of asbestos-containing debris off the body, hair, etc. The use of protective clothing and showers will minimize the chance of bringing asbestos out of the work area and into the home. Protective clothing will also minimize the chance of rashes and discomfort caused by the material being removed. In addition to the asbestos, frequently the material being removed contains mineral wool, fiberglass, and binders such as cement. Each of these may be irritating to the skin. Continued direct contact with asbestos has also been shown to cause "asbestos warts." These warts often take months to heal and occur more frequently if asbestos is trapped beneath a watchband, or in other ways kept in close contact with the skin.

Protective clothing for asbestos abatement projects usually consists of disposable coveralls, foot covering and head covering. The foot and head covering should be attached to the coveralls. This eliminates the need to tape openings between garments, etc. Gloves should be worn when inside the work area unless using a glovebag.

Other protective clothing/items such as hard hats and safety shoes/boots should remain in the work area for the duration of the project. Upon project completion, these items can be cleaned, placed in a plastic bag, labeled as containing asbestos, and taken to the next job.

After completing small-scale, short-duration type jobs disposable coveralls and other disposable protective clothing should be completely cleaned using a vacuum with HEPA filter and then disposed along with the asbestos waste. Clothing worn underneath the coveralls must also be vacuumed before leaving the work area.

To summarize, listed below is a list of items normally worn by asbestos abatement employees:

- Disposable coveralls, disposable foot covering, disposable head covering
- Shoes with non-skid rubber soles
- Hard hat (as required)
- Gloves (cotton is practical)
- Eye protection (not needed if full facepiece respirators are used)

Half Mask : It is called half-mask because it covers half of the face - from under the chin to the bridge of the nose. Most, but not all, half-mask respirators are NIOSH/MSHA approved. It is still necessary to chose the correct approved model for the identified air contaminant.

Full Face : It is called a full-face type because it covers from under the chin up to the forehead. This broader coverage provides a better face fit, higher degree of protection, and gives some eye protection. Many full-face respirators have four or more straps. Regardless of the number of straps, the respirator should be put on by placing the chin into the chin cup, then tightening the straps going from the bottom to the top.

A relatively new (last 5-10 years) and special subcategory of air-purifying respirator is the Powered Air Purifying (PAPR) type. The previously described air-purifying respirators depend on breathing energy to draw the air in through the respirator cartridge or filter (negative pressure). However, these PAPR units use a battery-powered blower that passes the contaminated air through the cartridge or filter where the air is cleaned and forced through a hose to the facepiece. The face covering can be a half-mask, full-face mask, helmet (hat), or hood.

An advantage of using a powered air-purifying respirator is that it supplies air at a positive pressure within the facepiece, helmet, or hood, so that any leak is hopefully outward. Therefore, they provide a higher degree of protection than do half-mask and full-face air-purifying respirators.

II. AIR-SUPPLIED RESPIRATOR

Air-supplied respirators deliver breathing air through a supply hose connected to the worker's facepiece (half mask or full face). This category of respirator is becoming the most important type on large asbestos abatement jobs. They provide a very high degree of protection. They are often required by the contract specifications on larger projects.

III. SELF-CONTAINED RESPIRATOR

Self-contained respirators provide protection for various periods of time depending upon the amount of breathing air (air pressure and tank size) and the breathing demands of the wearer. The worker is independent of his/her surrounding atmosphere when using these devices; therefore, they can be used in environments immediately harmful to life. They have several disadvantages, and are seldom used on asbestos jobs. They are heavy and awkward to wear. The air supply usually lasts only 30 to 60 minutes.

FIT-TESTING

Any employee who is assigned a respirator must be given the opportunity to wear the respirator and be qualitatively fit-tested. The qualitative fit-test is used to determine the fit of the respirator to the face of the individual. Qualitative (pass/fail) tests are fast, require no complicated, expensive equipment, and are easily performed. However, they depend on the wearer's response, and thus are not entirely reliable. A more detailed quantitative fit-test may be conducted instead.

The fit of respirators must be determined when the respirators are issued. Each employee should check the fit each time they put the respirator on. These are valid requirements since the weakest point of protection for a respirator is leakage around the face seal/fit.

During any type of fit-testing, the respirator straps must be properly located and as comfortable as possible. Over tightening the straps will sometimes reduce facepiece leakage, but the wearer may be unable to tolerate the respirator during the work period. The facepiece should not press into the face and shut off blood circulation or cause major discomfort. At the time of issuance, a visual inspection of the fit should always be made by a second person. That person should check to see that there are not visible openings/leaks and that the respirator appears properly adjusted and comfortable.

There are several methods of testing within both categories of fit-tests. Those considered most applicable to the qualitative fit-testing done at the Salisbury Plant are discussed as follows:

- Negative Pressure Test: For this test, the user closes off the inlet of the cartridges or filters by covering with the palms or squeezing the breathing tube so it does not allow air to pass; inhales gently so the facepiece collapses slightly; and holds his/her breath for about 10 seconds. If the facepiece remains slightly collapsed and no inward leakage is detected, the respirator probably fits tightly enough.

- Positive Pressure Test: This test is very similar in principle to the negative pressure test. It is conducted by closing off/covering the exhalation valve and exhaling gently into the facepiece. The respirator fit is considered okay if slight pressure can be built up inside the facepiece without any evidence of outward leakage around the facepiece.

(3) Respiratory equipment should be thoroughly rinsed in warm clean water (120°F maximum) to remove all traces of detergent, cleaner and sanitizer, and disinfectant.

(4) Respiratory equipment should be allowed to air dry on a clean surface.

(5) When not in use, respiratory equipment should be sealed in plastic bags and stored with the facepiece and exhalation valve in a non-distorted position.

Repair or replacement of component parts must be done by qualified individuals. Substitution of parts from a different brand or type of respirator will invalidate the approval of the respirator.

Inspection for defects in respiratory equipment must be done before and after each use and during cleaning. The primary defects to look for in the inspection of component parts of the respirator and corrective actions where appropriate are itemized below:

I. Air Purifying Respirators (half-mask and full facepiece)

A. Rubber facepiece - check for:
. Excessive dirt (clean all dirt from facepiece)
. Cracks, tears, or holes (obtain new facepiece)
. Distortion (allow facepiece to "sit" free from any constraints and see if distortion disappears; if not, obtain new facepiece)
. Cracked, scratched, or loose-fitting lenses (contact respirator manufacturer to see if replacement is possible; otherwise, obtain new facepiece)

B. Headstraps - check for:
. Breaks or tears (replace headstraps)
. Loss of elasticity (replace headstraps)
. Broken or malfunctioning buckles or attachments (obtain new buckles)
. Allow the facepiece to slip (replace headstrap)

C. Inhalation valve, exhalation valve - check for:
. Detergent residue, dust particles, or dirt on valve or valve seat (clean residue with soap and water)
. Cracks, tears, or distortion in the valve material or valve seat (contact manufacturer for instructions)
. Missing or defective valve cover (obtain valve cover from manufacturer)

RESPIRATOR PROGRAM EVALUATION AND RECORDKEEPING

The respirator program shall be evaluated at least annually with program adjustments, as appropriate, made to reflect the evaluation results.

Attention should be given to proper recordkeeping. Records which should be kept include: employees who are trained in respirator use, documentation of the care and maintenance of respirators, medical reports of each respirator user, airborne concentrations of asbestos fibers during work, and any problems encountered during asbestos handling projects with regards to respiratory equipment.

SECTION VI

ASBESTOS REMOVAL WORK PRACTICES

REFERENCES:

(1) Course Manual for EPA "Asbestos Abatement Training", Drexel University, Philadelphia, Pa., January, 1987.

(2) Celanese - Salisbury "Hourly Industrial Relations Guide Manual", HIRG 10:13, August 20, 1984.

NEGATIVE PRESSURE WORK AREAS

This section provides guidelines for the use of negative pressure systems in removing asbestos-containing materials from work areas. The manufacturer's instructions for equipment use should be followed for negative air filtration units, as well as any other equipment needed. A negative pressure system is one in which the static pressure in an enclosed work area is lower than that of the environment outside the containment barriers.

The pressure gradient is maintained by moving air from the work area to the environment outside the area via powered exhaust equipment at a rate that will support the desired air flow and pressure differential. Thus, the air moves into the work area through designated access spaces and any other barrier openings. Exhaust air is filtered by a high-efficiency particulate air (HEPA) filter to remove asbestos fibers.

The use of negative pressure during asbestos removal helps protect against the large-scale release of fibers to the surrounding area in case of a breach in the containment barrier. A negative pressure system also can reduce the concentration of airborne asbestos in the work area by increasing the dilution ventilation rate (i.e.: diluting contaminated air in the work area with uncontaminated air from outside) and exhausting contaminated air through HEPA filters. The circulation of fresh air through the work area reportedly also improves worker comfort by increasing the cooling effect, which may aid the removal process by increasing job productivity.

This type of system would be set up for large-scale long-duration jobs and would not likely be executed by plant maintenance. An outside contractor would be the likely choice due to the complexity of set up. However, if such a system is required, the Safety/Health/Environmental Department would be responsible for ensuring proper procedures are followed. The required equipment has been bought by the Salisbury Plant and is available for maintenance use.

PREPARING THE WORK AREA

Airborne fibers which are generated by disturbance of asbestos-containing material may remain suspended in the air for long periods of time because of their small size and aerodynamic properties. These airborne asbestos fibers can migrate via air currents to other parts of the building.

Each job has unique requirements for effective preparation. For instance, the sequence of steps would probably be different for preparing a boiler room than preparing an area with asbestos material above a suspended ceiling. The following are general guidelines which can be modified to address specific problems encountered on different jobs:

MATERIALS AND EQUIPMENT LIST FOR PREPARATION OF THE WORK AREA AND ESTABLISHING THE DECONTAMINATION STATION

Polyethylene Sheeting Material

Used to:

Seal off work areas and items within work areas; protect surfaces in the work area other than those being altered; construct decontamination and enclosure systems.

Types:

4 mil thickness	12' x 100' rolls	20 lbs
6 mil thickness	20' x 100' rolls	60 lbs

Duct Tape

Used to: Seam polyethylene sheets together; form airtight seal between polyethylene and wall; provide some support for vertical sheets.

Adhesive Spray

Used to: Seal seams; provide additional support to vertical sheets.

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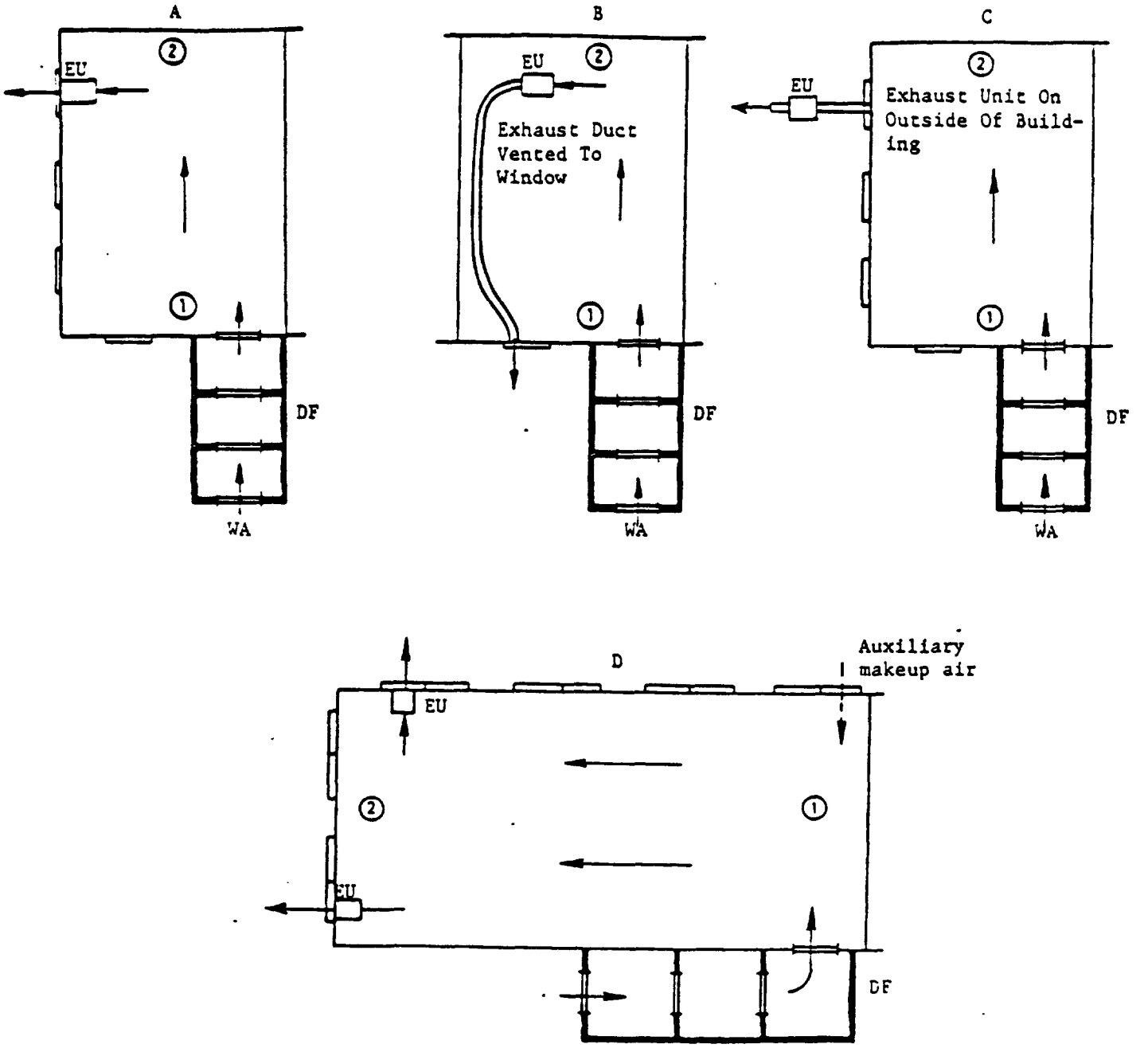

Examples of negative pressure systems.
DF, Decontamination Facility; EU, Exhaust Unit; WA, Worker Access; A, Single-room work area with multiple windows; B, Single-room work area with single window near entrance; C, Single-room work area with exhaust unit placed on the outside of the building; D, Large single-room work area with windows and auxiliary makeup air source (dotted arrow). Arrows denote direction of air flow. Circled numbers indicate progression of removal sequence.

WET REMOVAL TECHNIQUES

EPA regulations which cover the removal of asbestos material require wetting the material before removal begins and keeping it wet as it is removed and while it is being bagged. Dry removal, which requires specific EPA approval, is appropriate for some types of asbestos-containing materials which have been previously encapsulated and will not absorb amended water. Also, there are special conditions which preclude the use of water such as a room containing electrical supply lines which cannot be de-energized during the removal project.

Two advantages to the use of wet methods for removing asbestos materials include a reduction in airborne fiber concentrations which are generated during the removal and a reduction in the effort required to remove the material. Wet removal is based on the ability of water to lower the ability of the asbestos-containing material to release airborne asbestos fibers and increase the settling rate of fibers that are released.

The positive effects of wet removal can be further enhanced by adding a wetting agent to the water. The wetting agent is a combination of chemicals which aids in the penetration of the material and increases the probability of individual fiber wetting. Various wetting agents are available which have been used in the agriculture industry and fire fighting profession for many years. EPA recommends a wetting agent consisting of 50% polyoxyethylene ester and 50% polyoxyethylene ether in a ratio of 1 ounce to 5 gallons of water. This wetting agent is not as effective with materials which contain a high percentage of amosite asbestos.

Amended water is not totally effective in controlling fibers emitted from material containing amosite asbestos. Some contractors reportedly use ethylene glycol and/or oils to help reduce amosite emissions. Others have tried an encapsulant which is diluted so that it drys slowly and does not harden before the asbestos material can be removed from the pipes or vessels. No data is available from comparative testing of these wetting methods to determine which is the most effective.

GLOVEBAG TECHNIQUES

The glovebag consists of a 6-12 mil bag fitted with long sleeve gloves, a tool pouch and a two-inch opening used for water application. Although glovebags can be fabricated by the user for each project, most contractors prefer to purchase ready-made bags. The size, quality, style and cost vary depending on the manufacturer. In addition to the glovebag, several other tools and materials are commonly required to perform the project successfully. These materials are listed below:

. Glovebag (one or more depending on project size)

. Pump-up garden sprayer (2-3 gallon size)

. Amended water (surfactant)

. Duct tape (3-inch width)

. Polyethylene disposal bags (6 mil)

. Smoke tubes with aspirator bulb

. HEPA-filtered vacuum cleaner

. Bone saw

. Utility knife with retractable blade

. Wire cutters

. Tin snips (if aluminum jacket is present)

. Polyethylene plastic (roll of 4 or 6 mil)

. Dual cartridge respirators with high efficiency cartridges

. Disposable full-body suits with hood and feet covering

. Small scrub brush

. Stapler

. Several rags

. Wettable cloth

. Asbestos caution signs and labels

. Reinsulation materials as necessary

CLEANUP AND WASTE DISPOSAL

Although cleanup is a tedious, sometimes lengthy, process, it is one of the most critical tasks of an asbestos removal job. Successful cleanup operations require proper sequencing of tasks on large projects and great attention to detail on any job. For large removal projects where negative pressure regulated work areas are established, cleanup will be directed by a qualified person from the Safety/Health/Environmental Department as per the OSHA standard.

For small-scale, short-duration jobs, a vacuum equipped with HEPA filter is mandatory. The Salisbury Plant has purchased air-powered units which operate off the plant air system and can be used in classified areas. One model can be converted from a dry vacuum to a wet pick-up vacuum. The surrounding areas and any disposable clothing must be cleaned with a HEPA vacuum. NOTE: THE VACUUMS EQUIPPED WITH HEPA FILTERS MUST NEVER BE USED FOR ANYTHING OTHER THAN ASBESTOS REMOVAL OPERATIONS. Use on other jobs could lead to asbestos fiber contamination.

Walls and equipment adjacent to the work area should be wet wiped. For best results, workers should use cotton rags or lint free paper towels which are disposed after one use. Rinsing and reuse of towels may result in smearing asbestos fibers on the surfaces. Also, to avoid smearing of residual fibers, workers should wipe in one direction only.

After the walls are well wiped, the floor is mopped with a clean mop head wetted with amended water. The waste water from the wet wiping and mopping operations is treated as asbestos-containing water and dumped in the shower drain or placed in a barrel for disposal. It is now generally accepted that filtration of asbestos-contaminated water through a five micron filter is the state-of-the-art for asbestos removal from water. Discharge of the filtered water should be to a sanitary sewer system.

Once the asbestos-containing waste material has been removed from the areas of concern, there are certain precautions that must be taken before disposal operations begin. The first, and probably most important, undertaking is to ensure that all of the asbestos-containing waste has been thoroughly treated with water, or "wetted." This may be accomplished by having a water supply available in any area that removal is taking place (i.e.: a hose). As the asbestos-containing material is being removed, the material should be kept as damp as possible via a low pressure water stream. By ensuring this, the chances of airborne asbestos fiber generation are significantly reduced. The waste material will then be suitable for bagging or containerizing.

ATTACHMENT
Rev.: 2 10/31/96

Type R-13: Emergency Escape Breathing Apparatus - Used by Utilities Dowtherm Operator for emergency egress from the Dow Shack in the event a Dow release results in a surrounding vapor cloud. This apparatus is NOT acceptable for other than emergency use.

North Safety Equipment
Model 850
NIOSH & MSHA Approval #TC-13F-195